



ABSTRACT

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OC001 - AI MEETS HUMAN COACHING: FEASIBILITY AND ACCEPTABILITY OF A HOME- BASED EXERCISE APP FOR OLDER ADULTS

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Background: Aging is associated with a progressive decline in physical function, increasing the risk of disability, loss of autonomy, and reduced quality of life (Martins et al., 2024). While regular physical activity is a recognized protective factor, adherence to structured programs remains low among older adults (Cacciatore et al., 2019). Digital technologies, particularly mobile applications powered by artificial intelligence (AI), offer a promising path for delivering personalized and accessible home-based interventions (Di Martino et al., 2024; Romeo et al., 2019).

Purpose: This pilot study evaluates a novel, custom-developed AI-based mobile application uniquely designed for older adults. Unlike existing apps, this platform integrates real-time markerless 3D motion capture through a smartphone camera with dedicated human coaching and dynamic feedback adaptation, offering a tailored exercise experience. We assessed feasibility, adherence, and acceptability, along with changes in physical activity levels and functional ability.

Methods: Ten older adults completed a four-week program (2–3 sessions/week). Each was paired with a personal coach who remotely monitored progress via a web-based dashboard. The app used AI to create 3D movement models without external sensors, enabling coaches to provide individualised adjustments in real time. Pre-post assessments included SPPB and IPAQ.

Results: Participants showed strong adherence and rated the system highly in terms of usability, perceived usefulness, and motivation. The AI-enhanced visual feedback was improved physical activity.

OC002 - ADAPTED PHYSICAL ACTIVITY IN FONTAN ADOLESCENTS ADAPTED PHYSICAL ACTIVITY IN FONTAN ADOLESCENTS

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Purpose: The Fontan procedure is a surgical technique used in children born with univentricular hearts. It involves diverting the venous blood from the inferior vena cava and superior vena cava to the pulmonary arteries. Though lifesaving for thousands of children, this procedure leads to adverse consequences of numerous end-organs, including the airways, the intestines, the kidneys, the musculoskeletal system, and, most commonly, the hepatic system. Moreover, it is known that patients undergoing this surgery tend to be more sedentary than age-matched healthy peers and inactivity represents a further risk factor for the onset of these adverse effects. The aim of this study is to assess whether the fitness level (VO_{2peak}, strength, body composition, flexibility) of Fontan adolescents (FA) is lower than in healthy peers; in addition, the feasibility, safety and effectiveness of a physical activity protocol designed to improve their fitness and health-related quality of life will be assessed.

Methods: 10 FA of both sexes, aged between 13 and 18 years, were enrolled in February 2025 and evaluated before (T0) and after 4-month (T1) adapted combined training. A complete fitness evaluation was carried out (VO_{2peak}, strength, body composition, flexibility) as well as the health-related quality of life (The PedsQL™ Cardiac Module version for Adolescent) was investigated. The same evaluations were repeated at the end of the protocol.

Results: All FA completed the protocol and no adverse events occurred. Results of functional assessment at T0 evidence a lower level of VO_{2peak} in the FA (25.01 ± 6.59 mL/kg/min) compared to the normal value reported in literature (45.2–50.9 mL/kg/min). The

mean BMI (21.02 ± 2.97) results similar to healthy subjects. Hand-grip strength (dx 21.89 ± 8.00 ; sx 21.36 ± 6.84) and flexibility (-5.38 ± 10 cm) values are lower than those reported in literature for age-matched healthy peers. Preliminary results of functional evaluation at T1 show an improving trend for all tested.

Conclusions: Despite this is a pilot study, the preliminary analysis confirms the need to increase the involvement of FA in adapted physical activity programs in order not only to raise their life expectancy but also to improve their fitness level and the quality of life.

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References:

OC003 - A HOME-BASED EXERCISE PROGRAM IMPROVED MOBILITY AND QUALITY OF LIFE IN PATIENTS WITH CHRONIC KIDNEY DISEASE AND CONCOMITANT PERIPHERAL ARTERY DISEASE: PRELIMINARY ANALYSIS OF THE MULTICENTER RANDOMIZED-CONTROLLED STUDY EXACT-CKD-PAD

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Purpose: The aim of this multicenter randomized-controlled trial funded by Italian Ministry of Health is to confirm the hypothesis that a pain-free in-home walking program may improve functional capacity, quality of life and long-term outcomes in a sedentary population of patients with peripheral artery disease (PAD) and chronic kidney disease (CKD).

Methods: Patients with PAD at claudication stage and CKD at III and IV KDOQI stages, without absolute contraindication to exercise training and providing informed consent were invited to participate in the hospital of Ferrara, Reggio Calabria and Peschiera del Garda. Patients were then randomized into either Exercise (Ex) or Control (Co) groups. People in Ex group received a 6-month low-intensity interval walking program consisting of 1 min walking and 1 min resting to be repeated 10 times, two times per day with a walking speed weekly increasing and maintained at home through a metro-nome smartphone application.

Outcomes were collected by blinded investigator at baseline (T0), end of treatment (T6) and follow up (T12). Primary outcome was the 6-min walking distance (6MWD). Secondary outcomes included lower limb strength through 5-time Sit-to-Stand test (5STS), quality of life by SF-36 questionnaire and clinical outcomes.

Results: Nowadays, a total of 105 patients were randomized (Ex n = 52) and 33 of them (Ex n = 16) completed the 6-month intervention. At baseline the two groups did not differ for any anthropometric, clinical or functional characteristics. Patients of the Ex group executed a median of 90% of the prescribed home-training session. At T6, Ex group exhibited significantly higher improvements of 6MWD ($+31 \pm 12$ m vs -3 ± 23 m; $p < 0.001$), as well as Pain-free walking distance (Ex: 84 ± 45 m vs Co: 12 ± 54 ; $p < 0.001$), 5STS time (-2.5 ± 1.5 s vs -0.2 ± 1.2 ; $p = 0.038$)

and physical functioning score of SF-36 questionnaire (Ex: 12 ± 8 vs Co: 2 ± 10 ; $p = 0.045$).

Conclusions: According to this preliminary analyses, a simple home-based walking program obtained a high adherence and was effective in improving functional capacity and quality of life amongst people exposed to a sedentary lifestyle and walking disability as people with concomitant CKD and PAD. The prosecution of the trial may confirm these preliminary findings.

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OC004 - INFLUENCE OF LIFELONG FOOTBALL TRAINING ON THE SALIVARY MICROBIOTA COMPOSITION IN ELDERLY MEN

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Purpose: Age-related changes in the oral microbiota composition, are associated not only with oral but also with systemic health^{1,2}. Exercise affects gut and salivary microbiota composition³. The aim of the present study was to assess the impact of lifelong football training on the salivary microbiota composition associated with health in elderly men.

Methods: Saliva from 20 Veteran football Players (VPG) and 17 untrained active (CG) healthy males (74.4 ± 4.1 y) were collected. The composition of the oral microbiome was analyzed by 16S rRNA sequencing. The Amplicon were filtered, decontaminated, and phylogenetically classified using DADA2 software. Differential abundance analysis of microbiome taxa and pathway data was obtained by the LEfSe algorithm.

Results: LEfSe analysis showed a differential abundance of the genera *Eubacterium*, *Veillonella* and *Filifactor* (LDA score: 1.77, 3.91 and 1.98, respectively; $p < 0.05$) and in the species *Porphyromonas gingivalis*, *Prevotella nigrescens*, *Capnocytophaga granulosa*, *Catonella morbi*, *Filifactor alocis* and *Fusobacterium nucleatum* (LDA score: 2.58, 2.9, 1.9, 1.5, 1.9, and 3.02; respectively; $p < 0.05$) all of which were more abundant in the CG compared to the VPG saliva samples.

Conclusions: Our preliminary results indicate an enrichment of oral microbial pathogens associated with different systemic diseases in the CG vs VPG saliva. In particular, the increase of genera associated with dysbiosis and increased intestinal permeability suggests a higher risk to develop inflammatory diseases in CG². In conclusion, lifelong football training contribute to a more balanced oral microbiota composition, potentially reducing the risk of inflammatory diseases onset in older adults.

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OC005 - UNILATERAL MOTOR SYMPTOMS IN PARKINSON'S DISEASE DO NOT IMPAIR MAXIMAL FORCE OR NEUROMUSCULAR ACTIVATION

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Purpose: Parkinson's disease (PD) affects over 6 million people globally and is characterized by the progressive degeneration of dopaminergic neurons, leading to both motor and non-motor symptoms. The onset is typically unilateral in the upper limb, but it remains unclear whether motor symptoms are paralleled by impairments in maximal force and neuromuscular function. Therefore, the aim of this study was to determine the anatomical (cross-sectional area, CSA), neuromuscular (voluntary activation, VA%, and corticospinal activation, MIP), and intrinsic muscle contractility (IMC) components of the maximal voluntary contraction force (MVC) of the upper limbs in patients with PD. We hypothesized that the upper limb with more severe motor symptoms would exhibit reduced MVC due to spinal and supraspinal neuromuscular impairments.

Methods: In 10 patients with PD and 10 age-matched controls (CTRL), MVC, VA%, IMC, and MIP were measured during maximal isometric contractions of the dominant and non-dominant elbow-flexor muscles using interpolated twitch and transcranial magnetic stimulation (TMS) techniques. The CSA of the elbow-flexor muscles was determined using a planimetric ultrasound technique. The percent difference between the two limbs (lateralization) was then calculated for both groups.

Results: All participants (PD and CTRL) were right-handed, and the arm most affected by PD symptoms was the dominant one. Surprisingly, PD and CTRL groups exhibited similar lateralization: 12% for MVC ($p = 0.8$), 10% for VA% ($p = 0.7$), and 11% for IMC and MIP ($p = 0.6$). The lateralization of CSA in the elbow-flexors was negligible, and the force normalized by CSA was comparable between the two groups.

Conclusions: Contrary to our hypothesis, the upper limb with more severe motor symptoms in PD did not exhibit a deterioration in maximal force, nor was this accompanied by spinal or supraspinal neuromuscular impairments. The preservation of limb lateralization, even in the presence of motor symptoms, suggests that distinct neural pathways may underlie these different physiological and pathophysiological processes.

OC006 - POSTURAL AND GAIT STABILITY AS KEY CONTRIBUTORS TO URINARY INCONTINENCE IMPROVEMENT: A MULTIMODAL EXERCISE STUDY

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Purpose: This study aimed to evaluate the effectiveness of a five-week multimodal exercise program in reducing urinary incontinence (UI) symptoms and improving functional parameters such as postural control, core stability, and kinesiophobia in women.

Methods: Fifty women with UI (mean age 57.7 ± 8.0 years) participated in a supervised intervention designed to reduce intra-abdominal pressure on the pelvic floor and promote appropriate tone and conscious activation through breathing and posture control, and core stability exercises. Urinary loss was objectively assessed by weighing absorbent pads before and after use during a predefined period, according to the method proposed by the International Continence Society (PAD test). Postural stability was measured using static (Bodysway) and dynamic (March in Place) balance tests, assessed with the Gyko and Optojump systems (Microgate, Bolzano, Italy). Core stability was evaluated through the McGill test battery (flexor and extensor endurance test, left and right-side plank). Kinesiophobia was assessed using the Tampa Scale of Kinesiophobia (TSK). Measurements were taken at baseline, post-intervention, and one-month follow-up, except for the PAD test (baseline and post-intervention only).

Results: After the intervention, urinary loss significantly decreased (-28.7% , $p < .001$). In the Bodysway test with eyes closed, sway area was reduced by over 40% ($p < .001$), and this improvement was maintained at follow-up. Dynamic balance also improved post-intervention, with reductions in flight time (-7.9% , $p < .001$) and contact time (-5.6% , $p = .002$); these gains were either maintained or further improved at follow-up. Core stability improved significantly after the intervention in the trunk extensor ($+11\%$, $p = .002$) and flexor tests ($+17\%$, $p < .001$), but performance declined at follow-up. No significant changes were observed in side plank tests at any time point. Kinesiophobia scores decreased significantly by 7% after the intervention ($p = .012$) and remained stable at follow-up.

Conclusions: A short-term multimodal exercise program led to significant reductions in urinary loss, as well as improvements in postural control, neuromotor efficiency, and core stability. The observed decrease in kinesiophobia suggests improved confidence in movement. These findings support the use of multimodal approaches in the conservative management of pelvic floor dysfunction.

OC007 - ACUTE AND CHRONIC EFFECTS OF HIGH VS. REDUCED CARBOHYDRATE MEDITERRANEAN DIET ON WINGATE ANAEROBIC TEST PERFORMANCE IN AMATEUR ENDURANCE ATHLETES

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Purpose: The Mediterranean diet (MD) is widely recognized for its benefits, yet its role in sports nutrition remains relatively under investigated. This study aimed to evaluate how both acute and long-term intake of a MD providing different amounts of carbohydrates influence anaerobic performance and metabolic responses, specifically during the Wingate Anaerobic Test. Outcomes included mechanical performance indicators, blood lactate levels, and perceived exertion. The Mediterranean diet (MD) is widely recognized for its benefits, yet its role in sports nutrition remains relatively under investigated. This study aimed to evaluate how both acute and long-term intake of a MD providing different amounts of carbohydrates influence anaerobic performance and metabolic responses, specifically during the Wingate Anaerobic Test. Outcomes included mechanical performance indicators, blood lactate levels, and perceived exertion.

Methods: A randomized crossover trial was conducted with endurance-trained, non-professional athletes who followed a High-Carbohydrate Mediterranean Diet (HCMD; 55–60% daily energy from carbohydrates) and a Reduced-Carbohydrate Mediterranean Diet (RCMD; 40–45% energy from carbohydrates) for 8 weeks separated by a washout period. Performance parameters were assessed before and after each intervention. Moreover, the effect of a HC and RC meal 2 h before the tests was investigated.

Results: A total of 34 adults (24 men, 10 women) completed the intervention. Across all key performance indicators—including peak, average, and minimum power, as well as fatigue index—no significant time-by-diet interactions were found. Blood lactate concentrations and subjective perceived exertion ratings during the Wingate test were also unaffected. Moreover, no acute differences emerged between high- and reduced-carbohydrate meals within the MD context.

Conclusions: Debunking a misconception in sport nutrition, increased carbohydrate intake within a Mediterranean diet does not negatively affect anaerobic performance or metabolic responses in recreational endurance athletes. These findings support the flexibility of the MD in sports nutrition while further markers under study will help clarify the impact of the interventions on numerous markers of nutritional status, physiological and metabolic response.

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References: (non obbligatorio).

OC008 - ANTHROPOMETRIC REFERENCES AND CENTILE CURVES FOR SUM OF SKINFOLDS IN 2,507 ADULTS

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Purpose: Direct assessment of skinfold thickness and waist and hip girths provides information about body fat, avoiding estimation errors due to predictive equations. The present study aimed to provide new centile curves for the sum of eight skinfold thicknesses ($\Sigma 8SKF$) in adult population, and to identify breakpoints during adulthood.

Methods: The present investigation was conceived as a multicenter, cross-sectional study. Stature, body mass, and eight skinfold thicknesses (i.e., triceps, biceps, subscapular, iliac crest, supraspinal, abdominal, thigh, and calf) were measured according to the International Society for the Advancement of Kinanthropometry protocol in 1313 men and 1194 women aged 18–65 years. Smoothed age- and sex-specific percentile curves were generated using the Lambda Mu and Sigma method. For both sexes, simple linear regressions of the dependent variable ($\Sigma 8SKF$) versus the explanatory variable (age) were performed to investigate changes in the response variable’s slope and to test for potential breakpoints.

Results: Reference percentile curves (3rd, 10th, 25th, 50th, 75th, 90th, and 97th) for $\Sigma 8SKF$ were provided. In men, $\Sigma 8SKF$ increased by 1.0 mm/year between the ages of 21 and 59, while in women, it increased by 3.8 mm/year between the ages of 38.5 and 47.

Conclusions: $\Sigma 8SKF$ appear sex- and age-specific. Scientists and practitioners are provided with reference values for the adult population.

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OC009 - HEALTHY LIFESTYLE AND WELL-BEING IN UNIVERSITY STUDENTS: EVIDENCES FROM THE WELLNESS4STUDENTS PROJECT

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Purpose: The Wellness4students project, promoted by the University of Turin, aims to provide a physical and psychological screenings for university students, with the objective of developing future policies and actions on themes and issues of particular relevance to them. University students may face logistical and time constraints that prevent them from meeting the Physical Activity (PA) recommendations or maintaining a balanced Mediterranean Diet (MD), which

can have a negative impact on their overall health. An active and healthy lifestyle is associated with a lower risk of death from all causes (Sofi et al., 2008; Miko et al., 2020), as well as better psychological well-being and/or reduced depression. At this stage of the project, our aim was to examine the influence of lifestyle factors (i.e., PA, Sedentary Behaviours (SB) and MD) on well-being and depressive symptoms in a sample of university students.

Methods: A total of 662 students (aged 18–25 years; 58% were female) took part in the study. PA was measured using the Global Physical Activity Questionnaire. MD was measured through the MEDI-LITE questionnaire. The psychological well-being and depression scales were assessed using the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) and the Hospital Anxiety and Depression Scale (HADS), respectively. The statistical analysis included correlations and hierarchical linear regression models, with variables associated with the WEMWBS and HADS entered into the regression.

Results: The correlation analysis revealed that WEMWBS was associated with PA ($r = 0.168$, $p < 0.001$) and with SB ($r = -0.097$, $p = 0.012$), while HADS was associated with PA ($r = -0.116$, $p = 0.003$) and MD ($r = -0.124$, $p = 0.001$). After controlling for age and gender, hierarchical regression models showed that PA and SB accounted for a statistically significant amount of variance in WEMWBS ($\Delta R^2 = 0.024$, $R^2 = 0.065$, $p < 0.001$). The final model identified PA ($\beta = 0.130$) as a correlate of WEMWBS. Similarly, PA and MD explained statistically significant variance in HADS ($\Delta R^2 = 0.029$, $R^2 = 0.052$, $p < 0.001$). Both PA ($\beta = -0.103$) and MD ($\beta = -0.125$) were correlates of HADS.

Conclusions: From a primary prevention perspective, the results confirm the importance of lifestyle factors such as PA and MD in preventing psychological disorders related to well-being and depression during university years. To this end, the Wellness4Students project will provide targeted support in the areas of nutrition, active lifestyle and psychological wellbeing for university students who need it most.

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OC010 - THE NEUROMECHANICS OF EXPLOSIVE STRENGTH: INSIGHTS FROM NEUROPHYSIOLOGICAL AND MECHANICAL DETERMINANTS

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Purpose: Previously, explosive force ability has been investigated using the rate of force development (RFD; $\Delta F/\Delta t$) and its underpinning mechanisms. However, two concerns must be raised: (1) net impulse (N·s) is recognized as a more informative and practical

measure than RFD, and (2) the determinants of explosive force have been investigated through various frameworks (correlation or stepwise regressions), often including multiple determinants, but never integrating neural, muscular, and mechanical factors in a unified model. This study combines in vivo ultrasound, high-density EMG, and comprehensive statistical analysis (multiple linear regressions and commonality analysis) to examine the contribution of mechanical and neurophysiological variables to impulse generation.

Methods: Thirty-two healthy young adults (15F) performed isometric knee extension tests, including evoked contractions, two 5 s maximal voluntary contractions (MVF), and 15 explosive contractions. HD-sEMG from vasti lateralis and medialis, ultrasound-based patellar tendon stiffness (k_{PT}), fascicle shortening velocity (V_f), and muscle thickness (Th) were recorded. EMG was normalized to M-wave peak-to-peak and averaged. k_{PT} was calculated as the slope of the force–elongation curve in two intervals (0–50% and 50–100% MVF). V_f was computed from fascicle length change over time. Linear regressions and commonality analysis were performed for impulse at 0–25 to 0–150 ms using time-matched Th, EMG, V_f , and k_{PT} .

Results: Impulse 0–25 ms was not explained ($p > 0.05$) by the regression model. Impulse 0–50 ms was explained for ~65%, mainly by EMG (~25%), k_{PT} (~14%), and their interaction (~48% of R^2). Model fit peaked at 77% for impulse 0–75 ms, with $k_{PT} \times$ EMG still dominant (~28%), followed by $k_{PT} \times$ EMG $\times$ V_f (~21%), EMG (~16%), and k_{PT} (~11%). At 0–100 ms ($R^2 \approx 67\%$), V_f had the highest role (~19%), followed by $k_{PT} \times$ EMG (~17%), Th $\times$ k_{PT} (~12%), k_{PT} (~12%), and $V_f \times$ EMG (~11%). At 0–125 ms ($R^2 \approx 55\%$), Th became predominant (~18%), then $k_{PT} \times$ EMG (~12%), Th $\times$ k_{PT} (~11%) and V_f (~10%). At 0–150 ms ($R^2 \approx 67\%$), V_f (27%), Th (~21%), and Th $\times$ k_{PT} (~11%) were the main contributors.

Conclusions: Early impulse is mainly driven by early muscle activation and tendon stiffness; late impulses reflect muscular structure and behavior; Mid-phase impulse (0–75 and 0–100 ms) emerges from a combination of all factors. Thus, training both explosive dynamic (for peak power production) and isometric (for tendon stiffness) modalities may enhance explosive force production.

OC011 - EFFECTIVENESS OF COMPRESSIVE GARMENTS ON RECOVERY AND PERFORMANCE IN TRAIL RUNNERS: A CONTROLLED STUDY

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Purpose: The effectiveness of various recovery methods in sports has been a significant research focus, with particular attention to compressive garments (CGs). Initially used as medical aids for vascular diseases, athletes also employ these garments to speed up recovery. Since the results of previous studies are inconsistent, this study investigates the impact of wearing CGs during or after a 26-km trail running race on performance outcomes and recovery variables.

Methods: 56 trail runners (13 females and 43 males, 33.98 ± 8.14 years) were recruited and randomly allocated to three groups: 19 subjects wearing CGs during the race (RACE), 17 subjects

wearing CGs during the 48-h recovery (REC), and a control group of 20 subjects not wearing CGs (CON). Heart rate was collected during the race, and subjects' time spent in different exercise intensity zones was derived after determining $\text{VO}_{2\text{max}}$, HR_{max} , and ventilatory thresholds via a running incremental test to exhaustion. Inflammatory biomarkers, neuromuscular parameters (maximal voluntary contraction, rate of force development, local endurance of the knee extensors, countermovement jump's height, reactive strength index), and perceptual parameters (visual analogue scale for the perception of delayed onset muscle soreness) were assessed before (PRE), immediately after (POST-0) and 48 h (POST-48) post-race.

Results: The relative effort and total race time did not differ between groups. No significant differences were found in perceptual recovery or inflammatory biomarkers,

neither at POST-0 nor POST-48, all following expected post-exercise trends. Among neuromuscular parameters, only the countermovement jump showed a difference between groups, with a better recovery of the RACE group significantly increasing jump height from POST-0 to POST-48 ($p < 0.001$).

Conclusions: Despite previous studies suggesting benefits, our results indicated that CGs don't mitigate exercise-induced fatigue in trail runners. Overall, CGs worn during recovery don't enhance this, while the recovery may be sped up if worn during a trail run. These findings contribute to the ongoing debate on the utility of CGs in athletic recovery, highlighting the need for further research under different conditions to better understand their potential benefits and limitations.

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OC012 - OPTIMIZING IN-SEASON STRENGTH: MICRODOSING ENHANCES POWER AND NEUROMUSCULAR RECOVERY IN YOUTH FOOTBALL

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Purpose: Managing neuromuscular fatigue while sustaining performance is essential in high-performance team sports. In-season strength training must optimize recovery and performance in youth soccer athletes. Microdosing - short, high-intensity strength sessions - may minimize fatigue while preserving neuromuscular quality (1). Coupled with velocity-based training (VBT) and the locomotor efficiency index (LEI), this approach offers a potentially practical system to monitor fatigue and readiness (2).

The aim of our study is to compare the effects of microdosing and traditional strength training on neuromuscular performance and readiness, using LEI and mean power output as primary outcome measures on matchday -4 and -1(MD-4/-1).

Methods: Twenty-three male U19 football players were randomized into microdosing or traditional strength training groups for a 6-week intervention. Mean power during barbell deadlift on MD-4 and LEI measured on MD-1 were collected weekly. A linear mixed-effects model was applied with week, training condition, and their interaction as fixed effects, and player ID as a random effect to account for repeated measures.

Results: For mean power, a significant main effect of week was found ($\beta = 10.95$, $p = 0.003$), indicating overall performance improvement.

A significant interaction between week and training condition ($\beta = -13.50$, $p = 0.006$) revealed that the microdosing group exhibited a steeper improvement trajectory, while gains in the traditional group plateaued. No baseline differences were observed ($\beta = -1.99$, $p = 0.954$).

For LEI MD-1, a significant main effect of week ($\beta = 0.151$, $p = 0.001$) and a significant week $\times$ condition interaction ($\beta = -0.123$, $p = 0.036$) suggested enhanced neuromuscular readiness in the microdosing group. Although the traditional group showed higher initial LEI ($\beta = 0.705$, $p = 0.002$), their progression was less favorable compared to the microdosing group.

Conclusions: Microdosing elicited greater longitudinal improvements in power output and neuromuscular readiness compared to traditional training. Despite similar baseline levels, the microdosing group demonstrated superior adaptation across both performance and recovery markers. These findings support microdosing as an effective in-season strategy for optimizing neuromuscular function with minimized fatigue accumulation. Further research is warranted to confirm these effects across different sports and competitive levels.

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OC013 NEUROMUSCULAR STRATEGY DIFFERENCES DURING CONCENTRIC AND ECCENTRIC CYCLING

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Purpose: Cycling requires coordinated activation of lower limb muscles, with recruitment patterns adapting to task demands. This flexibility allows the nervous system to adapt motor strategies to meet task-specific requirements. Median frequency (MDF) and Sample Entropy (SampEn) are established metrics for evaluating fatigue-related neuromuscular adaptations from sEMG signals. Both parameters typically decline as task-induced fatigue increases, reflecting a reduction in muscle fiber conduction velocity and a simplification of motor unit discharge patterns, respectively^{2,3}.

However, how these parameters vary across contraction types is unclear. This study evaluated neuromuscular strategies during concentric (CONC) and eccentric (ECC) cycling tests in healthy young individuals.

Methods: 15 participants ($F = 4$; 23 ± 3 years) performed upright seated CONC and ECC cycling tests one week apart, starting at 75W and increasing by 25W/min until task failure. ECC test used a motorized ergometer, requiring eccentric contractions. Bilateral sEMG signals from the Rectus Femoris (RF) and Vastus Medialis (VM) were recorded. For each side, $\Delta\text{MDF}\%$ and $\Delta\text{SampEn}\%$ were calculated and then averaged to yield a single value per participant. 2-way ANOVA was performed to assess differences in $\Delta\text{MDF}\%$ and $\Delta\text{SampEn}\%$ by task and muscle.

Results: $\Delta\text{MDF}\%$ showed a significant main effect for task ($F = 9.91$, $p < 0.01$, $\eta^2 = 0.19$) and a significant muscle $\times$ task interaction ($F = 4.76$, $p = 0.03$, $\eta^2 = 0.10$). Specifically, a difference between tasks was found in the RF muscle ($-8.81 \pm 2.25\%$ in CONC vs. 4.05

$\pm 3.96\%$ in ECC; $p = 0.01$), but not in the VM muscle. For the CONC test, $\Delta\text{MDF}\%$ was significantly different between muscles ($3.07 \pm 1.54\%$ for VM vs. $-8.81 \pm 2.25\%$ for RF; $p < 0.01$), while no difference was observed in the ECC condition. $\Delta\text{SampEn}\%$ revealed a significant main effect for task ($F = 12.23$, $p < 0.01$, $\eta^2 = 0.23$). Differences between tasks were detected in both VM ($24.01 \pm 1.92\%$ in CONC vs. $6.54 \pm 3.29\%$ in ECC; $p < 0.01$) and RF ($20.13 \pm 3.53\%$ in CONC vs. $4.50 \pm 6.55\%$ in ECC; $p = 0.03$) muscles.

Conclusions: These findings suggest that neuromuscular strategies during cycling are modulated by contraction type. Both MDF and SampEn revealed different muscle-specific adaptations in both tasks, with a reduced SampEn in ECC, indicating lower signal complexity and potentially more constrained motor strategies. Notably, SampEn adaptations related more to the task than to the muscle, while spectral changes were muscle specific. These results support the theory that ECC and CONC cycling require distinct motor control strategies, impacting assessment and exercise prescription.

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OC014 - SPORT-SPECIFIC REACTION ABILITY AND SINGLE-LEG REACTIVE STRENGTH: AN INTERRELATED PROFILE OF TABLE TENNIS PLAYERS

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Purpose: Table Tennis (TT) requires explosive, reactive and multi-directional actions. Therefore, this study aims to explore the association between a sport-specific reactive test and a single-leg lateral rebound jump, and to evaluate differences across competitive levels.

Methods: Fifty-seven experienced male TT players (21.7 ± 6.1 years) of different competitive levels (High = 19; Medium = 19; Low = 19) executed two tests. In a reactive test, already validated for table tennis performance, players responded to 10 random and repeated visual light stimuli by executing a 1.5 m lateral or frontal displacement toward a timing gate. A 0.8 s delay between signals simulated the time between shots, allowing players to return to the starting position. The total time to complete all reactions was registered. In the single-leg Maximal Lateral Rebound Jump (MLRJ), players stood on one leg, jumped laterally, landed on the opposite leg, and rebounded back on the stance leg, aiming to achieve the maximal lateral distance with minimal contact time. The test was performed with both legs. The leg corresponding to the playing hand was defined as the Playing Side (PS), while the opposite leg was identified as the Non-Playing Side (NPS). The Reactive Strength Index (RSI) was calculated as the ratio of jump distance to contact time.

Results: A moderate and negative association emerged between the total time of the reactive test and the RSI of the MLRJ for both legs (PS: $r = -0.387$, $p = 0.003$; NPS: $r = -0.400$, $p = 0.002$). Moreover, significant differences emerged in the reactive test across competitive levels, with better performance for high level players (15.79 ± 0.53 s) compared with medium (16.37 ± 0.52 s, $p = 0.026$, $d = 1.10$) and low (16.52 ± 0.75 s, $p < 0.001$, $d = 1.12$) levels.

Furthermore, significant differences were found in RSI between high (440.6 ± 72.8 cm/s) and low (383.8 ± 63.0 cm/s, $p = 0.021$, $d = 0.83$) levels for the PS leg, and between high (436.1 ± 81.7 cm/s) and medium (372.3 ± 48.9 m/s, $p = 0.020$, $d = 0.95$) levels for NPS leg.

Conclusions: These findings suggest an association between reaction ability, evaluated with a sport-specific test, and reactive strength, assessed with a single-leg lateral rebound jump. Moreover, the greater results of high level TT players highlight their enhanced ability in executing explosive and reactive movements. Finally, both tests effectively differentiate competitive levels in TT, supporting their practical use in performance assessment and training monitoring.

OC015 - EFFECTS OF GRIP VARIATION ON MUSCLE EXCITATION AND SPATIAL ACTIVATION PATTERNS DURING THE LAT PULL-DOWN EXERCISE: A PRELIMINARY HDSEMG STUDY

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Purpose: Although resistance training prescriptions often recommend grip variations to vary muscular involvement during pulling exercises, the neuromuscular differences among such grips have not been systematically quantified. This study explored the effects of thumb position (normal vs false grip) and lifting straps usage (with vs without) on muscle excitation and spatial distribution during the lat pull-down, using high-density surface electromyography (HDsEMG).

Methods: Thirteen resistance-trained participants (≥ 12 months experience) performed one non-exhaustive set of four lat pull-down repetitions under four conditions: normal grip (NC), false grip (NF), normal grip with straps (SC), and false grip with straps (SF). All conditions were performed using the load corresponding to the 8-repetition maximum (8RM), previously determined in a separate session. HDsEMG signals were collected from the biceps brachii (BIC), latissimus dorsi (LAT), and forearm flexor (FLEX) muscles. Data were analyzed separately for concentric and eccentric phases and, for each phase, normalized global EMG amplitude (%MVC) and centroid coordinates were calculated. Linear mixed-effect models were then used to compare differences across conditions.

Results: Muscle excitation was significantly greater during concentric phase than eccentric across all grips for both BIC and LAT ($p < 0.05$), but not for FLEX. Straps usage showed minimal influence on LAT excitation and a small reduction in FLEX activity. No EMG amplitude differences emerged in the biceps brachii, but a significant medial shift of the centroid was observed between NF and SC during the concentric phase ($p = 0.012$; $d = 0.49$), suggesting greater recruitment of the short (medial) head under the false grip. In the eccentric phase, differences in EMG spatial distribution were negligible ($d = 0.06$). The forearm and latissimus dorsi showed no significant changes under any condition.

Conclusions: This exploratory study suggests that thumb and strap position influence muscle activation patterns during the lat pull-down in a muscle-specific manner. While no substantial changes were observed in the latissimus dorsi, the biceps brachii showed changes in spatial activation pattern—specifically a medial shift during the false grip—despite similar global excitation levels. The forearm flexors, conversely, presented alterations in EMG amplitude but not spatial distribution. These preliminary findings offer novel insights into grip

selection strategies and justify further investigation with larger samples.

OC016 - EFFECTS OF FOAM ROLLING DURING WARM-UP ON JUMPING ABILITY IN YOUNG ELITE FEMALE RHYTHMIC GYMNASTS: PRELIMINARY RESULTS

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Purpose: Rhythmic Gymnastics is an Olympic discipline featuring individual or team competitions. Regardless of the type of competition, athletes undergo rigorous training focused on enhancing their coordination and jump height [1]. To excel in competitions, athletes must achieve a high jump height, along with ample joint range of motion and synchronization with their equipment [1]. The warm-up phase has also been analyzed in rhythmic gymnastics, showing that it is essential for preparing athletes to perform better, even with different protocols [2]. Recently, a Foam Rolling protocol has been shown to improve jumping performance, which could be included in athletes' warm-ups [3]. Therefore, the objective of this study was to demonstrate whether a 3-week Foam Rolling protocol, included in the warm-up routine, can improve jumping performance in young Rhythmic Gymnasts.

Methods: 20 Female Elite Rhythmic Gymnasts were recruited and divided into two groups: Experimental Group (EG) including foam rolling during the warm-up phase ($n = 10$; Age: 12.4 ± 2.01 years; height: 149.4 ± 12.52 cm; weight: 36.7 ± 9.2 kg), Control Group (CG) used the same usual warm-up protocol without Foam Rolling ($n = 10$; Age: 14.1 ± 2.02 years; height: 154.1 ± 11.92 cm; weight: 43.9 ± 9.19 kg). A baseline assessment (T0) and an assessment after a 3-week intervention (T1) were performed. An optical detecting system, called Optojump (Microgate), was used to measure the CMJ values: flight time and jump height.

Results: Significant group by time interaction effects were found for Flight Time ($F = 16.73$; $p < 0.001$; $\eta^2 p = 0.482$) and for Jump Height ($F = 16.55$; $p < 0.001$; $\eta^2 p = 0.479$).

Post-hoc analysis (Scheffé) showed an increase in the EG between T0 and T1 in the EG ($p < 0.005$) and between the EG and the CG at T1 ($p < 0.05$) for both values. A similar trend was not observed in the CG group at T1.

Conclusions: The addition of a foam rolling protocol appears to enhance jumping performance, making it a valuable component for technicians and coaches during the warm-up phase for rhythmic gymnastics athletes.

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OC017 - BREATHING ADAPTATIONS TO ENDURANCE TRAINING

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Purpose: Despite growing evidence on the physiological adaptations to exercise training, ventilatory adaptations have surprisingly been overlooked. A reduction in minute ventilation ($\dot{V}_E$) to training has been described in healthy individuals [1], but potential variations in the breathing pattern have rarely been investigated. This is especially relevant considering the differential control of respiratory frequency (f_R) and tidal volume (V_T), which suggests that the two components of $\dot{V}_E$ may respond differently to training [2]. This study assessed the sensitivity of breathing variables to training-induced changes in exercise tolerance.

Methods: Twenty-one recreationally active individuals underwent an eight-week self-paced endurance training program and were randomly assigned to either a higher- ($N = 11$) or lower-intensity ($N = 10$) training group. Ramp incremental exercise tests were performed in duplicate both before and after the training intervention. The time course of cardiorespiratory variables and perceived exertion were compared pre and post training using the previously described individual isotime method [3].

Results: The improvement in time-to-exhaustion ($P < 0.01$) observed in both groups after training was accompanied by a reduction in f_R and $\dot{V}_E$ ($P < 0.05$) in the latter third of the incremental test. Conversely, no significant changes in V_T ($P > 0.05$) were observed. Furthermore, training resulted in a reduced ($P < 0.05$) perceived exertion at isotime during exercise.

Conclusions: Our findings suggest that f_R , $\dot{V}_E$, and perceived exertion are sensitive to training-induced changes in exercise tolerance. The reduced $\dot{V}_E$ at isotime is primarily attributable to a reduction in f_R rather than V_T . These results support the hypothesis that common regulatory mechanisms between f_R and perceived exertion contribute to improvements in exercise tolerance.

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OC018 - GUT MICROBIOME-PERFORMANCE CORRELATIONS IN ELITE VOLLEYBALL PLAYERS: A LONGITUDINAL ANALYSIS

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Purpose: Emerging evidence indicates gut microbiome influences athletic performance via metabolic and immunomodulatory mechanisms, however specific microbial-performance relationships in elite athletes remain poorly characterized. We investigated longitudinal associations between faecal microbiota composition and technical performance in professional volleyball players throughout a competitive season.

Methods: Seven elite male volleyball players (26.5 ± 4.5 years) from Italian SuperLega were monitored across four timepoints during the 2023/2024 season, including the regular season, rest period and tournament phases. Technical performance was assessed using composite z-scores from official match statistics including attack, service and reception efficiency. Faecal samples underwent 16S rRNA sequencing with Ion GeneStudio S5 platform. Statistical analysis included Pearson correlations with False Discovery Rate correction and multivariate compositional analysis.

Results: Despite varying training and competition phases, technical performance remained stable across timepoints ($p = 0.764$). Four Genera showed significant negative correlations with performance, Dialister ($r = -0.166$, $p = 0.006$), Dorea ($r = -0.165$, $p = 0.005$), Roseburia ($r = -0.036$, $p = 0.010$) and Subdoligranulum ($r = -0.016$, $p = 0.005$). Promising positive trends emerged for Bacteroidaceae Family ($r = 0.329$, $p = 0.088$) and Firmicutes/Actinobacteria Phyla ratio ($r = 0.343$, $p = 0.094$). Overall microbiota composition remained stable despite individual taxonomic fluctuations.

Conclusions: This first longitudinal study in elite volleyball players at genus-level resolution identifies specific bacterial taxa associated with performance, potentially serving as novel biomarkers for performance monitoring in volleyball. Counterintuitively, traditionally beneficial genera showed negative correlations, possibly reflecting stress-response mechanisms in elite volleyball athletes. Results suggest microbiota-performance relationships are taxa-specific rather than diversity-dependent, opening new avenues for personalized sports nutrition and training interventions.

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OC019 - SUSTAINABLE CAREER TRANSITIONS IN ELITE SPORT: A SYSTEMATIC REVIEW OF EVIDENCE AND PRACTICES

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Purpose: Retirement from an elite athletic career represents a high-risk phase in terms of psychological health, socioeconomic stability, and identity reconstruction. The lack of structured, accessible, and integrative support services undermines the sustainability of athletes' careers beyond sport and a loss of their social capital. Hence, the PORTAL project has been funded under the ERASMUS+ programme to support Olympians during and after their sport career, with a particular focus on mental health and lifelong learning. In this framework, the present systematic literature review aims to provide a clear picture and understanding of necessary career assistance service provision for sustainable retirement from an elite sport career.

Methods: According to the PRISMA guidelines, literature searches in five databases (e.g., SPORTDiscus, Psychinfo, Scopus, Google Scholar, and Web of Science) resulted in 113 manuscripts meeting the inclusion criteria. The methodological quality of each selected article was assessed using the Mixed Methods Appraisal Tool-Version 2018.

Results: Most studies investigated mental health support (59%), followed by dual-career planning, transition readiness, and identity-related factors. Methodologies included qualitative (50.5%), quantitative (43.1%), and mixed-methods (6.4%) designs. Studies involved multisport samples (72%) with a gender distribution of 74% mixed, 19.4% male-only, and 6.5% female-only. Common tools were semi-structured interviews (36.5%), and surveys (63.5%). Main themes included athletic identity negotiation, mental health indicators (e.g., stress, depression), psychosocial functioning, and perceived institutional support. Despite the growing evidence base, many studies reported gaps in access to mental health support services, limited transition planning resources, and inconsistent dual-career strategies across countries and sports.

Conclusions: The review underscores the need for inclusive, multi-dimensional, and multisectoral approaches to career guidance and assistance, psychological support, and flexible education, to be embedded within holistic athlete development frameworks. Findings will also inform the implementation of a project PORTAL's online platform and the establishment of Real-Life Transition Officers, promoting sustainable, evidence-based interventions to elite athletes' career transitions and assistance to foster career longevity, psychosocial wellbeing, and better retirement prospects.

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OC020 - SHOULD I STAY OR SHOULD I GO? EXPLORING THE DETERMINANTS AND CONSEQUENCES OF INTERNAL MIGRATION IN ITALIAN MALE YOUTH FOOTBALL

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Purpose: Research in Italian football has shown players from Southern Italy face barriers in progressing through the talent pathway and may need to relocate to access the next developmental stage [1]. This study adopted the aspirations-capabilities framework [2] to investigate internal migration in Italian youth football, exploring its determinants and long-term consequences on players' career outcomes.

Methods: We included 1047 Italian-born players who competed in the national U17 championship during the 2015–16 season to address how players' mobility (the distance between their provinces of birth and play) influences career progression. For each player, we assessed mobility (local, intraregional, interregional, or national) and career outcomes (dropout, amateur, semi-professional, or professional). For each province, we computed a weighted mobility index (lower values = more local players; higher values = more players engaged in national mobility) and recorded contextual variables (production of professional players, availability of professional youth clubs, and general emigration). ANOVA investigated geospatial variations in the mobility index. Linear regression explored contextual variables' impact on the mobility index. Multinomial logistic regression tested how players' mobility influenced their career outcomes.

Results: Northern and Central provinces recorded lower mean mobility indexes than Southern provinces ($p = 0.008$). Linear regression revealed contextual variables explained 27% of the variance in the mobility index ($R^2 = 0.27$; $p < 0.001$). Higher production of professional players and availability of professional youth clubs decreased provinces' mobility index, while higher general emigration increased it. Players engaged in interregional or national mobility were more likely to reach the professional level than local players ($p < 0.001$).

Conclusions: Developmental and competitive opportunities, as well as social and institutional support, shape internal migration in Italian youth football. Youth players' aspirations to migrate are influenced by the general emigration tendency of the provinces and reflect the degree to which they perceive they can fulfil their ambition locally or elsewhere. Moreover, results indicated relocation positively affected career outcomes. Challenges associated with early migration can help youth players develop the required character to complete the youth-to-senior transition.

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OC021 - IMPLEMENTATION OF DUAL CAREER IN EUROPEAN UNIVERSITIES: COMPARISON OF FORMAL POLICIES AND PRACTICES

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Purpose: To investigate the implementation of dual career (DC) services for student-athletes (SAs) within the *FIND-ME: University Dual Career Opportunities (FIND ME-101134043)* project partnership, by comparing the extent to which these services are delivered through formal (policy-based) or informal (practice-based) measures. **Methods:** A desk analysis was conducted in each participating country to collect and translate official DC regulations and programmes. In parallel, an online survey targeting higher education institution (HEI) experts was administered using a 31-item questionnaire to gather information regarding the implementation of DC services in six key DC areas (logistic support, assistance/tutorship, curricula requirements, social support, and financial support). For each area, the proportion of services implemented through formal (policy-based) provisions identified in institutional documents, and informal (practice-based) measures as reported by HEI experts was quantified.

Results: The analysis highlighted substantial cross-country variability in the implementation of DC services for SAs, particularly regarding the balance between formal and informal measures. Logistic support was predominantly implemented informally: Spain (54.2% informal, 25% formal), Italy (76.1%, 10.2%), Serbia (87.5%, 0%), Romania and Slovenia (100%, 0%). A similar pattern was observed for assistance/tutorship: Spain (43.3%, 23.3%), Italy (51.8%, 30%), Serbia (35%, 40%), Romania (54.3%, 20.0%), Slovenia (55%, 25%). Curricula requirements also showed a limited degree of formalization: Spain (29.2%, 41.7%), Italy (33.3%, 33.3%), Serbia (56.3%, 0%), Romania (39.3%, 25%), Slovenia (37.5%, 25%). Social support was largely informal in Italy (63.6%, 2.3%), Serbia (75%, 0%), Romania (71.4%, 0%), and Slovenia (58.3%, 0%), while Spain stands out with equal formal and informal implementation (50%, 50%). Financial support emerged as the least formalized area: Spain (25%, 8.3%), Italy (23.9%, 20.5%), Serbia (68.8%, 0%), Romania (32.1%, 0%), and Slovenia (12.5%, 0%).

Conclusions: The present findings reveal substantial cross-country variability in DC service implementation, highlighting a prevalent reliance on informal provisions. These insights may guide the development of minimum standards and inform the creation of the FIND-ME platform, aimed at supporting transparent and evidence-based DC strategies at the HEI level.

OC022 - CRISIS MANAGEMENT IN SPORT: A COMPREHENSIVE ANALYSIS OF GOVERNANCE STRATEGIES AND PRACTICAL IMPLICATIONS

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Purpose: In an increasingly complex global environment, sport organizations face multifaceted crises ranging from public health emergencies and geopolitical conflicts to ethical breaches and sociocultural challenges.¹ This study examines crisis management models adopted by key sport governance bodies. The aim is to identify differentiated strategic approaches, ranging from preventative frameworks to responsive and recovery mechanisms, and to support the development of a practical, evidence-based online tool for assessing crisis preparedness in sport organizations.²

Methods: Comprehensive searches performed across Scopus, Web of Science, SPORTDiscus and PsycArticles databases encompassed literature published from January 2015 to May 2025. The analysis included institutional documents such as policy papers, strategic frameworks, risk management guidelines, and safeguarding protocols from major sport organizations (e.g., IOC, IPC, FIFA, World Athletics, UEFA, USOPC, BOA, IJF) as well as from selected national and grassroots entities. Strategies were categorized into four functional types: preventive, adaptive, communicative, and restorative.

Results: Findings reveal a progressive evolution in crisis management practices, characterized by a shift from reactive, risk-containment models toward integrated, value-driven governance. The IOC's Olympic Agenda 2020 + 5, the IPC's strategic planning cycle, FIFA's COVID-19 Relief Plan, and UEFA's safeguarding policies illustrate cross-level coordination and strategic differentiation. Grassroots and regional initiatives, including empowerment programs like IJF's Judo for Peace, highlight the relevance of psychosocial resilience and ethical leadership. Comparative analysis shows that effective governance entails combining operational readiness with stakeholder engagement, transparency, and communication across governance levels.

Conclusions: To contribute to a multi-level, typology-based understanding of crisis management in sport governance, this study lays the foundation for a digital self-assessment tool designed to support grassroots, national, and European sport organizations in evaluating their crisis preparedness and accessing tailored strategic recommendations. The findings reinforce the need for coherent, ethically grounded, and sportpersons-centered crisis protocols as essential components of resilient and inclusive sport ecosystems.

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OC023 - EUROPEAN TOP-PERFORMANCE ATHLETES' PERCEPTIONS ON CAREER RETIREMENT TRANSITION AND MENTAL HEALTH SUPPORT CHALLENGES AND NEEDS

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Purpose: Elite athletes dedicate their lives to achieving peak performance, often at the expense of broader personal and professional development and with a challenging transition from competitive sports to post-athletic life. Thus, the aim of this study was to explore perceived challenges and needs of European top-performance athletes in relation to mental health and career retirement support services.

Methods: A 50-items semi-structured electronic questionnaire was administered to European top-performance athletes recruited during the EU funded Project "Portal". In particular, dependent variables included career path information, dual career experiences, perceived challenges/needs, and the rating of relevance, availability, satisfaction, frequency of delivery, and possible implementation of 14 selected career support services within an online platform.

Results: Respondents (n = 119; nationality: Italy n = 25, Croatia n = 35, North Macedonia n = 11, and Romania n = 48; age: 31.2 ± 11.7 yrs; gender: 42% female; status: 46% retired; competition level: 76% Olympic and World) highlighted difficulties during their sport and dual career paths, often lacking recognition from both the academic and the sport environments. Furthermore, 80% reported no participation in educational initiatives on career retirement planning. Career transitions and mental health services were perceived extremely important to prepare for retirement (5.2 ± 1.1 pts/6). However, a general low perceived satisfaction of received services emerged (2.9 ± 1.5 pts/6). Regarding the 14 selected services: (i) mental health and nutrition counsellors' accessibility, educational workshops, financial planning, and career development/networking services resulted the most relevant (3.9 ± 1.2 pts/5); (ii) 12/14 services were mostly not available to the athletes (range: 55–81%); (iii) a low satisfaction emerged for all the services (range 2.3–1.4 pts/5); (iv) 8/12 services should be implemented in an online support platform (range 4.0–4.3 pts/5); (v) preferred services' frequency of delivery varies upon typology.

Conclusions: Results reflect previous literature in this field, with career support services still needing substantial implementation. Given the importance of comprehensive support systems to meet the practical, psychological and emotional challenges associated with career retirement, the present findings would support the implementation of an online platform to assist athletes' retirement phase and life out of sport.

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OC024 - EFFECT OF MENSTRUAL CYCLE PHASES ON PHYSICAL PERFORMANCE IN ELITE WOMEN SOCCER PLAYERS

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Purpose: Menstrual cycle phases (MCP) may affect performance in professional female soccer players due to cyclic hormone fluctuations. During the luteal phase (LP) a reduced Yo-Yo IFT performance was found, suggesting impaired endurance, while others authors reported greater match distance at 16.69–19.94 km/h per minute during the same phase. These conflicting findings reflect the complexity of MCP-related physiological responses. The aim of this study was to evaluate the effects of MCP on physical performance and subjective internal load parameters in professional female soccer players during official matches.

Methods: Twenty-five female soccer players were recruited and grouped according to MCP: Menstrual Phase (FP), Follicular Phase (FP), Ovulation Phase (OP) and Luteal Phase (LP). Physical performance parameters were collected using GPS system and menstrual cycle was monitored by daily survey. Subjective internal load parameters were assessed by self-report questionnaires. RPE was collected after each match, while recovery status (TQR), sleep quality, stress, fatigue, and muscle soreness were recorded in the morning prior to each match using Hooper Scale.

Results: The highest values for total distance covered per minute (TD/min), distance covered above 13 km/h per minute (HS13/min) and RPE were observed during LP ($p < 0.05$). Peak acceleration events exceeding 2.5 m/s² per minutes (ACC/min) were most frequent in the MP ($p < 0.05$). The greatest perceived stress was recorded during the OP ($p < 0.05$), while the lowest levels of fatigue were reported in the FP ($p < 0.05$).

Conclusions: These findings suggest that hormonal fluctuations during the menstrual cycle may affect physical performance and perceived internal load parameters in professional female soccer players during matches. Elevated TD/min, HS13/min and RPE in LP may be linked to elevated progesterone levels and sympathetic drive. Higher ACC/min during the MP could reflect compensatory neuromuscular adaptations in response to decreased estrogen levels. The peak in perceived stress during OP and the lower fatigue reported in the FP are consistent with previous scientific data indicating greater psychological and physical well-being during the early FP and increased emotional reactivity during OP. These results highlight the importance of taking into account MCP in managing the load and individualizing training strategies in female soccer players.

Acknowledgments:

References:

OC025 - INTER-SET STATIC STRETCHING DOES NOT IMPAIR ACUTE BENCH PRESS PERFORMANCE: PRELIMINARY INSIGHTS OF A RANDOMIZED CROSSOVER STUDY

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Purpose: Static stretching is traditionally performed before or after a training session. However, when applied prior to exercise, it may impair the subsequent performance. The acute effects of static stretching applied between sets, particularly when targeting agonist or antagonist muscle groups, remain poorly investigated. Therefore, this study aimed to examine the effects of inter-set static stretching targeting the pectoralis major (agonist, AG) and the dorsal musculature (antagonist, AN) on bench press performance.

Methods: Twenty-six healthy male participants (23.8 ± 3.70 years, 173.0 ± 6.76 cm, 76.3 ± 10.7 kg) were recruited. Before completing the three experimental conditions, participants attended an additional laboratory session during which their one-repetition maximum (1-RM) in the bench press was determined using a standardized and validated protocol. Following the 1-RM assessment session, each participant completed three experimental conditions, administered in a randomized order and separated by a minimum of 48 h: pectoralis muscle stretching (AG), dorsal muscle stretching (AN) and control (CC). Prior to starting the first session, anthropometric measures were taken. After a standardized warm-up, the main protocol consisted of performing five sets of bench press to volitional failure at 70% 1-RM, with 90-s rest intervals. In the AG and AN conditions, 30 s of static stretching were performed during each rest period, targeting either the agonist or antagonist muscles, respectively. In the CC, no stretching intervention was performed during the rest periods. The primary outcome was the total lifted volume across each AG, AN and CC session. The secondary outcomes were force (N), velocity (V), and power (W). Data were collected using a linear position transducer (T-Force®).

Results: No significant differences were found among conditions in total lifted volume ($p = 0.335$), force ($p = 0.704$), velocity ($p = 0.925$), or power ($p = 0.912$).

Conclusions: Inter-set static stretching, whether applied to agonist or antagonist muscles, does not impair acute bench press performance. These findings suggest that static stretching may be effectively integrated during rest intervals to optimize time efficiency in resistance training sessions without compromising performance.

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References: (non obbligatorio).

OC026 - A COMPARISON AMONG CHANGE OF DIRECTION SPRINTING AND LATERAL JUMPING TESTS IN COLLEGIATE BASKETBALL PLAYERS

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Purpose: The multidirectional nature of team sports performance requires players to perform rapid decelerations, accelerations, changes of direction, and jumps with a different direction of force application. Therefore, the aim of this study was to evaluate the commonalities among two change of direction sprinting tests and two lateral rebound jumping tests.

Methods: Twenty-eight male collegiate basketball players were evaluated for the force–time characteristics (contact time, ground reaction force, and impulse of the braking and propulsive phase of the foot stance on an embedded force plate) during a 60° (60COD) and 180° change of direction (180COD) sprinting test, and a controlled (CLRJ) and maximal (MLRJ) lateral rebound jumping test. For the sprinting tests, players had to sprint for 5 m, make a change of direction while pushing on the force plate and sprint for other 5 m. For the lateral rebound jumps, players stood on one leg, performed a lateral jump, and rebounded with the opposite leg as fast as possible returning to the stance leg, reaching the maximal lateral jumping distance (MLRJ) or the starting point (CLRJ).

Results: The vertical impulse of the braking and propulsive phase did not demonstrate a clear pattern of differences among tests. Greater values in the braking phase were found for the 180COD (2.79 ± 0.43 N•s/kg), whilst MLRJ (4.02 ± 0.63 N•s/kg) showed greater values in the propulsive phase compared to other tests.

For the mediolateral impulse of the braking phase, greater values emerged for 180COD (2.22 ± 0.37 N s/kg) compared to the others 3 tests (MLRJ: 1.20 ± 0.47 N s/kg, $p < 0.001$, $d = 2.41$; CLRJ: 0.56 ± 0.29 N s/kg, $p < 0.001$, $d = 4.99$; 60COD: 0.46 ± 0.14 N s/kg, $p < 0.001$, $d = 6.29$). Moreover, MLRJ showed greater values than 60COD ($p < 0.001$, $d = 2.13$) and CLRJ ($p < 0.001$, $d = 6.29$). For the mediolateral impulse of the propulsive phase, 60COD showed lower values (1.63 ± 0.22 N s/kg, $p < 0.001$, $d = 2.48$) than MLRJ (2.34 ± 0.34 N•s/kg), whilst 180COD demonstrated higher values (2.29 ± 0.30 N s/kg, $p < 0.001$, $d = 1.32$) than CLRJ (1.74 ± 0.51 N s/kg). Differences ($p < 0.001$, $d = 2.51$) between 60 and 180COD also emerged.

Conclusions: The results of the current study demonstrated some commonalities between the 60COD and CLRJ tests and between the 180COD and the MLRJ tests. Among the different parameters analysed and the force application directions, greater similarities emerged for the mediolateral direction of force application during the propulsive phase of both sprinting and jumping abilities.

OC027 - TRADE-OFF BETWEEN STABILITY AND EFFICIENCY: INSIGHTS FROM MUSCLE SYNERGIES AND METABOLIC COST DURING PERTURBED WALKING IN OLDER ADULTS

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Purpose: Walking is an accessible and beneficial form of physical activity for older adults. However, when performed under perturbed conditions, it can place greater demands on both neuromuscular control and metabolic efficiency, highlighting the need to better understand the underlying adaptations. It was hypothesized that perturbed walking at the same speed would result in increased neuromuscular and metabolic demands, reflected by a shift from accurate (i.e., mature, functionally fine-tuned) to more robust (i.e., able to cope with unexpected errors) motor control, higher energy cost (EC)¹, and unchanged perceived effort².

Methods: We compared stable and perturbed walking on a treadmill (ReaxRun, Reaxing, Milano) at three different speeds (3, 4, and 5 km/h) in 16 healthy older adults (8 males and 8 females; age = 69 ± 5 years; weight = 68 ± 10 kg; height = 1.67 ± 0.08 m). Muscle synergies³ were extracted from surface electromyographic signals of eight lower limb muscles, oxygen uptake (VO₂), minute ventilation, heart rate, and rate of perceived exertion (RPE) were also collected.

Results: Perturbed walking at 3 km/h increased oxygen uptake (+18%; $p = 0.003$; $d = -0.52$) and EC (+28%; $p = 0.003$; $d = -1.12$) compared to the stable condition. VO₂ ($p < 0.001$; $\eta^2 = 0.92$), EC ($p = 0.02$; $\eta^2 = 0.25$), and RPE ($\chi^2 = 4.45$; $p = 0.04$) were higher at 3 km/h than at higher speeds.

No significant metabolic differences were observed at 4 and 5 km/h. The number of muscle synergies remained stable (four across all conditions), but synergy activation patterns widened significantly during perturbed walking, as reflected by increased Full-Width at Half Maximum (FWHM) values ($p = 0.01$; $\eta^2 = 0.04$). This suggests a transition from accurate to more robust motor control to cope with unpredictable perturbations. Weight sparsity and cosine similarity showed no significant differences between conditions, implying that muscle recruitment patterns were preserved at the spinal level, with adaptations likely occurring at supraspinal levels.

Conclusions: These findings highlight that continuous medio-lateral perturbations require reorganized motor strategies, increasing metabolic cost and revealing a trade-off between stability and efficiency. The combined analysis of muscle synergies and metabolic responses enhances our understanding of how aging individuals adapt to unpredictable walking conditions, especially at lower speeds.

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OC028 - TIME-RESTRICTED EATING IN ELITE VS. RECREATIONAL CYCLISTS: A COMPARATIVE ANALYSIS

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Purpose: Time-restricted eating (TRE) is a dietary approach that limits food intake to a specific daily window, commonly 16:8 (16 h fasting, 8 h eating). While TRE has gained popularity, its effects on performance, particularly when combined with cycling training, are not yet well understood. This study explores the impact of TRE by comparing elite cyclists (EC) and non-elite cyclists (NEC) following this dietary protocol.

Methods: We selected 11 NEC and compared them with a group of 8 EC from a previous study by Moro et al. (2020) conducted in the same lab. The NEC group reported a weekly training volume of 222 ± 78 km across 3 to 5 sessions, while the EC group trained 500 ± 50 km per week over six sessions. All participants were tested before and after the dietary intervention. Body composition was assessed via bioelectrical impedance, $\text{VO}_{2\text{max}}$, and resting metabolic rate via indirect calorimetry, and blood samples were collected for hormonal analysis.

Results: A mixed-factor ANOVA showed that TRE combined with exercise significantly reduced body weight ($p = 0.004$), with a notable decrease in body fat ($p = 0.004$), while lean mass remained unchanged in both groups. In terms of performance, the NEC group improved peak power output at $\text{VO}_{2\text{max}}$ relative to body weight ($\text{PVO}_{2\text{max}}/\text{bw}$) ($p = 0.005$) and absolute $\text{PVO}_{2\text{max}}$ ($p = 0.027$). Resting energy expenditure ($p = 0.019$) decreased, supported by an, although not significant, reduction in caloric intake. A significant group difference in testosterone (TST) ($p = 0.002$) and IGF-1 ($p = 0.009$) was observed: TST decreased in the EC group ($p = 0.003$), with no change in the NEC group; whilst IGF-1 decreased in EC ($p = 0.028$) and increased in NEC, but without significance in time.

Conclusions: TRE supports body recomposition by reducing body fat in both EC and NEC groups. It may be especially useful for non-elite athletes, as lean mass was maintained and $\text{PVO}_{2\text{max}}$ increased, improving power-to-weight ratio. Training status emerges as a key factor in the hormonal response, especially regarding anabolic hormones like TST and IGF-1. These data suggest that TRE might be a dietary strategy more useful in non-elite athletes.

References: (Moro et al., 2020 <https://doi.org/10.1186/s12970-020-00396-z>)

OC029 - ROAD TO PARIS: TRAINING CHARACTERISTICS OF WORLD-CLASS MALE TRIATHLETES IN THE YEAR PRIOR TO THE OLYMPICS. A QUALITATIVE MULTIPLE CASE STUDY

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Purpose: To describe the individual training characteristics of world-class male triathletes in the year approaching the Olympic competition. In particular, the primary objective is to expand current

knowledge about periodization, volume, and training intensity distribution in the Olympic-distance triathlon, given the actual limited data available in the literature for this specific sport, distance, and performance level.

Methods: Four world class male triathletes (27 ± 4 yr, 75 ± 2 $\text{ml}\cdot\text{min}^{-1}\cdot\text{kg}^{-1}$ $\text{VO}_{2\text{max}}$) were analyzed. Day-by-day power, velocity, distance, and training time, all 35 weeks macrocycle long, were analyzed. Weekly volume, training intensity distribution, altitude training camp, hypoxic exposure, as well as the sharpening period, were considered in the analysis. Training data were divided into three periods (General GP Specific SP and Finalization FP), and the three disciplines (swimming, cycling, and running) were analyzed by considering the external load (swim pace, power and run pace) in the form of total time in zone across the three physiological zones (Z1, Z2, Z3). During GP and SP, lactate and $\text{VO}_{2\text{max}}$ tests were conducted to identify changes in thresholds and aerobic power.

Results: Athletes trained 676 ± 22 h in 610 ± 34 sessions in the analyzed period. 87% of training time was executed below the first lactate threshold (Z1). The training intensity distribution shifted from 86.7%, 8.30%, and 4.95% in GP to 87.3%, 6.80%, and 5.50% in SP and 86.4%, 7.06%, 6.50% in FP at Z1, Z2, and Z3, respectively. Additionally, in all the triathletes, the polarized index increased from the SP to the FP, indicating a more polarized training tendency as the event approached. The athletes trained at altitude for 29 ± 8 days at an altitude of 1950 ± 115 m above sea level. All of them achieved a high hypoxic dose (1391 ± 422 km h) from 5 to 3 weeks before the Olympic competition. That period was characterized by a high volume of low-intensity training. The week leading up to the Olympic Games, all athletes reduced their training volume by $30.5 \pm 12.5\%$ without modifying their training frequency or intensity. The triathletes' $\text{VO}_{2\text{max}}$ increased by $2.27 \pm 0.78\%$ comparing GT and SP. The Lactate Threshold 1 (LT1) in swimming, cycling, and running improved by $2.75 \pm 2.80\%$, $5.25 \pm 1.30\%$, and $2.50 \pm 1.0\%$, respectively, instead the lactate threshold 2 (LT2) improved by $2.75 \pm 2.80\%$, $5.25 \pm 1.30\%$, and $2.50 \pm 1.0\%$, in swimming, cycling, and running respectively.

Conclusions: Our data reveal training volumes and intensity distributions consistent with best practices suggested by scientific literature. Confirming that the periodization followed a traditional model, characterized by high-volume, low-intensity training during altitude camps. Achieving Olympic qualification and performing at a high level requires a high training volume, with more than 80% of it completed at an intensity below LT1. The most common strategy involves increasing training intensity from the specific to the final preparation, followed by a few days of tapering before the competition. A pragmatic approach to training planning is needed, where general scientific evidence is integrated with individual adjustments to enable the best possible adaptations specific for each athlete and for a specific event.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC030 - RELIABILITY OF THE 16 × 25 M REPEATED SPRINT SWIMMING TEST IN ELITE YOUTH WATER POLO PLAYERS: A PILOT STUDY

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Purpose: Although several repeated sprint swimming tests (RST) are currently used to assess players' repeated sprint ability (RSA) in water polo [1], there is still a need to find new tests that could offer a higher ecological validity and ease of management. This pilot study aimed to evaluate the reliability of a repeated 16 × 25 m swimming test in youth water polo players, assessing its usage for monitoring RSA performance in aquatic environment training.

Methods: Twelve male U18 water polo players completed the same 16 × 25 m swimming protocol on two different days (T2: one week after T1). The RST was performed in basic crawl style at maximum speed and the restart signal was set every 45 s. The test was recorded with a video camera, and each 25 m time was calculated using Kinovea software to minimize manual stopwatch errors. Then, it was calculated the average 25 m time (s) across the 16 repetitions; the total time (s) to complete the test; the cumulative time (s) at each 100 m split; and the percentage decrement using an adaptation of the RSA formula (RSAdec%) validated in other team sports [2]: $[(25m_{average}/25m_{best}) \times 100] - 100$.

Results: The overall average 25 m sprint time was 14.0 ± 0.4 s, while the mean RSAdec% was under 6% across both sessions. The ICC showed excellent reliability for each dependent variable (ICC > 0.94). The paired t-test showed no significant differences between T1 and T2 ($p > 0.05$). The Bland–Altman analysis indicated a mean bias of 0.0158 s, with limits of agreement ranging from – 0.48 s to 0.51 s.

Conclusions: This pilot study contributes to the developing investigation of RSA testing in water polo. The RSAdec% showed to be a specific indicator and a valuable field-test tool for water polo coaches, providing accurate information regarding repeated sprint swimming level and players' potential ability to sustain high-intensity efforts during a match. Further studies should also focus on the validity of the test, including larger samples and different age categories.

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OC031 - INFLUENCE OF INDIVIDUALIZED FOREARM POSITIONING ON CORE ACTIVATION AND PELVIC KINEMATICS DURING PLANK EXERCISE

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Purpose: The aim of this study is to investigate the effects of specific forearm positioning on core muscle activation and pelvic kinematics during plank exercises, focusing on how symmetrical, asymmetrical, and scaled variations of the forearm can influence neuromuscular and biomechanical responses.

Methods: 28 healthy young adults (20 and 30 years) participated in a controlled repeated measures study. Participants performed four 40-s plank variations based on individualized forearm positioning, determined by evaluating the distance between the jugular notch and the acromion. The trials consisted of four different configurations: a standard plank forearm distance, with the forearms placed symmetrically and perpendicular to the shoulders; 80% and 120% of the jugular notch acromion distance; and an asymmetric setup. Trials

were administered in a counterbalanced ABBA sequence. Muscle activation of the bilateral rectus abdominis and external obliques was recorded via surface electromyography (sEMG) FreeEMG system (BTS Bioengineering). Pelvic kinematics were assessed using inertial measurement unit (IMU) BTS G-Walk[®] secured at L2 level. sEMG signals were band-pass filtered and rectified. The Friedman test was applied to assess differences across conditions, with post-hoc comparisons with Benjamini–Hochberg method.

Results: Right rectus abdominis activation was significantly higher in the 120% condition compared to the standard ($p = 0.002$), and also elevated in the asymmetric condition ($p = 0.034$). A similar pattern was found for the left rectus and external obliques, with the highest activation recorded in the asymmetric and 120% conditions. Pelvic kinematic data showed increased tilt and rotation in the asymmetric and 120% conditions compared to standard and 80% setups. These findings suggest that wider and asymmetric forearm positioning elicits greater core muscle engagement and alters pelvic control during the plank.

Conclusions: Forearm positioning significantly influences core muscle activation during the plank, with wider and asymmetric configurations eliciting greater right rectus abdominis engagement compared to the standard setup. These findings underscore the role of support base setups in modulating neuromuscular demand and suggest that adjustments in plank posture can be employed to target specific muscle responses. The results of this study have practical implications for tailoring exercise programs in both athletic and rehabilitation contexts.

OC032 - ASSESSMENT OF TECHNICAL PROFICIENCY FOLLOWING A BOXING PROGRAM IN FEMALE UNIVERSITY STUDENTS: A PRELIMINARY STUDY

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Purpose: Boxing beginners need to learn various skills, such as how to assume the boxing stance, maintain stability and balance while performing basic forward and backward movements, and learn the technique of fundamental punches executed both stationary and in motion. This study aimed to assess the acquisition of basic boxing technical skills in female sport science students following a university boxing course for novices. None of the participants had any prior experience with boxing.

Methods: Twenty-four female students participated in a boxing program designed for novices, which included two 90-min technical lessons each week over three weeks, focusing on the technical execution of the boxing stance and three punching techniques [i.e., straights (S), hooks (H), and uppercuts (U)], both in static and dynamic conditions. The individual's techniques before (T1) and at the end (T2) of the boxing program were assessed by two qualified coaches using a customised scoring system based on a Likert scale assigning (a) 1–5 points for the boxing stance's quality and (b) 1–4 points for each of the three punch techniques.

Results: The paired-sample Wilcoxon test showed significant improvements for both conditions from T1 to T2 ($p < 0.001$) for: (a) boxing stance [static: 14.4 ± 1.72 (T1) and 18.5 ± 2.02 (T2);

dynamic: 14.0 ± 2.50 (T1) and 17.0 ± 1.87 (T2)]; (b) S [static: 10.1 ± 2.22 (T1) and 14.7 ± 1.99 (T2); dynamic: 8.46 ± 1.86 (T1) and 13.1 ± 2.54 (T2)]; (c) H [static: 9.04 ± 2.82 (T1) and 13.7 ± 2.20 (T2); dynamic: 7.58 ± 2.04 (T1) and 12.0 ± 2.43 (T2)]; (d) U [static: 8.17 ± 2.58 (T1) and 13.2 ± 2.88 (T2); dynamic: 7.38 ± 2.14 (T1) and 11.8 ± 2.66 (T2)]. All effect sizes were large (rank-biserial correlation = -1.00 in most cases).

Conclusions: This study demonstrates significant improvements in the technical proficiency of female university students following a boxing program, in both static and dynamic conditions for the boxing stance and all three punching techniques (S, H and U). These findings provide valuable insights into the ability of female university students to acquire fundamental boxing skills within a short period, suggesting that tailored programs within a university academic curriculum can foster technical development in novices and engage female students in the practice of boxing. Aligned with other studies [1], this supports the inclusion of boxing in university curricula, which has proven to be an effective approach for fostering skill development and encouraging physical activity among female students.

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OC033 - IMPACT OF EXERCISE SETTING AND ENVIRONMENTAL CONTEXT ON PSYCHOPHYSICAL HEALTH IN BREAST CANCER SURVIVORS

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Purpose: Physical exercise is increasingly recognized as a “positive tool” in the recovery process of breast cancer survivors (BCS), helping to reduce the side effects of oncological treatments. Exercising in natural environments may further enhance its psychophysical benefits, supporting more complete recovery. Despite growing evidence in favor of physical activity, few studies have compared not only indoor vs outdoor settings, but also the effects of different natural environments on BCS health. This study aimed to evaluate the impact of various training environments (indoor vs outdoor) on mental and physical health, heart rate variability (HRV), and perceived exertion in BCS following a six-month aerobic exercise program.

Methods: A total of 100 BCS (mean age 54.7) were divided into four groups based on training location: (i) seaside pine forest, (ii) mountain environment, (iii) urban park, and (iv) indoor gym. Each group trained twice a week for six months in 2-h sessions, including a 15-min warm-up, a central training phase, and 15 min of cool-down. The central phase consisted of Nordic walking for outdoor groups and aerobic circuit training for the indoor group, with gradually increasing intensity up to an RPE of 13–14. Assessments were conducted approximately every six weeks, focusing on various psychophysical outcomes. This article reports findings from the SF-12 questionnaire, HRV analysis using the HeartMath device, and workload

monitoring—both objective (Polar OH1, Edwards method) and subjective (Session-RPE using Borg’s CR10 scale).

Results: All groups showed significant improvements in physical and mental health, as measured by the SF-12 questionnaire. The improvements were stronger in the mountain and coastal groups. The mountain group reached the highest final scores in both physical and mental components, while the indoor group had medium results. Cardiac variability also increased over time, with bigger improvements in natural environments, especially in the coastal group. With the same objective workload, Session-RPE was significantly lower in the outdoor groups.

Conclusions: Environmental settings have a strong influence on the psychophysical response to exercise in BCS. Mountain and coastal environments are especially effective in improving mental and physical health, as well as in supporting autonomic regulation. This suggests that including natural settings in exercise programs may help improve recovery paths for BCS.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC034 - LONG-TERM FOLLOW-UP AFTER STROKE—ADHERENCE TO STRUCTURED PHYSICAL EXERCISE, ITS ASSOCIATION WITH MAINTAINING EXERCISE CAPACITY, AND QUALITY OF LIFE

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Purpose: Structured physical exercise programs (SPEP) immediately following rehabilitation therapy is essential for maintaining an active lifestyle and reducing the risk of hypokinesia and clinical relapses[¹]. This observational study aimed to assess the effectiveness of the *Palestra della Salute* (Health Gym) in preventing dropout from non-medical physical exercise programs by evaluating the long-term effects of a SPEP developed, managed, and supervised by Exercise Physiologists. The program is aimed at maintaining residual functional abilities in stroke survivors.

Methods: The study sample consisted of stroke survivors who participated in SPEP after discharge from a medical rehabilitation program. Recruitment criteria included clients who had attended the *Palestra della Salute* for at least six years (analysis period: 2015 to present). Two groups Group A and Group B were identified: adherence to scheduled sessions over the subscription period $\leq 50\%$ and $> 50\%$ respectively.

Functional assessments were performed at baseline (T0) and at the end of the follow-up period (Tf). These included: 6MWT, (TUG) (STS) (SPPB) (10MWT) (BBS). The Charlson Comorbidity Index (CCI) was also recorded.

The SPEP focused on mobility, static and dynamic balance, dexterity, strengthening, and aerobic exercises, with sessions held twice weekly, each lasting 60 min[¹]. Statistical analyses were performed using Prism-GraphPad 8.

Results: A total of 15 subjects (6 females, 9 males) were recruited and divided into two groups: Group A (n = 7; 6 males; age 66 ± 9 years; CCI: T0 = 7 ± 2 , Tf = 8 ± 2) and Group B (n = 8; 3 males; age 64 ± 9 years; CCI: T0 = 5 ± 1 , Tf = 6 ± 1). Group A showed a significant decline in exercise capacity at follow-up, as measured by multiple functional assessments: 6MWT (T0 = 138 ± 87 m; Tf = 82 ± 53 m, $p < 0.05$), TUG (T0 = 33 ± 24 s; Tf = 38 ± 20 s, $p < 0.05$), SPPB (T0 = 4 ± 3 ; Tf = 4 ± 2 , $p < 0.05$), and BBS (T0 = 41 ± 12 ; Tf = 39 ± 9 ,

$p < 0.05$). STS and 10MWT did not show significant changes. Conversely, Group B demonstrated resilience, with a significant improvement in exercise capacity: 6MWT ($T0 = 204 \pm 86$ m; $Tf = 211 \pm 96$ m, $p < 0.05$), TUG ($T0 = 19 \pm 8$ s; $Tf = 17 \pm 10$ s, $p < 0.05$), STS ($T0 = 18 \pm 3$; $Tf = 15 \pm 4$, $p < 0.05$), 10MWT ($T0 = 20 \pm 6$; $Tf = 16 \pm 10$, $p < 0.05$), with improvements also observed in SPPB and BBS scores.

Conclusions: Good adherence to the SPEP is associated with the maintenance of functional abilities in stroke survivors, while low adherence may lead to worsening or less improvement in physical performance. Ongoing monitoring and support are essential to ensure lasting benefits.

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OC035 - “GE.MA.TA SPA: FEEL GOOD AND WORK BETTER”: WORKPLACE HEALTH PROMOTION INTERVENTION, PHYSICAL EXERCISE AND “PAUSE ATTIVE”

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Purpose: This study evaluated the effectiveness of an informative and formative workplace health promotion (WHP) program in increasing physical activity levels, reducing musculoskeletal disorders and sedentary behaviour through “Pause Attive” in staff Gemata SPA company.

Methods: In the beginning, 84 employees (E) (average age = 47.8 years, 17% female) attended an information meeting on “health and well-being” and answered the Client Satisfaction Questionnaire-8 (CSQ-8) and declared whether they used the company gym (GYM). All were asked to participate in training supervised by a graduate in sports science. 24 employees and managers (EM) joined and two groups were formed: 12 experimental group (EG) that trains in the GYM and 12 control group (CG) that does not follow the training. EG and CG completed three questionnaires before (T0) and after two months (T1) twice a week of training: International Physical Activity Questionnaire (IPAQ), Nordic Musculoskeletal Questionnaire (NMQ), Short Form Health Survey (SF-36). During the gym lessons, the “Pause Attive” physical exercise protocol was explained, tested and delivered and after 3 months and 5.5 months (T2) it was investigated whether it was performed and how often. At the 5.5 months T2 follow-up: IPAQ, SF-36, NMQ, CSQ-8 and GYM usage count.

Results: The proposed activities were highly appreciated: WHP CSQ-8 = 82.34% and gym training CSQ-8 = 89.93%. In initial it was observed that no one had used the GYM at least twice a week for at least two months, in T1 = 12.5%, T2 = 25% of EG. Practice “Pause Attive” T1 = 12.5%, T2 = 15% of EG. SF-36: significant difference between groups $p < 0.05$; EG with lower results than Physical functioning and limitations, well-being, social functioning and pain. Many of the EG suffer or have suffered in the last 12 months from musculoskeletal disorders (NMQ): cervical area EG = 83.33%, lumbar area EG = 70.8%, shoulders EG = 50%; there were significant changes in pain decreased in the cervical area ($p < 0.05$) at follow-up. IPAQ: there were no significant variations. In T2 the dropout rate was 16.67% mainly due to EM trips abroad.

Conclusions: All activities conducted align with the Veneto Region’s “Luoghi di lavoro che promuovono salute” WHP program. Although the initial information intervention was very welcome only 28.57% of E adhered to the practical proposals for physical exercise. Future studies should focus on developing and implementing new strategies to enhance employee engagement in WHP initiatives.

OC036 - EXPLORING QUALITY OF LIFE IN SPORT SCIENCE STUDENTS: ASSOCIATIONS WITH PHYSICAL ACTIVITY LEVELS, ORTHOREXIA AND INTERNET HABITS

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Purpose: This observational, cross-sectional study evaluates the association between physical activity (PA) levels and quality-of-life (QoL) patterns in a cohort of Sport Science students¹.

Methods: We collected cross-sectional data from 779 Sport Science students (University Parthenope, Naples; Jan 8–Feb 25, 2025) using Google Forms online survey. The survey, completed in about 16 min per student, combined validated questionnaires to assess General Data; Physical Activity levels (GPAQ); QoL (SF-12); mood (POMS); sleep quality (PSQI); back pain limitations (ODI); adherence to MD (MedDiet); internet use (IAT) and orthorexia symptoms (I-DOS). The cohort consist of Italian young adults (age 22.9 ± 3.9 y, BMI 23.8 ± 3.7), predominantly belonging from the Campania region. Relative frequencies and Spearman correlations between the outcomes were analyzed using JASP (0.19.3.0) software.

Results: Among the students surveyed, 65% reported high levels of PA, with an additional 28% classified as active and the remaining 7% as inactive. Sleep quality was generally good, with 80% of respondents reporting good sleep and 20% reporting poor sleep quality. Furthermore, 68% of the students surveyed fell within the normal emotional range. When assessing eating disorder (orthorexia symptoms), 73% of respondents have no symptoms, compared to 27% who exhibited some symptom.

Furthermore, concerning internet use, 14% displayed problematic online behaviour and 2% of responders showed addictive online behaviours. Interestingly, a significant negative correlation was identified between high-PA levels and symptoms of orthorexia ($p < 0.001$) in the responders. Moreover, mindful internet use showed significant positive correlations with multiple positive outcomes: sleep quality ($p < 0.001$), emotional state ($p < 0.001$) and the absence of orthorexia symptoms ($p < 0.001$).

Conclusions: This survey reveals that high levels of physical activity may have a protective effect against the symptoms of orthorexia nervosa. Furthermore, conscious use of the Internet emerges as a key factor that positively influences sleep, emotional well-being, and the absence of orthorexia symptoms.

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OC037 - MIND–BODY CONNECTION: BALANCE PERFORMANCE AND ATTENTIONAL FOCUS IN INDIVIDUALS WITH INTELLECTUAL DISABILITIES

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Purpose: Individuals with intellectual disabilities (IDs) are known to have deficits in body balance, particularly when cognitive and attentional demands for postural control are increased¹. Notably, there is a paucity of evidence regarding the effects of attentional focus in this population². Therefore, we investigated the impact of different attentional focus strategies on static balance performance in individuals with IDs while they stood quietly on both firm and mobile surfaces.

Methods: Participants (n = 14 males; 28.4 ± 5.5 years, 26.3 ± 7.1 kg/m²) performed a 30-s static balance assessment with, eyes closed in bipodal stance, under three conditions: no focus (NF, based on common instructions), internal focus (IF, based on ankle and foot perceptions), external focus (EF, based on metaphors such as “stay stiff as if you were a statue or a stone”). The Microgate GYKO inertial sensor system measured the center of pressure convex hull area (mm²), length (mm), and mean velocity (mm/s).

Results: Compared to NF and IF, the EF strategy showed a better balance on convex hull area ($p = 0.017$) when standing on the firm surface, and a better stability on convex hull area ($p = 0.030$), length ($p = 0.024$) and mean velocity ($p = 0.022$) when standing on the mobile surface.

Conclusions: Our results highlight the beneficial effects of external focus (EF) in individuals with IDs. These findings may assist practitioners and coaches in selecting the most appropriate attentional focus instructions during balance training, thereby potentially enhancing the effectiveness of interventions targeting postural control.

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OC038 - IS CARDIORESPIRATORY FITNESS PROTECTIVE AGAINST LOW-GRADE INFLAMMATION IN PARALYMPIC ATHLETES WITH A LOCOMOTOR IMPAIRMENT?

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Purpose: Low grade chronic inflammation, determined by the inflammatory state (IS), is the main cause of all the chronic non communicable diseases (1). IS has a high prevalence in Paralympic athletes (PA) with a motor impairment (2). We demonstrated in individuals with a spinal cord injury (SCI) that improvement of oxygen uptake peak (VO_{2peak}) through an arm cranking training reduces IS (3). In the present study we hypothesise that in PA competing in different sport types and with different health conditions (HC) affecting lower limbs, an inverse relationship exists between VO_{2peak} and IS.

Methods: Data from 153 male PA (82 PA with SCI and 71 with other HC) recruited from the pre-participation screenings (4) preceding 9 summer and winter Paralympic Games were retrospectively evaluated. PA competed in different sport types: skilled sports-SS (25%), power sports-PS (18%), mixed metabolism (aerobic-anaerobic alternated) sports-MS (40%) and endurance sports-ES (17%). Blood samples, to assess neutrophil (N) and lymphocyte counts and to calculate their ratio (NLR) to assess IS (5), and VO_{2peak} (ml kg⁻¹ min⁻¹), measured during an incremental cardiopulmonary maximal exercise test, to assess cardiorespiratory fitness, were used in the present study. Kruskal–Wallis test was used to compare the differences in the 4 groups of sport types. Spearman correlation was performed to evaluate the relationship between VO_{2peak} and NLR.

Results: Median NLR values (and ranges) didn't show differences among PA competing in the different sport types: 1.71 (0.7–3.8) in SS, 1.61 (0.9–3.2) in PS, 1.61 (0.9–4.1) in MS and 1.41 (0.9–2.7) in ES. VO_{2peak} significantly differed in the 4 types of sports (23.88; 15.2–39.7 in SS; 32.38; 17.1–50.8 in PS; 33.26; 16.4–44.7 in MS and 43.12; 27.5–58.1). A linear regression analysis revealed a negative correlation between VO_{2peak} and NLR ($r = -0.208$; $p = 0.009$).

Conclusions: We demonstrated an inverse relationship between VO_{2peak} and IS in PA with a locomotor impairment competing in sports with different energy expenditure and intensities. PA competing in SS, who display lower VO_{2peak} and higher IS than other PA, should improve their VO_{2peak} to counteract low grade chronic inflammation.

Acknowledgments: (non obbligatorio)

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OC039 THE IMPACT OF MOUNTAINEERING ON HEALTH: PRELIMINARY FINDINGS

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Purpose: Physical activity at high altitudes can promote general well-being. However, health-related parameters (e.g., sleep, stress, quality of life) may be negatively affected during consecutive days of mountaineering due to acute physiological and individual changes to altitude exposition. This study aims to investigate the effects of mountaineering on health-related parameters, including physical and cognitive efficiency, in individuals engaging in high-altitude physical activity.

Methods: Participants are recruited from a local association of mountaineers (Club Alpino Italiano, CAI) and engaged in a single leg of an overall 7-month mountain expedition (CrossAlps–La traversata delle Alpi). Before and after each leg, participants completed the Euro Quality of Life 5 Dimensions (EQ-5D-5L and Visual Analogue Scale, VAS), the Mini Sleep Questionnaire (MSQ), and the Perceived Stress Scale (PSS). Motor and cognitive assessments included simple and complex reaction time, rhythm and dynamic balance (march in place, MIP) and static balance (with open and closed eyes). The International Physical Activity Questionnaire (IPAQ) was completed only before the leg, and the Physical Activity Enjoyment Scale (PACES) only after the leg. Statistical analyses were performed to compare pre- and post-evaluations.

Results: A total of 29 participants (46.69 ± 14.41 years, 86% males, activity level > 700 MET/w) were enrolled. Significant improvements were observed in complex reaction time ($p < 0.001$, $d = 1.042$). No changes emerged in static balance. However, a significant reduction ($p < 0.05$) in the coefficients of variation of MIP parameters (pace [step/m]) and cycle [s]) tests was detected. Questionnaire data revealed a better sleep quality (MSQ, $p = 0.04$, $d = 0.401$) and a higher perceived health (VAS, $p = 0.043$, $lr = 0.37$), with no significant changes in stress perception. High enjoyment levels were reported after each leg (PACES = 73.31 ± 4.99 pt.).

Conclusions: Preliminary findings suggest that high-altitude physical activity may improve cognitive-motor efficiency and positively impact subjective sleep quality and health perception in highly performance mountaineers. Although no changes were observed in stress perception and static balance, improvements in rhythm and dynamic balance and reaction time to stimuli highlight the potential of mountaineering to enhance well-being and some components of motor coordination. Final results may confirm these preliminary observations in a larger sample.

OC040 - POLARIZED VS. HIGH-INTENSITY INTERVAL TRAINING: WHICH IS MORE BENEFICIAL FOR OBESE ADULT MALES?

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Purpose: Obesity is often associated with physical inactivity and poor dietary habits. Compared to normal-weight individuals, those with obesity typically show lower cardiorespiratory fitness (CRF), reduced exercise tolerance, and impaired lipid oxidation. The American College of Sports Medicine recommends combining moderate and vigorous physical activity to improve physical performance and body composition. In recent years, it has been shown that a combination of 80% of the volume at low intensity and the remaining 20% at high intensity is optimal training for athletes. This is known as polarised training (POL). This study aimed to evaluate and compare the effects of high-intensity interval training (HIIT) and POL on body composition, aerobic capacity, energy cost during walking, and substrate utilization at 5 km/h in men with obesity.

Methods: Twenty-eight adult males with obesity were randomly assigned to POL ($n = 12$), HIIT ($n = 8$), or Control (CONT, $n = 8$) groups. Evaluations at baseline (T0) and after 12 weeks (T3) included anthropometry, body composition, basal metabolic rate, $\dot{V}O_{2max}$, ventilatory thresholds, blood biomarkers, and substrate oxidation during walking. Training programs for POL and HIIT were individualized based on ventilatory thresholds, while CONT received no structured training only tips for healthy living.

Results: Body weight decreased in POL (-3% , $p = 0.016$) and tended to decrease in HIIT (-2% , $p = 0.091$). Also Fat mass tended to decrease in POL (-4% , $p = 0.097$). HDL levels improved significantly at T3 in both groups (POL: $+8\%$, $p = 0.053$; HIIT: $+32\%$, $p < 0.001$). VAI indices also improved in both groups (POL: -62% , $p = 0.001$; HIIT: -66% , $p = 0.003$). $\dot{V}O_{2max}$ increased significantly in absolute values (POL: $+7\%$, $p = 0.051$; HIIT: $+12\%$, $p = 0.019$) and improvements were significantly higher in HIIT than POL. Maximal aerobic velocity increased significantly (POL: $+8\%$, $p = 0.001$; HIIT: $+10\%$, $p = 0.001$), also $\dot{V}O_2$ (VT1, POL: $+22\%$, $p < 0.001$; HIIT: $+13\%$, $p = 0.022$; VT2, POL: $+8\%$, $p = 0.022$; HIIT: $+12\%$, $p = 0.015$) and velocity (VT1, POL: $+10\%$, $p < 0.001$; HIIT: $+12\%$, $p < 0.001$; VT2, POL: $+8\%$, $p < 0.001$; HIIT: $+13\%$, $p < 0.001$) increased at ventilatory thresholds in both groups.

Conclusions: Both POL and HIIT improved body composition, aerobic performance. POL was more effective for weight reduction, while HIIT promoted greater gains in $\dot{V}O_{2max}$ and HDL. These structured exercise programs offer distinct and complementary benefits for improving health in this population.

OC041 - PRESERVING FUNCTIONAL AUTONOMY IN MULTIPLE SCLEROSIS THROUGH ADAPTED PHYSICAL ACTIVITY: PRELIMINARY DATA

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Purpose: Multiple sclerosis (MS) is a chronic disease of the central nervous system that can impair functional autonomy and abilities such as balance, strength, and mobility. This observational study, conducted with local patient associations, aims to evaluate the effects of adapted physical activity (APA) in individuals with MS. Preliminary data include comparative analyses and correlations between physical and gait-related parameters.

Methods: Seventeen adults were evaluated after 4 months within a 10-month intervention. Assessments included the Chair Stand and Sit and Reach tests, and instrumented tests using Inertial Measurement Units (IMUs): 6-Minute Walk Test (6MWT), Timed Up and Go (TUG), and Walk+. Participants followed a bi-weekly APA program. Correlation analysis was conducted on percentage changes ($\Delta\%$) of functional and postural parameters using linear regression.

Results: Participants (mean age $\pm$ SD: 62.8 ± 16.69 years; 53% female) had a mean EDSS score of 3.9 ± 2 . MS types included: relapsing-remitting (76.4%), primary progressive (18%), secondary progressive (6%). Significant improvements were found in the Chair Stand Test ($p = 0.0054$), Sit and Reach (right: $p = 0.0088$; left: $p = 0.0062$), and 6MWT ($p = 0.0011$). A significant correlation emerged between TUG duration and seated TUG ($p = 0.0344$; $R = 0.2816$). Other correlations were not significant but showed functional stability, a relevant outcome in neurodegenerative disease.

Conclusions: Preliminary results suggest that APA may help preserve functional autonomy and improve physical performance in people with MS.

Further evaluation at 10 months (June 2025) will clarify the effectiveness of the intervention.

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References: (non obbligatorio).

OC042 - TENNIS BACKHAND TECHNIQUE ASSESSMENT USING AN INERTIAL SYSTEM

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Purpose: This study proposes the use of a single inertial measurement system [1] to quickly assess relevant technical parameters in one hand (SH) and double hand (DH) backhand [2,3], and particularly how the angles of flexion–extension and torsion of the trunk during impact may contribute to the kinematics of the shot.

Methods: Thirty tennis players ranked in the 2nd and 3rd categories of the Italian Tennis Federation are recruited. The subjects wear a sensorized chest strap with an inertial unit and receive two sets of 12 balls each. Two action cameras capture backhand shots from lateral and rear perspectives at 5 m from the point of impact. Video analysis is conducted to identify the lateral distance (LD) to the ball at the point of impact. Test–retest reliability is verified among the two sets. Pearson's correlations between distance, trunk inclination (Euler Y), shoulder line angle (Azimuth), and parameters such as angular speed (Gyr X) and horizontal acceleration (Acc Z) are investigated during the impact phase.

Results: High reproducibility for all parameters was found in the preliminary data on 5 subjects. The mean LD in the two techniques was 58 ± 14 cm, the Gyr X: $675 \pm 182^\circ/\text{s}$, and the Acc Z: 19 ± 8 m/s². In the DH backhand, a more prominent trunk action was found with higher Gyr X ($\Delta = 292^\circ/\text{s}$; $p < 0.001$) and Acc Z ($\Delta = 5$ m/s²; $p < 0.05$). In SH backhand, on the other hand, a highly significant correlation was found between LD and Euler Y ($r = 0.6$, $p < 0.001$), and between Azimuth angle with Gyr X ($r = 0.81$, $p < 0.001$) and Acc Z ($r = 0.74$, $p < 0.001$). In the DH backhand, however, no

correlation was found between LD and Euler Y, while a positive correlation was found between the Euler Y angle and Gyr X.

Conclusions: Interesting insights emerged in both SH and DH backhands by analyzing kinematic parameters. The finding underscores the importance of proper LD and shoulders rotation in the effective execution of the SH backhand. Different coordination and force generation strategy is shown in the DH backhand, where the trunk might contribute differently to torsion velocity production, maintaining greater verticality. Further studies are needed to refine the system, expand the number of subjects, and examine all the technical-tactical situations of the game.

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OC043 - GAIT AND BALANCE FUNCTIONAL SUBTYPES IN KNEE OSTEOARTHRITIS USING UNSUPERVISED MACHINE LEARNING

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Purpose: Knee osteoarthritis (OA) is a major contributor to pain and mobility limitations in older adults, often presenting with gait alterations and balance deficits. This study aims to investigate whether distinct functional subgroups can be identified within the knee OA population by analyzing gait and balance data collected via wearable sensors using unsupervised machine learning methods. Recent advances in artificial intelligence, particularly Principal Component Analysis (PCA) and Self-Organizing Maps (SOM), offer promising tools for revealing hidden biomechanical patterns. When applied to sensor-based movement data, these methods may inform the development of more personalized physical activity interventions.

Methods: A cross-sectional study was conducted involving 50 participants (25 with OA and 25 healthy controls), aged 45 to 80. Both gait and postural stability data were collected using the BTS G-Walk[®] inertial sensor. Gait parameters were assessed during walking on a flat surface, while balance was evaluated under both eyes-open (EO) and eyes-closed (EC) conditions in a static stance. After statistical comparison between groups, a four-stage machine learning pipeline which

includes PCA, SOM, and K-means clustering, was applied to identify underlying functional subtypes within the OA group.

Results: OA participants exhibited significantly slower gait speed (1.05 vs. 1.30 m/s, $p = 0.025$), reduced cadence (101.98 vs. 110.04 steps/min, $p = 0.015$), and a shorter propulsion phase (5.3% vs. 7.6%, $p = 0.007$), along with greater sway ellipse areas in both EO (1656 vs. 427 mm², $p < 0.001$) and EC conditions (2011 vs. 443 mm², $p < 0.001$). PCA identified four principal components reflecting gait performance, asymmetry, cadence, and postural control. Unsupervised clustering revealed three OA subgroups: (C1) patients with severe functional limitations (80% with KL grade 2–3), (C2) high-functioning individuals (50% with KL grade 1), and (C3) those with poor postural control (40% with KL grade 2).

Conclusions: These findings underscore the functional heterogeneity within the OA population and the limitations of relying solely on x-rays. By identifying distinct motor phenotypes, this approach enables the design of personalized physical activity programs that align with individuals' biomechanics. The integration of wearable sensor data with machine learning offers a valuable strategy to better tailor movement-based interventions.

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OC044 - HIGHER AUTONOMIC NERVOUS SYSTEM BALANCE IN DUAL CAREERS OFF-SEASON POWERLIFTERS

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Purpose: Dual career (DC) students are simultaneously engaged in their academic duties as well as in intensive sports programs. In this study we focused on university students engaging in a competitive strength sport, powerlifting, at the national level. Since it is believed that their dual commitment may lead to experiencing higher level of stress than regular students, this study aimed to observe whether their autonomic nervous system (ANS) balance differed from control.

Methods: Eleven DC off-season powerlifters (aged 23.73 ± 1.27) and nine lightly active university students (aged 22.11 ± 1.76) were assigned into two groups (DC-PL and C group). Both groups were not undergoing university examinations. Heart Rate Variability (HRV) at rest was collected by using the HRV4training mobile application, first thing in the morning after waking up. Root mean squared standard deviation (RMSSD) was used to assess their ANS balance. A Wilcoxon rank-sum test was performed to test baseline differences in RMSSD between groups.

Results: RMSSD in the off-season DC-PL group was 94.10 ± 69.27 ms and resulted to be statistically higher than in the C group (60.74 ± 28.62 ms, $p < 0.01$).

Conclusions: This investigation seems to suggest that DC powerlifters have a higher parasympathetic activation, “lower stress”, than their students Control, when in an off-season period and far from university exams. Further studies will focus on ANS balance during the concomitance of in-season and university exams.

OC045 - ACUTE EFFECTS OF A SENSORIZED INSOLES-BASED VISUAL BIOFEEDBACK ON RUNNING PATTERNS IN RECREATIONAL RUNNERS. FEASIBILITY STUDY

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Purpose: In the last years, research about medium and long-distance running injuries causes has grown. Biomechanical dysfunctions, load progression, and tissue stress seems to be involved but despite extensive studies, the factors that influence injuries and performance are still unclear. Biomechanical analysis, particularly of ground impacts, is useful for optimizing efficiency and reduce injury risk. Biofeedback has emerged as a promising tool for improving gait, although the variability of study designs does not clarify the most effective typology. This study aimed to assess the acute effects of a sensorized insoles based visual biofeedback on running patterns in a sample of recreational runners.

Methods: Between November 2023 and February 2024, 15 participants (6 females) were recruited and signed an informed consent. Participants wore their running shoes and carried out the four phases of the study at a self-selected speed. Between each phase a five minutes washout was done. The study started with six minutes of warm up on a treadmill (T3xm, Matrix, Italy). During the washout, participants wore the sensorized insoles (FlexInFeet, Sensormedica, Italy) and then performed the first evaluation (T0). The visual biofeedback intervention lasted six minutes. Via the Bluetooth transmitter of the insoles, the participants saw in real time the distribution of the foot load on a screen and were able to correct both weight bearing and rare foot impacts. Study ended with the second evaluation (T1). Evaluations lasted 90 s and were done with a baropodometric treadmill (Strider, Sensormedica). Spatiotemporal parameters analyzed for both limbs were: cadence, step length, contact time and step width.

Results: At T1, compared to T0, all parameters improved. Cadence increased significantly (left 172.97 ± 6.36 , 164.38 ± 5.55 , $p < 0.001$; right 172.99 ± 4.81 , 162.99 ± 5.48 , $p < 0.001$). Contact time decreased significantly (left: 0.29 ± 0.02 , 0.30 ± 0.02 , $p < 0.001$; right: 0.29 ± 0.02 , 0.31 ± 0.03 , $p = 0.001$). No significant changes were observed for step length or width ($p > 0.05$).

Conclusions: Visual biofeedback has been shown to be effective in improving participants' running patterns. Results suggest that the use of this technology could reduce the risk of injury and optimize the performance of the recreational runners.

OC046 - FOOT PLANTAR DISTRIBUTION AND KINEMATIC ANALYSIS OF LOW DIVE IN SOCCER GOALKEEPERS: A CASE STUDY

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Purpose: Goalkeepers require fast, precise movements combining explosive force and neuromuscular control. While previous studies [1] analyzed diving using force platforms and optical motion capture, they lack detailed insight into how forces are distributed across different regions of the foot during a dive. To address this gap, we investigated plantar pressure distribution and lower-limb kinematics in an elite female goalkeeper performing low-corner dives, using wearable inertial sensors and sensorized pressure insoles.

Methods: An 18-year-old goalkeeper from an elite youth team performed four randomized low dives (two per side) intercepting balls launched at approximately 30 cm height and 70 cm from the goal post. Kinematic data were recorded at 60 Hz with the Xsens MVN Biomech Link system (17 IMUs) and plantar pressures at 100 Hz using XSENSOR® smart insoles. A distinctive foot-strike acceleration peak was used as a synchronization marker across all devices. Time series were normalized from peak hip flexion to ipsilateral foot take-off, and analysis focused on stance width (normalized to leg length), joint angles (hip, knee, ankle), vertical ground reaction forces, and regional plantar pressures at four key instants: preparatory phase, ipsilateral foot initial contact (IFIC), contralateral peak force (CPF), and ipsilateral peak force (IPF). Given the exploratory nature and small sample size, data are presented descriptively without inferential statistics.

Results: In the preparatory phase (0%), vertical ground reaction force was ~ 640 N, evenly distributed. Peak pressure occurred under metatarsals (136 N) and toes (126 N); stance width was 44%, with 105° hip flexion, 59° knee flexion, and 17° ankle dorsiflexion. At IFIC (~ 48%), contralateral force rose to 341 N, with pressure shifting to midfoot/metatarsals. Stance width increased to 56%, hip flexion reduced to 93°, and ankle dorsiflexion to 11°. At CPF (~ 76%), forefoot force peaked at 470 N, stance width reached 84%, and ankle dorsiflexion peaked at 27°. At IPF (~ 84%), ipsilateral load peaked at 403 N under metatarsals; hip and knee reached maximum extension (118°, 114°), and ankle dorsiflexion was 28°.

Conclusions: Sequential loading confirms differentiated roles of contralateral (propulsion) and ipsilateral (control) limbs. These findings highlight the potential of portable sensor technologies to inform targeted coaching, neuromuscular training, and injury prevention programs, particularly by optimizing forefoot loading strategies and ankle stability.

Acknowledgments: The authors would like to thank Alessandro Colombo and Daniele Airoldi for their participation in the study.

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OC047 - ADAPTATIONS IN MOTOR UNIT BEHAVIOR OF THE DELTOID DRIVEN BY CHANGES IN MUSCLE LENGTH

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Purpose: The glenohumeral joint is one of the most complex joints in the human body. It performs a wide range of movements through the coordination of numerous muscles, with the deltoid being the primarily responsible for shoulder abduction. Therefore, this region is a challenging structure to identify individual motor unit activity from high-density surface electromyography (HD-sEMG) and only few studies have examined the rate coding of the shoulder muscles. It remains unclear how deltoid motor units adapt to increased abduction force demands, particularly when the muscle is positioned at different lengths.

The aim of this study is to investigate changes in the rate coding of deltoid motor units across different force levels and at two different joint angles (30° and 65° of lateral abduction).

Methods: This study consisted of two sessions conducted on consecutive days, one for each joint angle. Seven subjects performed two maximal voluntary contractions (MVCs), followed by trapezoidal isometric contractions at 5%, 10%, 20%, and 30% MVC. HD-sEMG signals were recorded using two 64-electrode grids placed over the deltoid and were subsequently decomposed into individual motor unit spike trains using a convolutive blind source separation algorithm (Negro et al., 2016). Motor units were matched across different force levels by reapplying the motor unit separation vectors.

Results: The results indicated motor unit adaptations depending on muscle length. At 30° of abduction (optimal length for force generation), increases in contraction intensity were consistently associated with increased rate coding ($p = 0.006$ between 5–10% MVC; $p = 0.046$ between 10–20% MVC; $p = 0.007$ between 20–30% MVC). Conversely, at 65°, where the deltoid is shortened (i.e., less optimal length), rate coding significantly increased only between 10 and 20% MVC ($p = 0.011$) and between 20 and 30% MVC ($p < 0.001$), with no significant changes between 5 and 10% MVC ($p = 0.53$).

Conclusions: These findings suggest that when the deltoid is in the optimal length, it responds to increasing force demands by increasing the rate coding. Conversely, in a position of mechanical disadvantage, the nervous system appears to prioritize the recruitment of additional motor units. Consequently, it can be concluded that the deltoid employs distinct neuromuscular strategies depending on muscle length to meet increasing force requirements.

OC048 - CONTINUOUS LEARNING AND QUALITY AGING: SUPPORTING WELL-BEING IN THE TRANSITION FROM WORK TO RETIREMENT

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Purpose: The AGER project investigates successful retirement transitions among secondary school and university teachers, exploring physical well-being, self-efficacy, and existential redesign. The aim is to understand how transversal skills, lifestyles, and professional context contribute to active aging and an effective transition.

Methods: The research employs both quantitative and qualitative approaches. A total of 90 teachers are included, divided between those nearing retirement and those recently retired. In the first phase, questionnaires assess physical and psychological health, lifestyles, and LifeComp skills, complemented by motor tests (6MWT, Hand-grip Test, V-Sit and Reach, Flamingo Test, and body composition analysis). The second phase involves a subset of 30 participants for

semi-structured interviews and advanced neuromuscular assessments with EMG.

Results: Preliminary results show a negative correlation between fat mass and flexibility ($r = -0.432$, $p = 0.035$), suggesting that higher fat mass may reduce joint mobility. Additionally, left balance loss is significantly correlated with BMI ($r = 0.422$, $p = 0.032$), highlighting the potential impact of body composition on postural stability. These findings underscore the importance of body composition in motor function and balance, with implications for prevention strategies and physical performance improvement.

Conclusions: The AGER project underscores the importance of educational and institutional strategies in supporting work transitions and promoting active aging.

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OC049 - EFFECTS OF 12 WEEKS OF ACTIVE BREAKS ON ENHANCING COMPLEX PROCESSING SPEED, MATH PERFORMANCE, AND PHYSICAL ACTIVITY IN PRIMARY SCHOOL CHILDREN

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Purpose: The World Health Organization (WHO) recommends that children and adolescents aged 5–17 years engage in at least 60 min of moderate-to-vigorous physical activity (MVPA) daily. Adherence to these guidelines is low across European countries, with a notable increase in physical inactivity among children [1]. Active Breaks (ABs) have gained increasing attention in educational settings. ABs are short periods of physical activity integrated into the school day aimed at enhancing both academic and physical outcomes. Research indicates that ABs can improve attention levels and mathematical performance in primary-school children [2]. This study aimed to evaluate the effects of a 12-week ABs program on physical, academic and cognitive outcomes in primary school children.

Methods: This study was designed as a randomised controlled trial (RCT). Eighty third-grade children (aged 7.84 ± 0.37 years) were recruited from Primary School in Italy. Classes were randomly assigned to one of four conditions based on the type of AB protocol performed twice a day for 10 min each for 12 weeks: creativity (CREAT), fitness (FIT), combined (COMB), and a control group (CON). All participants underwent the MOTORFIT test, Reynolds Interference Task (RIT), and AC-MT 6–11 Math Test.

Results: RM-ANOVA showed significant improvement in math performance, particularly in written calculations and problem solving, where the experimental groups showed significant improvement from

pre- to post-assessment ($p < 0.001$) and in comparison with CON ($p < 0.030$). Significant improvements were found in complex processing speed, where the experimental groups showed significant improvement from pre- to post-assessment ($p < 0.001$) and in comparison with CON ($p = 0.032$). Finally, significant differences were found in the MOTORFIT test, in which the experimental groups achieved better performance than the CON group ($p < 0.05$). Significant improvements were found from pre- to post-assessment in the shuttle run test in the fitness and creative groups ($p < 0.001$).

Conclusions: The study demonstrated that the incorporation of active breaks over 12 weeks within the school system led to improvements not only in physical skills but also in math performance and complex processing speed. These enhancements positively affect two key academic parameters: problem-solving skills and written calculations. Therefore, physical activity promotes motor ability and improves executive functions.

Acknowledgments: (non obbligatorio).

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OC050 - ESTABLISHING NORMATIVE 6-MINUTE WALKING TEST VALUES IN ADOLESCENTS AGED 12–18: A STUDY FROM FIVE ITALIAN REGIONS

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Purpose: The 6-Minute Walking Test (6MWT) is a simple, sub-maximal field test widely used to assess functional aerobic capacity and overall health status. Despite its increasing application in pediatric and adolescent populations, normative reference values for healthy adolescents are still limited, especially in the Italian context, reference values were not investigated. The purpose of this study was

to develop age- and sex-specific normative reference values for the 6MWT in Italian adolescents aged 12 to 18 years.

Methods: A total of 1772 adolescents (907 girls), aged 12–18 years, were recruited from middle and high schools across five Italian regions. Assessments were conducted during regular physical education classes. Each participant completed the 6MWT, walking as far as possible along a 20-m aisle over six minutes. Sex-stratified centile curves were developed using the Generalized Additive Models for Location, Scale and Shape (GAMLSS), using BCPE distribution.

Results: Results indicate that, in both sexes, the distance walked increases with age, although with differing patterns. Boys demonstrated a consistent improvement in performance across the entire age range. In contrast, girls showed relatively stable values, with a slight decline during mid-adolescence followed by a plateau. Overall, boys outperformed girls across all percentiles and age groups, with the most marked differences observed in the higher performance percentiles. The data provide sex- and age-specific normative reference values useful for evaluating functional capacity in youth.

Conclusions: This study offers a comprehensive overview of normative reference values for the 6MWT in a large sample of Italian adolescents. Given the strong association between functional performance and health status, these normative values represent a valuable tool for assessing age- and sex-specific aerobic capacity during adolescence.

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OC051 - GAME CHANGER: HOW MIDDLE CHILDHOOD SPORT PREDICTS REDUCED OPPOSITIONAL-DEFIANT BEHAVIORS BY EARLY ADOLESCENCE

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Purpose: Oppositional-defiant disorder (ODD) is linked to long-term social and functional impairments. Often under-diagnosed and comorbid with other developmental disorders, persistent oppositional behaviors in childhood predict negative adult outcomes. There is a need for accessible, community-based strategies to support symptom reduction. Youth sport may offer a developmentally appropriate, ethical context for shaping adaptive behaviors. This study examined the prospective association between extracurricular sport participation in middle childhood and oppositional-defiant behaviors in early adolescence, hypothesizing stronger effects in boys.

Methods: A population-based, longitudinal design was used, drawing on data from the Quebec Longitudinal Study of Child Development. Participants included 1467 children (49% boys) with complete data on sport participation between ages 6 and 10 years. Using maternal reports, children were classified into consistent or low-inconsistent

sport participation trajectories using Growth Mixture Modelling. Self-reported oppositional-defiant behaviors were assessed at ages 10 and 12 years. Ordinary least-squares regressions, adjusted for early childhood individual and family factors, estimated the prospective association, stratified by sex.

Results: Boys with consistent participation in organized sport from ages 6 to 10 years exhibited significantly lower levels of oppositional-defiant behaviors at ages 10 ($B = -0.45$, $SE = 0.22$, $p < 0.05$) and 12 years ($B = -0.46$, $SE = 0.22$, $p < 0.05$), compared to peers with low or inconsistent participation. Among girls, the association was weaker and not statistically significant, although a marginal trend was observed at age 12 years ($p = 0.05$). Oppositional-defiant behaviors at age 6 years significantly predicted later outcomes.

Conclusions: This study adds to the accumulation of evidence on the beneficial role of extracurricular sporting activities on children's socio-emotional and behavioral development. Sustained participation in organized sport during middle childhood predicted reduced oppositional behaviors in boys, supporting youth sport as a natural, community-based strategy with long-term benefits for public health, education, and social systems.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC052 - MENTAL IMAGERY, STRESS, AND THE MEDIATING ROLE OF SELF-EFFICACY IN MARTIAL ARTS ATHLETES

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Purpose: Martial arts are diverse systems of combat practices, each with its unique techniques, philosophies, and histories. Mental imagery is a multisensory experience that integrates various senses to create vivid mental representations, evoking the physical attributes of people, places, or objects not currently within our perception. In sports contexts, studies have indicated that martial arts often use imagery to enhance performance. This study aimed to investigate the mediating role of self-efficacy in the relationship between static (visualizing still scenes or concepts) and dynamic (focusing on motion and action) vividness, controllability (manipulating the imagery experience), and the degree of stress, in a group of competitive martial arts.

Methods: 110 participants athletes (61 males and 49 females), aged between 21 and 23 years old ($M = 22.47$, $SD = 0.75$), completed the Vividness of Visual Imagery Questionnaire, the Vividness of Movement Imagery Questionnaire-2, the Mental Image Transformation Task, The General Self-Efficacy Scale, and Measuring Psychological Stress Test.

Results: A 2×3 (gender $\times$ sport type) between groups MANOVA showed significant differences in imagery dimensions by sport type. The results of the mediation analysis showed that self-efficacy plays a mediating role between imagery and stress.

Conclusions: The study advanced exploration in the field of mental imagery training, providing additional evidence for its importance in improving performance and managing stress in athletes.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC053 - MODERATING EFFECTS OF AGE AND LIVING PLACE ON THE RELATIONSHIP BETWEEN PERCEIVED BARRIERS AND PHYSICAL ACTIVITY LEVELS IN YOUNG ADULTS LIVING IN SOUTH TYROL

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Purpose: In Europe, 22% of young adults aged 18–39 do not meet the World Health Organization (WHO) physical activity (PA) guidelines (WHO, 2024). Identifying the factors that hinder PA participation is essential for designing successful interventions. This study examined the relationship between perceived barriers (personal, social, and environmental) and PA levels in adults living in South Tyrol who are not physically active enough. It also explored whether first language (German, Italian or Ladin), gender, and age moderated this relationship.

Methods: As part of the LOOK4SPORT project, a survey was conducted to investigate PA levels in people aged 18–34 years living in South Tyrol. Out of 400 participants, 68 (17%) (35.3% males, average age 27.0 ± 5.1) did not meet PA guidelines and were considered for further analyses. PA levels were assessed using the International Physical Activity Questionnaire short-form (IPAQ-SF). Perceived barriers to PA practice were evaluated using the Physical Activity Barriers Questionnaire (PABs). Personal, social and environmental barriers were analysed separately. Linear regression analyses were conducted to investigate the relationship between the PABs and the IPAQ scores. Moderation analyses were performed to assess the moderating effects of first language, gender, and age.

Results: Personal PAB is significantly and inversely associated with IPAQ total score ($b = -444.9$, $SE = 216.9$, $R^2 = 0.06$, $p = 0.044$). Participants' living place moderated this relationship ($R^2 = 0.12$, $F(3,64) = 2.87$, $p = 0.043$), with a statistically significant p value found only among those living in villages ($< 15,000$ inhabitants) ($b = -732.9$, $p = 0.006$). No significant effect was found among city dwellers. Age also moderated the relationship ($R^2 = 0.14$, $F(3,64) = 3.40$, $p = 0.023$), with stronger negative associations at ages 27 ($b = -474.6$, $p = 0.030$), 33 ($b = -996.9$, $p = 0.003$), and 34 years ($b = -1084.0$, $p = 0.003$). Neither gender nor first language acted as moderators. Finally, linear regression analyses showed no significant impact of social or environmental PABs on the IPAQ total score.

Conclusions: Among physically inactive people aged 18–34 years living in the South Tyrol, personal barriers are significantly associated with lower PA levels, particularly among those living in villages and those aged over 27. To increase participation in physical activity, tailored strategies should be implemented to address the personal barriers faced by these subgroups.

References:

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OC054 - STATUS QUO AND FUTURE CHALLENGES IN BLIND ADAPTED BASEBALL: COACHES AND VISUALLY IMPAIRED ATHLETES PERSPECTIVE FROM THE FIRST WORLD CUP

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Purpose: Regular practice of sport and physical activity is recognized as a source of psychophysical health and quality of life in both general population and individuals affected by disabilities. Focusing on visually impaired subjects, nowadays a large number of adapted sports can be played, and, among them, blind baseball represents an effective tool of inclusion, socio-emotional development, and psychophysical well-being promotion. The present study aimed to provide, for the first time, an evidence-based picture of blind baseball psychosocial perception, and on-field management in coaches and athletes engaged in the Blind Baseball World Cup 2024.

Methods: Twenty-six coaches and thirty-five athletes, regrouped into different continents, completed a structured online survey featuring purposely designed questions peculiarly inquiring the tailored on-field organization and criticalities, coach-athlete relationship perception, and Paralympic sport media attention. Psychological well-being and sport-related psychological functioning were also assessed using the 18-item Psychological Well-being scale and the Mental Ability questionnaire, respectively.

Results: Despite the geo-cultural variance, overall, no significant differences were detected among the investigated athlete groups, hence remarking the sociofunctional benefits of this adapted sport. Moreover, the coach-athlete relationship, staff specific competences/training, tailored psychological support need, and human resources implementation, along with a scarce Paralympic sport media attention, were considered key points both by athletes and coaches from all over the World.

Conclusions: Hopefully, our research might help filling the gap in para sport coach-athlete perspective studies and spread knowledge and interest in this still under investigated adapted discipline, thus fostering practice-related psychophysical benefits, inclusiveness, and worldwide visibility.

Acknowledgments: The authors are most grateful to all the visually impaired athletes and coaches who took part in the study. The authors also wish to thank the World Baseball Softball Confederation (WBSC) which promoted the present research in the event frame.

OC055 - UNTANGLING THE EFFECTS OF A SHORT MENTAL TRAINING INTERVENTION ON ATHLETES' WELLBEING, CONFIDENCE IN THEIR SPORT, AND MENTAL SKILL ABILITIES

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Purpose: In sport psychology, mental training (MT) approaches mostly focus on performance optimization, while little is known about

MT interventions addressing athletes' wellbeing. Hence, this study aimed to test the effects of a short MT intervention on a broad conceptualization of the wellbeing construct, including optimism, mental skill abilities, and confidence towards one's own sport.

Methods: $N = 54$ Italian athletes were recruited and randomly allocated to either the experimental ($N = 25$) or the waiting list control group ($N = 29$). Athletes were tested pre- and post-training via self-report questionnaires aimed at evaluating participants' levels of depressive symptoms (CES-D), stress (IPSS), affect (PANAS), optimism (Optimism subscale of the Flourishing Scale), mental skill abilities (QuAM-2), and confidence towards their own sport (Trait Sport-Confidence Inventory). Additionally, with the aim to assess athletes' perception of the effectiveness of the intervention on their wellbeing, two post-training open questions were administered to participants belonging to the experimental group. The MT consisted of 3 two-hour-long in-person meetings conducted by an expert sport psychologist. The intervention utilized a cognitive-somatic approach by focusing on progressive relaxation and motor imagery with the addition of the technique of psychological empowerment. Either linear or generalized models were run to test the training benefits. Within these models, age, years of sport practice, and number of training sessions *per* week measures were included as covariates. Furthermore, a thematic analysis was performed to explore the contents of the two open questions assessing athletes' perception.

Results: The MT intervention showed significant effects on optimism ($p=.003$), mental skill abilities ($p = 0.006$), and on athletes' confidence towards their sport ($p = 0.023$). From the qualitative analysis, it emerged that athletes' perception of wellbeing improvement was related to both the areas of daily life and sport-related activities.

Conclusions: A short MT intervention can be beneficial for young adult athletes determining a perceived improvement in personal and athletic wellbeing.

Acknowledgments: (non obligatorio).

References: (non obligatorio).

OC056 - WHEN MOTIVATION MEETS MOVEMENT: GENDER DIFFERENCES IN UNIVERSITY STUDENTS' PHYSICAL ACTIVITY BEHAVIOR

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Purpose: The aim of this study was to investigate gender differences in the four psychological dimensions related to physical activity participation among university students: persistence, effort, enjoyment, and motivational regulation related to Self-Determination Theory (SDT).

Method: The study comprised 60 male ($M_{age} = 22.71 \pm 4.83$ years) and 41 female ($M_{age} = 23.73 \pm 5.41$ years) enrolled in Bachelor and Master's degrees in Sports and Exercise Science.

The Italian versions of the following surveys were administered: Persistence and Effort Scale, Physical Activity Enjoyment Scale, and Behavioral Regulation in Exercise Questionnaire (2nd Version). Differences between genders were analyzed through Mann-Whitney test, while correlations among psychological dimensions were estimated via Spearman's rho and corrected for multiple testing.

Results: Female students reported significantly higher levels of enjoyment than their male peers (median difference = 0.37, $U = 884.500$, moderate effect). No other significant differences between men and women were observed. Among males, the most relevant correlations were observed between intrinsic motivation and

enjoyment ($\rho = 0.83$), intrinsic and identified regulation ($\rho = 0.79$), and enjoyment and identified regulation ($\rho = 0.76$). Among females, relevant correlations were observed between intrinsic motivation and enjoyment ($\rho = 0.68$), and intrinsic motivation and identified regulation ($\rho = 0.59$).

Conclusion: The findings of this study offer valuable insights into the motivational dynamics associated with physical activity in a university context. The current findings highlight gender differences in the enjoyment related to physical activity. This difference suggests the potential for a stronger affective or relational component in how women engage with physical activity. In both groups, intrinsic motivation was strongly and positively associated with enjoyment, confirming the central hypothesis of SDT, which posits that autonomous forms of motivation are linked to positive psychological outcomes. Among males, strong correlations emerged between intrinsic motivation and identified regulation with enjoyment, indicating that practice physical activity is motivated by internal factors recognized. In the female sample, although the correlations were less strong than the ones of male, intrinsic motivation was still positively associated with both enjoyment and identified regulation, suggesting the presence of a significant autonomous component in their motivational engagement as well.

Acknowledgments: (non obligatorio)

References: (non obligatorio)

OC057 - THE EFFECTS OF AGING AND COGNITION ON GAIT COORDINATION ANALYZED THROUGH A NETWORK ANALYSIS APPROACH

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Purpose: To investigate how age and cognitive status influence gait coordination by analyzing joint-to-joint relationships in lower limb kinematics using a network-based approach.

Methods: Lower limb joint angles were acquired from 56 participants during walking: 36 males and 20 females. The group included 30 participants under the age of 60 and 26 participants aged 60 and above. From the time series of joint angles, correlation matrices were computed to quantify the synchrony between each pair of joints. These matrices were interpreted as weighted networks, with nodes representing joints and edge weights representing the strength of their temporal correlation. Measures such as node strength were extracted to characterize individual coordination profiles. Group differences and associations with cognitive performance were examined.

Results: On the sagittal plane, mean lower limb coordination negatively correlated with age and positively with MMSE scores. Knee coordination (nodal strength) also declined with age, particularly in both knees, and drove the overall age effect. No joint-level correlation was found with MMSE. Younger adults showed higher knee

coordination than older adults. No significant results emerged on other planes.

Conclusions: Gait coordination, as quantified by kinematic network analysis, is modulated by both aging and cognitive impairment. The kinectome approach reveals fine alterations in joint synchrony that may serve as early indicators of neurocognitive decline.

OC058 - PRELIMINARY EVALUATION OF THE EFFICACY OF A SIMULTANEOUS DUAL PHYSICAL AND COGNITIVE TRAINING IN TRADITIONAL AND AUGMENTED REALITY SETTINGS IN OLDER ADULTS

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Purpose: Increasing life expectancy calls for maintaining key cognitive, physical, and social skills to support healthy aging. Studies show that both cognitive and physical exercise, especially when combined, can improve performance and promote successful aging. Augmented Reality (AR) has recently enhanced medical interventions by promoting functional activity, social interaction, and adherence to training programs through immersive and motivating environments. This pilot study aimed to evaluate the effects of a combined physical and cognitive training program carried out in a traditional (T) setting compared to AR environment.

Methods: Eleven (six females) older adults (age: 69.5 ± 9) completed a combined physical-cognitive training for six weeks. The training was executed in a T (5 subjects) or AR (6 subjects) setting. Training sessions included simultaneous customized strength or aerobic exercises (2:1 ratio) and a modified categorization working memory span task. Before (Pre) and after (Post) training period total weight, body mass index (BMI), cognitive abilities (Criterion, Corsi Block-Tapping and Digit Span tests to assess trained task, and visuospatial and verbal short-term memory) and physical skills (30-s chair standing and arm curl tests) were evaluated. The Positive and Negative Affect Schedule scale and the International Physical Activity Questionnaire for Elderly were administered to evaluate social and physical behaviors at Pre and Post. Non-parametric statistical analysis was performed to evaluate differences between Pre and Post and between settings.

Results: Both T and AR groups decreased similarly in weight and BMI ($\sim -2.5\%$, both) and improved performance in 30-s arm curl ($\sim 15\%$) and Criterion task (50%). In addition, while AR group improved performance in the Digit ($14.29 \pm 13.13\%$) and the Corsi ($36.67 \pm 33.93\%$) tests, T group decreased daily sitting time ($-40 \pm 30\%$) and increased 30-s chair standing ($\sim 15\%$) and positive affect score ($\sim 6\%$).

Conclusions: Although preliminary, the simultaneous dual training resulted in improved physical and cognitive skills in older adults. While AR group showed near transfer effects in verbal and spatial short-term memory, T group showed improved positive mood and strength of lower limbs, partially explained by the lower daily sitting time. The training seems to be effective in improving general well-being in older adults, but further research is needed to better understand the implications of AR in training programs.

OC059 - RELATIONSHIP BETWEEN FITNESS AGE ACCELERATION AND RISK FOR DEVELOPING MAJOR HEALTH CONDITIONS: THE MEDIATING ROLE OF SOCIODEMOGRAPHIC STATUS

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Purpose: Biological ageing consists of a progressive decline in functional and cognitive performance. Fitness status is commonly employed as a predictor of biological age acceleration, which is associated to higher risk of major health conditions, such as cardiovascular and metabolic diseases.

Methods: We determined biological age acceleration by means of selected haematochemical parameters and tested its association with age-related diseases and mortality. Based on this, we built a new, regression-based phenotypic clock according to the results at multiple fitness tests. Finally, we weighted the mediating role of sociodemographic characteristics including, but not limited to, income, schooling, social participation, access to health system, etc., assessed by the multidomain ASQI (*Austerità Sanitaria e Qualità dell'Invecchiamento*) Questionnaire.

Results: Healthy adults ($n = 50$, age 50–90, 44% men) underwent a multi-domain assessment (motor-functional, metabolic, nutritional, biochemical, cognitive). We developed multiple biological ageing measures through elastic net penalized regressions and defined age acceleration measures as the residuals of the predicted vs chronological age regression. High correlations were found among the different biological ageing definitions. In particular, biological age based on motor-functional outcomes (walking endurance, speed, muscle strength, balance, VO_2 , etc.) showed the strongest correlation with the chronological age ($r = 0.75$; $p < 0.0001$). Our definition of fitness status based on biological ageing outperformed its previous definitions in predicting 10-year risk for cardiovascular diseases ($p = 0.0001$), atherosclerosis ($p = 0.01$), and all-cause mortality ($p = 0.0006$). The path analysis model confirmed the significant relationship between the independent predictors (reduced physical fitness, altered body composition, cognitive decline) and increased risk of mortality, comorbidity, cardiovascular and metabolic conditions. Moreover, selected sociodemographic features, in particular access to health systems and social participation, emerged as the strongest significant mediators of the abovementioned relationship.

Conclusions: Fitness status measured through a core set of low-cost, feasible motor-functional tests allowed to accurately determine biological age and predict risks for age-related diseases. The newly introduced estimate of age acceleration was also found to be significantly amplified or reduced in its predictive ability depending on sociodemographic moderators.

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OC060 - ACUTE EFFECTS OF FASTED TRAINING ON PHYSICAL PERFORMANCE AND TRAINING STRESS IN HIGHLY-CONDITIONED SUBJECTS

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Purpose: Over the years, the effects of fasted training on the performance of competitive and amateur athletes have been gathering increasing attention. This primarily relies on the potential increase of fatty acid metabolism during exercise, as well as the enhanced lipolysis in adipose tissue. On the other hand, it allows amateur athletes, especially those who work, to train early in the morning before work. The present study aims to evaluate the effects of a single training session in fasting conditions on the physical performance, body composition, and training stress in competitive athletes. The present study aims to evaluate the effects of a single training session in fasting conditions on physical performance, body composition, and training stress in competitive athletes.

Methods: 12 competitive male athletes (amateurs or professionals) in different sports were firstly scored for anthropometric measurements (weight, height, BMI), body composition (Bioelectrical Impedance Analysis, BIA, Akern srl, Italy), salivary cortisol levels (Immunoenzymatic Assay, Diametra srl, Italy), velocity at maximal oxygen uptake (treadmill incremental $\dot{V}O_{2max}$ test) and maximal dynamic strength by 2 different exercise (1-Repetition Maximum by Brzycki formula both in bench press and in lat pull-down with pronated grip); each subject performed 2 equal-volume single training sessions randomly after 12–14 h fasting and after no fasting. During the training sessions, the Heart Rate and the Ratings of Perceived Exertion (Borg CR10 scale) were monitored, and at the end of each session, all the previous measurements were scored again.

Results: No difference was found between the training session in fasted condition and in no fasted condition regarding all the measurements performed except the Heart Rate in the first 5 min of aerobic exercise (-3.2% in fasted training, $P < 0.05$) and the lat pull-down maximal strength test (-19% in fasted training, $P < 0.05$); the salivary cortisol level after the training session in fasted state is 49% higher but not statistically significant than in no fasted condition ($p = 0.07$); about the BIA variables, at the end of the training session in the fasted condition the phase angle showed a slightly but significant decrease (-1.3% $p < 0.05$); moreover a minor significant reduction of the resistance in fasted *versus* no fasted training session (-1.4% , $p < 0.05$ *vs* -3.5% , $p < 0.002$, respectively) indicated a higher catabolic state.

Conclusions: The acute response to a single standard training session in fasting conditions does not show an athletic and metabolic excessive body stress, but it induces a reduction of dynamic strength and a higher catabolism at the end of the training in highly-conditioned subjects. It could be considered a possible choice, even it is probably not the best.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC061 - EXPLORING THE ASSOCIATION BETWEEN LIFESTYLE BEHAVIORS AND QUALITY OF LIFE IN PATIENTS WITH A RECENT DIAGNOSIS OF THORACIC MALIGNANCY

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Purpose: In lung cancer, physical activity may help to manage treatment-related side effect thus improving treatment tolerance. However, a cancer diagnosis often triggers behavioral shifts that may contribute to increase the sedentary habits and reduce physical activity. The aim of this study was to examine physical activity levels, nutritional and sarcopenia risk, and cardiorespiratory fitness (VO_{2max}) in patients recently diagnosed with thoracic cancer, and to analyze their relationship with quality of life (QoL).

Methods: A cross-sectional study was conducted at the Oncology Unit of the University of Verona. Adults with a recent thoracic cancer diagnosis were invited to complete a questionnaire evaluating physical activity, using the Godin-Shepherd Questionnaire, included VO_{2max} (FitMáx tool), nutritional risk (Nutrition Risk Screening-NRS-2002), sarcopenia risk (SARC-F), and QoL through the Functional Assessment of Cancer Therapy-Lung-FACT-L. Statistical analyses included absolute, descriptive frequencies, and Pearson correlations.

Results: A total of 84 participants (mean age 68.5; 46 males) were enrolled. The predominant cancer type was non small-cell lung cancer (92%), with adenocarcinoma histology reported in 82% of cases, and 65% of patients had an advanced-stage disease. At the time of diagnosis, 90% of patients were physically inactive, 44% were at high nutritional risk, and 70% exhibited low cardiorespiratory fitness. Mean QoL scores were 57.5 ± 12 for FACT-TOI, 77.1 ± 17.3 for FACT-G, and 93.8 ± 19.5 for FACT-L. Body mass index was inversely correlated with NRS-2002 ($r_s = -0.315$, $p = 0.004$), VO_{2max} ($r_s = -0.283$, $p = 0.029$), physical-functional QoL domain FACT-TOI ($r_s = -0.230$, $p = 0.043$), and SARC-F ($r_s = -0.310$, $p = 0.006$). VO_{2max} showed a positive correlation with both FACT-TOI ($r_s = 0.372$, $p = 0.004$) and FACT-L ($r_s = 0.277$, $p = 0.035$). Sarcopenia risk was negatively associated with FACT-TOI ($r_s = -0.396$, $p = 0.002$), FACT-G ($r_s = -0.299$, $p = 0.019$), and FACT-L ($r_s = -0.331$, $p = 0.009$).

Conclusions: Patients with thoracic cancer commonly exhibit low physical activity and compromised nutritional and functional status. Cardiorespiratory fitness and sarcopenia emerged as the lifestyle factors influencing the QoL, thus reinforcing the value of early multidisciplinary interventions to mitigate its decline.

OC062 - EFFECT OF ACUTE AEROBIC EXERCISE ON PBMCs: ROLE OF FITNESS LEVEL IN HISTONE AND TOTAL PROTEIN POST-TRANSLATIONAL MODIFICATIONS (PTMS)

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Purpose: Lactylation, similar to acetylation, is a novel post-translational modification (PTM) involving the addition of a lactyl group to lysine residues, potentially linking metabolism to protein function and epigenetic regulation. It has been mainly studied in tumor models, while its in vivo modulation under physiological conditions and its dependence on individual characteristics remain unexplored. This study aims to quantify lactylation and acetylation PTMs in global protein and H3 histone in peripheral blood mononuclear cells (PBMCs) from healthy subjects after an incremental cycling test to exhaustion, controlling their training status.

Methods: A pilot study (n = 6, healthy men aged 25–35; sedentary vs. trained) has been conducted. Participants were subjected to incremental cycling test to exhaustion (8–12 min) with HR_{max}, VO_{2max}, RCP, and AT assessment. Before (T0) and after 24 h from the exercise (T1), fasting blood samples have been collected with PBMCs, plasma, and serum isolation. Anthropometric measurements were collected at T0, while plasma lactate has been measured pre/post the incremental test. Global protein and H3(k18) lactylation and acetylation are assessed via immunoblot. Statistical analyses evaluate pre/post exercise changes and intergroup differences.

Results: As expected, significant differences were observed between trained (TG) and sedentary (SG) groups in both VO_{2max} (P < 0.033) and test duration (P < 0.011). Plasma lactate increase post-exercise was 13.27 ± 3.38 , with no differences between TG and SG. No significant changes were detected in global protein lactylation or in the expression of specific target proteins such as SOD1, SOD2, and HSP27 pre/post exercise. p-HSP27 increased in TG individuals and decreased in SG individuals, although without statistical significance. The analysis on H3K18 acetylation and lactylation will be presented and discussed, too.

Conclusions: This study investigates lactylation as a novel epigenetic marker in exercise biology, in comparison to the acetylation. These preliminary findings are likely limited by the small sample size and require future validation in the extended study, where 40 participants stratified by age, sex, and training status are involved. It is expected to clarify how these variables modulate molecular responses to acute metabolic stress and inform future strategies targeting immunometabolism and healthy aging.

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OC063 - EXPLORING THE INTERPLAY BETWEEN BALANCE, GAIT KINEMATIC, AND PHYSICAL ACTIVITY LEVEL IN FACIOSCAPULOHUMERAL MUSCULAR DYSTROPHY

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Purpose: Balance impairments can affect walking ability and, consequently, limit physical activity level (PAL). This investigation in facioscapulohumeral muscular dystrophy (FSHD) may help unravel factors limiting PAL and identify training strategies to improve mobility in these patients.

Methods: Eighteen FSHD patients (10 males; mean age: 36.33 years) and twenty-three age- and sex-matched healthy controls (HC) were recruited. Balance was assessed using the Mini-BEST and Four Step Square test (FSST), while PAL was measured with the International Physical Activity Questionnaire. Gait performance during usual walking (UW), fast walking (FW), and dual-task walking (DT) was evaluated using an inertial sensor (BTS G-Walk). Gait speed (GS), stance time (ST), gait cycle (GC), stride length (SL), pitch and roll angles were considered. Correlations between gait parameters and Mini-BEST were performed in patients, while between PAL, GS, and SL were assessed in both groups.

Results: Compared to HC, patients showed lower PAL, Mini-BEST scores and longer FSST times. As group effect, patients exhibited major ST, GC, and roll angle. In the interaction between group and walking condition, during FW patients showed reduced GS and prolonged GC, while no differences were observed in UW and DT. Altered gait parameters, except roll angle, were associated with Mini-BEST, while PAL resulted associated with gait parameters only in HC.

Conclusions: Balance resulted associated with impaired gait parameters in FSHD. The association between balance and gait deficits emerging during FW indicate balance impairment as an element discouraging patients from engaging in physically demanding tasks, plausibly decreasing PAL. Specific balance training may help promote more active lifestyles in FSHD.

OC064 - PILOT STUDY ASSESSING THE HEMODYNAMIC IMPACT OF HIGH VERSUS LOW INTENSITY ISOMETRIC HANDGRIP EXERCISES IN PATIENTS WITH HEART FAILURE AND MILDLY REDUCED EJECTION FRACTION

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Purpose: Isometric handgrip exercise has been shown to effectively reduce blood pressure (BP) in both normotensive and hypertensive individuals. However, there are no studies specifically addressing its effects in hypertensive patients with heart failure and mildly reduced ejection fraction (HFmrEF). This study aimed to compare the acute hemodynamic responses to isometric handgrip exercise performed at two different intensities in patients with HFmrEF.

Methods: Forty-five sedentary patients were enrolled and randomly assigned to one of three groups: (1) high-intensity isometric handgrip (HIIE) performed at 70% of maximal voluntary contraction (MVC), (2) low-intensity isometric handgrip (LIIE) performed at 30% of MVC, and (3) control group (no exercise). Heart rate and BP were measured, and transthoracic echocardiography was performed at baseline, during exercise (lasting 3 min), and after 15 min of recovery.

Results: Compared to baseline, during the exercise systolic BP significantly decreased in the HIIE (+ 33%) group compared to both HIIT (− 9%) and control (ANOVA p 0.015); global constructive work (+ 23% and + 14% respectively) and global wasted work (+ 18% and + 11% respectively) increased significantly in the HIIE and LIIE compared to control (ANOVA p 0.003) while there were not significant differences between HIIE and LIIE. Global work efficiency was unchanged in the HIIE (− 4%) and LIIE (+ 1%) compared to control (ANOVA p 0.154). During recovery systolic BP significantly decreased in the HIIE (− 28%) group compared to both HIIT (− 6%) and control (ANOVA p 0.022).

Conclusions: High-intensity and low-intensity isometric handgrip exercises did not caused hemodynamic impairment in HFmrEF. The high-intensity exercise was more effective than low-intensity in reducing systolic BP.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC065 - A 48-WEEK HOME-BASED DIGITAL MONITORED EXERCISE PROGRAM IMPROVES MUSCLE FUNCTION IN OLDER ADULTS WITH SARCOPENIA: RESULTS FROM THE GYM STUDY

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Purpose: Sarcopenia is an age-related syndrome characterized by a progressive decline in muscle strength, mass, and physical performance. Although physical exercise is considered a cornerstone in its prevention and treatment, its effects on muscle function and imaging biomarkers remain debated. This study presents results from the Grow Your Muscle (GYM) project, which aimed to evaluate the effects of a 48-week home-based, digitally monitored exercise program on functional capacity, body composition, and muscle quality in older adults from the general population (GP) and in people living with HIV (PWH). The primary outcome was the proportion of participants in the Experimental Group (EG) achieving at least a 20% increase in handgrip strength compared to the Control Group (CG).

Methods: Sedentary older adults diagnosed with sarcopenia—aged > 60 years (GP) and > 50 years (PWH)—were enrolled and randomized (1:1) within each subgroup to EG or CG. The EG followed a home-based, app-monitored resistance training protocol; the CG received usual care. Assessments at baseline (BL) and after 48 weeks (W48) included muscle function (handgrip strength, chair-stand test, knee extensor force, Mini-BESTest, 6MWT), body composition (DEXA), and muscle morphology by MRI evaluation of Intermuscular Adipose Tissue (IMAT) and muscle Cross-Sectional Area (CSA).

Results: A total of 196 participants were enrolled (98 GP, 98 PWH); 134 completed the 48-week follow-up [EG: n = 68, 69% male, age 63 (59–69); CG: n = 66, 70% male, age 67 (61–73)]. Drop-out rate was 35% (n = 48). Median training adherence in the EG was 85% (69–92). At W48, EG showed significant improvements in handgrip strength (p = 0.003), chair-stand test (p < 0.0001), and knee extensor force (right: p = 0.002; left: p = 0.0002). Between-group differences at W48 were significant for handgrip (p = 0.0001), chair-stand (p = 0.006), and knee extension (right: p = 0.021; left: p = 0.009). Notably, 10.3% of EG participants achieved a $\geq$ 20% increase in handgrip strength vs. 0% in CG (p = 0.022). No significant changes were observed in body composition or MRI-derived parameters.

Conclusions: A 48-week home-based exercise program significantly improved muscle strength and functional capacity in older adults with sarcopenia, despite the absence of relevant changes in lean mass or muscle quality.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC066 - SAFETY AND FUNCTIONAL BENEFITS OF A 6-MONTH ADAPTED EXERCISE PROGRAM IN ADULTS WITH HAEMOPHILIA

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Purpose: Haemophilia, a genetic disorder caused by a deficiency in clotting factors, often leads to musculoskeletal complications such as arthropathy, which reduces function and can induce kinesiophobia. Regular physical activity, as recommended by the World Federation of Haemophilia, supports musculoskeletal health, coordination,

weight control and psychological well-being. This study explores the safety and the changes in functional capacity, strength, and balance following a 6-month adapted exercise program in adults with haemophilia.

Methods: The study employed a single-arm, within-subjects design with assessments at baseline (T0) and two follow-ups at 3 months (T1) and 6 months (T2); during the period between T0 and T2, participants completed a twice-weekly, individually tailored adapted exercise program supervised by qualified specialists. Functional capacity was assessed using the Six-Minute Walk Test (6MWT). Perceived fatigue and dyspnea were recorded after each 6MWT using the Borg scales, respectively. Secondary outcomes included the 30-s Chair Stand Test (30''CST) to assess lower-limb strength, the Single-Leg Stance Test (SLST) for static balance, and the Timed Up and Go (TUG) test for dynamic balance. Adverse events were monitored by the research team using a dedicated register. Data were analyzed using nonparametric tests: the Shapiro–Wilk test assessed normality; the Friedman test evaluated repeated measures, with Wilcoxon signed-rank tests and Bonferroni correction for post hoc comparisons ($p < 0.05$).

Results: After a six-month intervention period, participants exhibited significant improvements in functional capacity and balance, while TUG performance remained unchanged. The most noteworthy improvements were observed in the 6MWT distance ($\chi^2 = 17.64$, $p < 0.001$), with moderate but significant reductions in perceived dyspnea ($p = 0.003$) and fatigue ($p = 0.015$) recorded after each test. Additional advancements were noted in lower-limb strength, as measured by the 30''CST ($\chi^2 = 11.44$, $p = 0.003$), and in static balance, with significant gains in SLST time on both the dominant ($\chi^2 = 12.05$, $p = 0.002$) and non-dominant leg ($\chi^2 = 16.05$, $p < 0.001$). No adverse events were recorded during the exercise program period.

Conclusions: This study supports the safety of a 6-month supervised adapted exercise program for adults with haemophilia. The absence of adverse events further reinforces the safety of such interventions in this population. Significant improvements were observed in functional capacity, lower-limb strength, and balance, along with reduced perceived fatigue and dyspnea. Despite the single-arm design and small sample, findings endorse adapted exercise as a safe, effective adjunct in haemophilia care, in line with systematic reviews on resistance and aerobic benefits.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC067 - ASSESSING THE EFFECTS OF A NOVEL PHYSICAL-COGNITIVE TRAINING ON CHILDREN WITH AUTISM SPECTRUM DISORDER AND IDENTIFICATION OF THEIR NEURAL CORRELATES

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Purpose: Autism Spectrum Disorder (ASD) is marked by deficits in social communication and restricted, repetitive behaviors. The predictive impairment hypothesis posits that abnormal neural

development and synaptic plasticity dysfunction in the prefrontal cortex compromise anticipatory motor and cognitive processes. Recent evidence indicates that physical activity can enhance social interaction, communication, and self-regulation in individuals with ASD, with dual-task cognitive-motor training (CMDT) proving more effective than exercise alone.

Methods: This study evaluated the efficacy of a 12-week CMDT program in enhancing anticipatory mechanisms and normalizing prefrontal activity in children with ASD compared to Typically Developing Children (TDC). We hypothesized that children with ASD would exhibit suppressed anticipatory brain activity in the prefrontal cortex relative to their TD peers. Twenty children (10 ASD, 10 TD), aged 9 to 14 years, participated. Pre- and post-intervention assessments included electrophysiological recordings via EEG and motor performance evaluations using the Movement Assessment Battery for Children–Second Edition (M-ABC2). EEG analyses focused on event-related potentials (ERPs): the P3 component, associated with cognitive resource allocation and stimulus evaluation, and the Bereitschaftspotential (BP), linked to motor preparation. Data were analyzed using repeated-measures ANOVA.

Results: The analysis of variance revealed significant effects of both group (ASD vs. TD) and time (pre- vs. post-intervention) on response times, as well as a significant interaction between these factors ($p < 0.05$). Specifically, TD children exhibited faster response times, while the ASD group demonstrated a marked post-intervention improvement that effectively eliminated the significant pre-test difference between groups. In addition, the M-ABC2 scores demonstrated significant post-training improvements in motor coordination and dynamic balance ($p = 0.02$), with ASD performance approaching that of TD peers.

Conclusions: These findings support the efficacy of CMDT in enhancing sensorimotor integration in children with ASD by improving anticipatory processing and cognitive-motor performance. This work contributes to the development of evidence-based clinical and rehabilitative interventions aimed at enhancing socialization and autonomy in daily life.

OC068 - CAN HYPOPRESSIVE ABDOMINAL GYMNASTICS IMPROVE SLEEP? EVIDENCE FROM A PILOT STUDY

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Purpose: Postpartum women and individuals with diastasis recti, pelvic floor disorders, or chronic lower back pain are always more and more encouraged to practise Hypopressive Abdominal Gymnastics (HAG). It is a postural method designed to engage core and pelvic floor muscles by combining specific breathing techniques with low-pressure exercises. HAG aims to reduce intra-abdominal pressure and support muscle function. Although its benefits are well explored, its potential impact on sleep quality remains unclear. This study aimed to explore whether HAG might influence subjective and objective sleep parameters in women with rectus abdominis diastasis.

Methods: Twenty-eight women (mean age 43.2 ± 7 years) with diastasis recti were assigned to either an intervention group (INT, $n = 17$) or a control group (CTRL, $n = 11$). The INT group participated in a supervised HAG program for two months (one session per week), while the CTRL group was advised to perform unsupervised home practice. Subjective sleep was evaluated using the Mini Sleep

Questionnaire (MSQ), and objective sleep data were collected via actigraphy. Assessments were conducted one week before and after the intervention. ANCOVA (age as COVARIATE) was used to analyse differences in pre-post delta values between groups.

Results: Although not statistically significant, delta MSQ total scores (INT: -2.67 ± 1.19 a.u.; CTRL: -0.94 ± 0.24 a.u.; $p = 0.67$) and subcomponents, i.e. sleep (INT: -1.7 ± 0.92 a.u.; CTRL: -0.99 ± 0.74 a.u., $p = 0.82$) and wake domains (INT: -0.97 ± 0.46 a.u.; CTRL: 0.05 ± 0.03 a.u., $p = 0.63$) showed slightly greater improvements in the INT group compared to CTRL. Actigraphy data also suggested a positive trend in the INT group for delta sleep time (INT: $0.62 \pm 0.35\%$; CTRL: $-0.38 \pm 0.22\%$; $p = 0.49$) and immobility percentages (INT: $0.43 \pm 0.14\%$; CTRL: $0.32 \pm 0.25\%$; $p = 0.23$), while the CTRL group showed slight declines. Sleep efficiency remained stable across both groups (INT: $1.48 \pm 1.02\%$; CTRL: $2.01 \pm 1.49\%$).

Conclusions: This preliminary study suggests that a two-month HAG program may have a modest, positive effect on sleep quality, particularly in subjective assessments. However, results may not have reached statistical significance due to the small sample size and short duration. Future studies with larger cohorts and longer interventions are warranted to better understand HAG's potential role in sleep improvement.

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OC069 - CHANGES IN $\dot{V}O_{2\text{MAX}}$ AND TRIGLYCERIDES AFTER A 12-WEEK LIFESTYLE INTERVENTION PROGRAM MAY BE PREDICTED BY BASELINE LEVELS OF INFLAMMATORY MARKERS

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Purpose: Chronic inflammation may reduce cardio-metabolic health in breast cancer survivors (BCS)¹. This study examined whether baseline (T0) inflammatory marker levels can predict cardio-metabolic health changes observed after a 12-week (T1) lifestyle intervention (LI) in BCS.

Methods: Twenty-seven sedentary BCS women (aged 52.3 ± 8.6 years) were randomized into a control (CA, $n = 12$) and an intervention (IA, $n = 15$) arm. Both arms received the current lifestyle guidelines for cancer survivors. The IA underwent a 12-week supervised aerobic training program with incremental intensity (40–70% of heart rate reserve) and duration (20–60 min) for 3 days/week. Cardio-metabolic health (weight, BMI, % of fat mass, $\dot{V}O_{2\text{max}}$, glycemia, insulin, HOMA-IR, triglycerides, and total, LDL, and HDL cholesterol), Mediterranean diet adherence score (MDS), and inflammatory markers (hsPCR, TNF- α , IL-1 β , IL-6, and IL-10) were assessed in both arms at T0 and T1. Generalized Linear Mixed Models (GLMMs) were used to evaluate T1 changes in all variables ($\alpha = .05$). Multiple linear regression (MLR) models were used to assess T0 inflammatory marker levels as predictors of cardio-metabolic health changes at T1 ($\alpha = .05$).

Results: GLMMs showed a main effect of time for fat mass (CA, -2.2% ; IA, -3.8% ; $p = .015$), insulin (CA, -14.1% ; IA, -15.6% , $p = .006$), HOMA index (CA, -13.7% ; IA, -16.3% , $p = .009$), and triglycerides (CA, -4.2% ; IA, -15.9% , $p = .020$). Time $\times$ group interaction was significant for $\dot{V}O_{2\text{max}}$ (CA, 5.3% ; IA, 16.4% , $p = .020$), IL-10 (CA, 21% ; IA, -6% , $p = .030$), and MDS (CA, 25.8% ; IA, -0.5% , $p = .026$). Other variable changes were not significant. MLR models revealed that IL-6, IL-10, LDL, and BMI significantly explain the variance in $\dot{V}O_{2\text{max}}$ (adjusted R^2 , .299, $p = .021$), and that IL-6, IL-1 β , total cholesterol, HOMA-IR, and weight significantly explain the variance in triglycerides (adjusted R^2 , .548, $p < .001$). The models were adjusted for weight, age, glycemia, LDL, and total cholesterol. Inflammatory marker levels didn't predict fat mass, insulin, and HOMA-IR changes.

Conclusions: LI significantly reduced fat mass, insulin, HOMA-IR, and triglycerides in CA and IA, but $\dot{V}O_{2\text{max}}$ increased significantly only in the IA, probably due to the supervised training program. IL-10 and MDS increased significantly in CA, suggesting a possible dietary role in anti-inflammatory processes. MLR models revealed a potential role of baseline IL-6, IL-10, and IL-1 β levels as predictors of $\dot{V}O_{2\text{max}}$ and triglycerides changes in BCS who underwent LI, which aims to improve cardio-metabolic health.

Acknowledgments:

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OC070 - EFFECTS OF AN 8-WEEK CYCLING TRAINING PROGRAM AT DIFFERENT INTENSITIES ON AEROBIC FITNESS IN HEALTHY OLDER ADULTS

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Purpose: The aim of the present study was to investigate the effects of cycling training performed at three different intensities on maximal (i.e. oxygen uptake ($\dot{V}O_{2\text{max}}$), peak power output (PPO)) and sub-maximal (i.e. gas exchange threshold, GET; respiratory compensation point, RCP) indexes of aerobic fitness in healthy sedentary older adults.

Methods: Forty-one healthy older adults were randomly assigned to one of four interventions: control (CTRL), moderate intensity training (MOD), heavy intensity training (HVY) and high intensity interval training (HIIT). Training consisted in three sessions per week on a cycle ergometer, for a total of 8 weeks. MOD performed continuous cycling for 50 min at an intensity corresponding to 90% of GET. HVY performed continuous cycling for 30–35 min at 70% of the difference between GET and RCP. HIIT group alternated 4-min intervals at 120% of RCP with 3-min intervals at 30% of GET. All participants completed a maximal cardiometabolic test before (PRE) and after (POST) the training intervention. One-way ANOVA was used to assess baseline group differences in age, anthropometrics and initial aerobic fitness. Two-way RM ANOVA was also used to compare $\dot{V}O_{2\text{max}}$, PPO, GET $\dot{V}O_2$ and RCP $\dot{V}O_2$ between groups and over time.

Results: No significant differences were observed between groups at baseline. A significant main effect of Group (< 0.05) and a Group-Time interaction ($p < 0.05$) were found for all outcome variables. In particular, no changes were recorded over time in the CTRL group. MOD significantly improved PPO, GET $\dot{V}O_2$ and RCP $\dot{V}O_2$ (all $p < 0.05$), while $\dot{V}O_{2\text{max}}$ remain unchanged. HVY significantly improved $\dot{V}O_{2\text{max}}$, PPO and RCP $\dot{V}O_2$ (all $p < 0.05$), while GET $\dot{V}O_2$

was unaffected by training. HIIT significantly improved $\dot{V}O_{2\max}$, PPO, GET $\dot{V}O_2$ and RCP $\dot{V}O_2$ (all $p < 0.05$).

Conclusions: These findings indicate that all cycling training interventions, conducted for 8 wks, improve indexes of aerobic fitness in healthy older adults. Higher training intensities (i.e., HVY and HIIT) appear to produce larger changes in $\dot{V}O_{2\max}$ and PPO while the lower training intensity (i.e. MOD) mostly affect submaximal indexes of aerobic fitness.

OC071 EFFECTIVENESS OF TANGOTHERAPY AND MOTOR RECONDITIONING IN PATIENTS WITH PARKINSON'S DISEASE

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Purpose: The study aimed to evaluate the effectiveness of tango therapy (Riabilitango[®]) and motor reconditioning on balance, strength, mobility, mood, and quality of life in individuals with Parkinson's disease, to identify motor strategies complementary to pharmacological treatment.

Methods: Thirty patients with idiopathic Parkinson's disease (aged 40–85, Hoehn & Yahr ≤ 3 , on stable medication) were randomly assigned to one of three groups: Tango therapy, Motor Reconditioning, or Control (usual activity). The active protocols involved two 60-min sessions per week for 12 weeks. The tango therapy program, conducted by a qualified instructor, was based on adapted Argentine tango (Riabilitango[®]), with partner work, rhythmic walking, directional changes, trunk rotation, and balance tasks. Motor reconditioning included resistance training, functional strength, static and dynamic balance, and flexibility, organized in progressive circuits. Assessments were conducted at baseline, 4 weeks, post-intervention, and 3-month follow-up, using: UPDRS I–IV, SF-36, PDQ-39, Self-Rating Depression Scale, 6-Minute Walk Test, Hand-grip, Sit and Reach, Back Scratch, Timed Up and Go, balance tests (Romberg, Stork), gait speed, and a satisfaction questionnaire.

Results: Tango therapy and Motor Reconditioning groups showed significant improvements ($p < 0.05$) in balance, mobility, strength, and flexibility compared to the control group. The Riabilitango group showed marked improvements in postural stability and dynamic coordination. Both experimental groups reported significant enhancements in quality of life (SF-36, PDQ-39) and mood (Self-Rating Depression Scale). Satisfaction levels were high, especially in the Tango therapy group. No adverse events were recorded.

Conclusions: Tango therapy and Motor Reconditioning are effective in improving motor and psychosocial outcomes in patients with Parkinson's disease. Although no significant differences emerged between the two interventions, both outperformed the control group. Riabilitango, in particular, appears to be a safe, multidimensional, and engaging rehabilitation strategy. Improvements in mood and satisfaction suggest that Tango therapy may enhance adherence and motivation in long-term interventions.

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References: (non obbligatorio).

OC072 - ENERGY COST ANALYSIS OF RECREATIONAL SCULLING IN BREAST CANCER SURVIVORS AT DIFFERENT STROKE RATES

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Purpose: Rowing can be a beneficial adapted physical activity (APA) for women who have undergone breast cancer surgery, improving health-related physical fitness¹. However, the metabolic demands required by this activity have not yet been clearly defined. The available research on the bioenergetic aspects of rowing has primarily been conducted on healthy individuals or athletes^{2–3}. Therefore, the aim of the present study was to measure the energy cost of recreational sculling in a sample of women who have undergone breast cancer surgery.

Methods: The study was conducted within the project Effect and efficacy of Rowing in breast CancEr survivors/The Same Boat (ERICE/TSB), involving 18 women (age 55.8 ± 6.1 years; BMI 24.57 ± 3.26 kg·m⁻²; cancer stage I, II, or III; time since surgery ranging from 3 to 230 months). Participants were paired to undertake an on-water test in a Jole and equipped with a portable metabolic system (K5, Cosmed, Italy). After the measurement of resting metabolic rate on boat, participants performed four constant velocities (10, 12, 14 and 16 strokes per minute, corresponding to 1.2, 1.4, 1.6, 1.8 m·s⁻¹), each lasting 4 min with 1 min rest in between. The steady state oxygen consumption ($\dot{V}O_2$) was recorded and the metabolic power output ($\dot{E}$) of the crew was calculated. Energy cost at each stroke rate was then obtained dividing $\dot{E}$ by sculling speed ($v_{m\cdot s^{-1}}$).

Results: The average results show a progressive and significant ($p < 0.0001$) increase in both oxygen consumption ($\dot{V}O_2$ ml·kg⁻¹·min⁻¹: 14.0 ± 3.7 , 15.3 ± 4.4 , 16.8 ± 4.9 , 19.6 ± 5.8) and metabolic power ($\dot{E}_{kW}$: 0.4 ± 0.1 , 0.5 ± 0.2 , 0.6 ± 0.2 , 0.7 ± 0.2) with increasing velocities. In contrast, the energy cost ($C_{J\cdot m^{-1}}$: 351.9 ± 71.6 , 364.3 ± 73.8 , 358.5 ± 78.2 , 371.6 ± 54.0) remained stable across the different sculling rates.

Conclusions: This study offers a deeper insight into the physiological responses elicited during recreational sculling in breast cancer survivors, providing novel findings relevant for the development of appropriate exercise prescriptions. The steady increase in oxygen consumption and metabolic power with stroke rate confirms that sculling can serve as a graduated cardiovascular stimulus. The stability of the energy cost per unit distance suggests that progressing to higher stroke rates does not lead to a disproportionate rise in metabolic stress, supporting safe, progressive exercise for these women.

References:

¹Real-Pérez et al., 2025

²Volianitis et al., 2022

³Capelli et al., 2009.

OC073 - METAMODAL SENSORIMOTOR TRAINING TAILORED TO BLIND ADULTS

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Purpose: Visual impairment jeopardizes body kinematics and environmental interactions progressively leading to postural instability, coordinative deficits, and quality of life reduction. Although vision plays a key role in motricity, sensorimotor control mostly relies on proprioceptive inputs provided while dynamically interacting with gravity, and its efficiency is frequency-dependent. Therefore, targeted proprioceptive training is necessary to counteract the disability-related deficits. The present pre-post study investigated the benefits of an adapted proprioceptive training on sensorimotor control of blind adults aiming to improve postural stability, body awareness, coordination, and daily functionality.

Methods: Twenty legally blind adults aged 18–60 voluntarily adhered to the study. Before and after taking part in the targeted 8-week proprioceptive training protocol, sensorimotor control was evaluated by Brief BESTest and a biofeedback-based device able to adapt multimodal high-frequency stimulation to the specific needs of blind subjects. Psychological well-being and quality of life were also assessed using the 18-item Psychological Well-being and 12 item-Short Form questionnaires, respectively.

Results: Post-training evaluation revealed a statistically significant improvement in ankle stability/mobility and orthostatic postural control/reactivity in micro and macro instability conditions.

Conclusions: Our findings suggest that a targeted high-frequency sensorimotor training conceived, led, and monitored by a specialized kinesiologist may effectively improve proprioceptive control in visually impaired individuals. The present research might also offer innovative methodological hints to apply in further studies aimed at improving sensorimotor efficiency and daily functionality in this under investigated population.

OC074 - MUSCLE-SPECIFIC CRY1/2 KNOCKOUT ALTERS REST-ACTIVITY RHYTHM, METABOLISM, EXERCISE PHYSIOLOGY, AND LIGHT-DARK RE-ENTRAINMENT

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Purpose: Circadian rhythms regulate fundamental physiological and behavioral processes, including metabolism, temperature, and rest-activity cycles. At the molecular level, these rhythms are governed by “clock genes” such as *Cry1* and *Cry2*, which not only modulate circadian timing but also influence muscle metabolism by suppressing PPAR δ , a key regulator of fatty acid oxidation. In this study, we investigated the impact of skeletal muscle-specific *Cry1/2* knockout (dMKO) on metabolism, physical performance, and rest-activity rhythm (RAR) in mice before and after a light–dark (LD) cycle inversion.

Methods: Twenty male C57BL/6J mice (10 dMKO, 10 WT) were assessed through metabolic analysis, physical performance tests (rotarod, grip strength, treadmill sprint), and circadian rhythm profiling using Cosinor and non-parametric analyses. RAR was monitored via

running wheel activity, while metabolism was analyzed using metabolic cages.

Results: Results showed that dMKO mice exhibited higher activity levels (MESOR, M10) both before and after LD inversion compared to WT, as well as an accelerated RAR realignment. Despite no differences in physical performance, dMKO mice displayed a lower respiratory exchange ratio (RER) MESOR and higher amplitude, suggesting a metabolic shift toward lipid oxidation. These findings support a role for *Cry1/2* in modulating circadian plasticity and energy substrate preference in skeletal muscle.

Conclusions: Overall, muscle-specific deletion of *Cry1/2* appears to enhance behavioral adaptation to circadian disruption without affecting motor performance.

These results suggest that *Cry1/2* may play a key role in coordinating muscle energy metabolism with the light–dark cycle.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC075 - ACUTE EFFECTS OF WHOLE-BODY VIBRATION ON GAIT KINEMATICS IN INDIVIDUALS WITH PARKINSON'S DISEASE

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Purpose: Whole-body vibration (WBV) favours central integration and elaboration of proprioceptive stimuli enhancing gait performance in Parkinson's disease (PD), neglecting spatiotemporal gait kinematics. This study investigates how WBV exposure could influence kinematic parameters in PD.

Methods: Twenty-six participants with PD performed a 10-m walk test after exposure to WBV, Half Squat without Vibration (HS), and Control Condition (CC), in a randomized order. Participants stood on a platform with slightly bent knees (25–30°) while receiving a vibration stimulus (1 min at 30 Hz) or not (HS). In the CC condition, no exercise was performed before the walking test.

Results: Walking time was significantly ($p < 0.01$) longer in CC (9.7 ± 1.6 s) than in WBV (9.3 ± 1.4 s) and in HS (9.0 ± 1.4 s) conditions. No significant differences between WBV and HS conditions were observed. Propulsion R (right leg propulsion) was significantly higher ($p < 0.01$) in HS ($6.9 \pm 1.2^\circ$) than in CC ($6.3 \pm 1.2^\circ$) and in WBV ($6.4 \pm 1.3^\circ$) conditions. No significant difference was observed on propulsion R between CC ($6.3 \pm 1.2^\circ$) and WBV ($6.4 \pm 1.3^\circ$) conditions. A similar effect was observed for propulsion L (left leg propulsion), where post hoc analysis showed a significantly higher ($p < 0.01$) in HS ($6.9 \pm 1.2^\circ$) than in CC ($6.3 \pm 1.2^\circ$) and in WBV ($6.4 \pm 1.3^\circ$) conditions. No significant difference was observed on propulsion L between CC ($6.3 \pm 1.2^\circ$) and WBV ($6.4 \pm 1.3^\circ$) conditions. Tilt Pelvic was significantly lower ($p < 0.05$) in CC ($59.9 \pm 24.6\%$) than WBV ($67.7 \pm 23.6\%$) and HS ($69.6 \pm 18.7\%$) conditions. No significant difference was observed between WBV ($67.7 \pm 23.6\%$) and HS ($69.6 \pm 18.7\%$) for tilt pelvic. Cadence was significantly higher in HS (115.6 ± 7.5 steps/min)

than CC (112.3 ± 10.8 steps/min, $p < 0.05$) and WBV (113.5 ± 8.9 steps/min, $p = 0.05$). No significant difference was observed on cadence between CC (112.3 ± 10.8 steps/min) and WBV (113.5 ± 8.9 steps/min). Spatial parameters (step length, stance phase and double support) showed no significant differences across conditions ($p > 0.05$).

Conclusions: WBV shows promising effects on functional mobility and postural control in PD with HS offering greater benefits. Exercise modalities should be carefully selected to enhance different gait parameters. Future research should explore the long-term effects of WBV and HS interventions, as well as optimize vibration parameters to maximize therapeutic outcomes.

OC076 - CARDIOVASCULAR PREVENTIVE PATHWAY FOR ACTIVE AGING THROUGH LIFESTYLE INTERVENTIONS: A QUASI-EXPERIMENTAL PILOT PROJECT WITHIN AGE-IT PNRR

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Purpose: As part of the Age-Itprogram (part of the National Recovery and Resilience Plan), the Università del Piemonte Orientale (Novara, Italy) has developed a lifestyle medicine-based preventive pathway aimed at promoting healthy aging and cardiovascular risk prevention, implemented through a digital platform focused.

Methods: A quasi-experimental study targeting employees of the Alessandria University Hospital was conducted. The preventive pathway includes three main phases. A first evaluation phase dedicated questionnaires (ISS cardiovascular risk, IPAQ physical activity, MEDAS Mediterranean diet adherence, PSS-10 perceived stress, and MAC-AL/AF motivation for change). The second phase was focused on identification of a personalized prevention plan; moreover, participants were offered free tele-consultation with prevention and lifestyle specialists. The last phase consisted in a final evaluation in order to measure the effectiveness of the preventive pathway.

Results: Since May 2025, 85 participants have been enrolled (mean age 48.88 ± 10.06 years; 78.3% female; 68.7% with a university degree). Among them, 14.5% had a medium/high cardiovascular risk. 61.4% were physically active, while 38.6% were partially active or inactive. Only 31.3% fully adhered to the Mediterranean diet, and 13.3% reported moderate to high perceived stress levels. In terms of change motivation, 31.7% were in the action stage (i.e., motivated to change), 57.8% were in the pre-contemplation/contemplation stages (i.e., not ready to make concrete changes), and only 7.5% were in the maintenance stage. Using the developed health algorithm, each participant was assigned a health profile and corresponding personalized preventive pathway. Specifically, 57.8% of the participants needed to improve one or more lifestyle domains, but were not inclined to act concretely and 20.5% had specific needs in nutrition, stress management, and readiness for change. Other profiles included individuals with healthy lifestyles requiring only reinforcement strategies (13.3%), inactive, non-adherent, and stressed individuals who are, however, in the action stage (4.8%), and subjects requiring focused efforts to increase physical activity (3.6%).

Conclusions: Baseline results suggest that motivational level is the key factor to address in order to improve adherence to the preventive pathways offered on the platform. Currently, the preventive programs

have been launched, and the first telemedicine consultations have taken place.

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OC077 - EFFECTS OF KETOSIS ON SKELETAL MUSCLE MOLECULAR RESPONSE TO A SINGLE BOUT OF RESISTANCE TRAINING IN STRENGTH TRAINED INDIVIDUALS

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Purpose: The ketogenic diet (KD) is a well-established dietary strategy, widely recognized for its efficacy in promoting fat loss. It is characterized by high fat, adequate protein, and restricted carbohydrate intake (< 50 g per day). The KD mimics certain effects of caloric restriction by enhancing metabolic pathways involved in fat oxidation and oxidative phosphorylation. However, KD-induced metabolic adaptations may potentially interfere with pathways regulating the hypertrophic response. Therefore, this study aims to investigate the impact of KD on muscle adaptation to resistance training (RT) in trained male subjects.

Methods: Fifteen healthy, trained males (28.6 ± 7.3 years) were enrolled and randomly assigned to either a ketogenic diet (KD, $n = 8$) or control diet (CD, $n = 7$). Both diets were isoenergetic (35 kcal/kg body weight) and matched for protein intake (2 g/kg body weight). At the same time, all participants followed an identical RT protocol for four weeks. Serum hormone levels (IGF-1, insulin, total and free testosterone), resting metabolic rate (REE), respiratory exchange ratio (RER), body composition with DXA, quadriceps cross-sectional area with ultrasound, and muscle strength were assessed at baseline and after 4 weeks of RT. Muscle biopsies from the vastus lateralis were obtained at rest and at 6 and 24 h after a single bout of RT performed before and after the intervention period of diet and training. Phosphorylation of regulatory signalling proteins (i.e., Akt, rpS6, 4E-BP1, and p70S6K1) were assessed via western blotting and expressed as the fold-change from pre- to post-exercise.

Results: Preliminary data indicate that the KD group exhibited higher fat oxidation, as reflected by a statistically reduction in RER ($p < 0.05$). Despite non significantly, serum insulin levels decreased in the KD group (-10% vs. $+5\%$), whereas IGF-1, total testosterone, and free testosterone remained similar in both groups. The KD group experienced a significant reduction in body mass and fat mass ($p < 0.05$) while no significant differences were observed in fat-free mass between groups. Markers of the mTOR signalling pathway (total and phosphorylated Akt, 4E-BP1, and rpS6) were comparable between KD and CD.

Conclusions: These preliminary findings suggest that four weeks of KD combined with RT improves body composition without impairing post-exercise hypertrophic signalling.

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References: (non obbligatorio).

OC078 - BIOMECHANICAL GAIT ALTERATIONS UNDER DUAL-TASKING: PRELIMINARY RESULTS OF A SYSTEMATIC REVIEW OF EXPERIMENTAL AND OBSERVATIONAL STUDIES IN PARKINSON'S DISEASE

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Purpose: Parkinson's disease (PD) leads to progressive motor and cognitive impairments that exacerbate gait dysfunction under dual-task (DT) conditions, increasing fall risk^[1]. This systematic review synthesizes evidence on DT-induced biomechanical gait alterations in PD, examining spatiotemporal and kinematic parameters, and identifying clinical and methodological moderators.

Methods: Following PRISMA guidelines^[2], we systematically searched Cochrane Library, EBSCO, PubMed, Scopus, and Web of Science (2000–2025). Two independent reviewers assessed study quality using the Newcastle–Ottawa Scale for observational studies and Cochrane Risk of Bias Tool for Randomized Controlled Trials^[3, 4], with discrepancies resolved through consensus or third-reviewer consultation. We additionally evaluated observational studies against STROBE reporting guidelines^[5]. Planned meta-regressions and subgroup analyses will examine associations with disease severity, DT type, and walking modality (PROSPERO: CRD420251004404).

Results: Preliminary synthesis of 56 studies (experimental/observational) reveals consistent DT-induced gait impairments in PD: reduced speed (– 15% to – 30%), shortened stride length (– 10% to – 20%), and diminished joint range of knee motion (– 5° to – 12°), with heightened variability (stride time coefficient variation: + 20% to + 40%). Cognitive DTs (e.g., Stroop) exacerbated deficits more than motor DTs, especially in individuals with postural instability and gait disorder (+ 35% step variability) and freezers (– 28% speed). Overground walking incurred greater DT costs (– 22% speed) than treadmill, while motion capture outperformed walkways in detecting kinematic anomalies (e.g., hip adduction variability).

Conclusions: DT exacerbates gait impairments in PD, with effects modulated by task type, disease severity, and phenotype. Standardized protocols are needed to improve comparability. These findings underscore the utility of DT assessments in clinical practice for fall risk stratification and personalized rehabilitation (e.g., cueing, cognitive-motor training).

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OC079 - STILL ROOM TO IMPROVE: RESISTANCE TRAINING PROMOTES SKELETAL MUSCLE HYPERTROPHY AND CAPILLARIZATION IN ACTIVE OLDER ADULTS

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Purpose: Aging is a natural process that leads to a progressive decline in muscle mass and strength. Physical activity, particularly resistance training (RT), is an effective strategy to counteract age-related muscle loss and improve quality of life in older adults. However, few studies have compared the effects of a RT protocol between highly endurance-trained older adults (e.g. half-marathon and marathon runners) and moderately active older adults (> 8000 steps/day). Therefore, our study aims to fill this gap by evaluating the effects of 12 weeks of RT in these two groups.

Methods: Seven moderately active older adults (ACT group, mean age = 71.7 ± 5.6 years) and six endurance-trained older adults (FIT group, mean age = 73.3 ± 5.0 years). Neither group had prior experience with resistance training. Participants completed a 12-week progressive RT protocol performed three times per week. The protocol consisted of three lower limb and three upper body exercises (three and two sets respectively). Training intensity progressed from 65%1RM in the first month to 80%1RM, which was maintained throughout the final month. FIT group was instructed to maintain their usual levels of running regimen (at least 3 times a week of running, totaling a minimum of 35 km/week). Assessments were conducted at baseline and after 12 weeks of RT protocol. Isometric muscle strength was evaluated through maximal voluntary contractions (MVC) and body composition was measured using DXA. Additionally, muscle biopsies of the vastus lateralis were taken to analyze myofiber cross-sectional area (mCSA) and capillary parameters.

Results: Statistical analysis revealed significant differences between groups in fat mass (p = 0.03) and body weight (p = 0.01). Following the intervention, both groups decreased in fat mass (– 3.4%; p = 0.002), and increased total (+ 1.5%; p = 0.001) and leg lean soft tissue (+ 3.4%; p = 0.002) as per mCSA increased (+ 28.2%; p = 0.14). Strength parameters improved markedly across all measures (+ 16.3%; p < 0.001). Surprisingly, capillary levels were similar between groups at baseline. The capillary-to-fiber perimeter exchange index showed a trend towards statistical significance (+ 13.8%; p = 0.06), and capillary contacts of type II fibers increased significantly in both groups (+ 16.2%; p = 0.02).

Conclusions: These findings suggest that resistance training elicits positive adaptations in muscle mass and strength even when combined with endurance training. Moreover, improvements are evident even in individuals who are not highly trained but maintain an active lifestyle, emphasizing that resistance training is effective in older adults as long as they remain sufficiently active.

OC080 - EFFECTIVENESS OF A HOME-BASED, APP-GUIDED EXERCISE PROGRAM FOR FRAIL OLDER ADULTS POST-DISCHARGE: PROTOCOL FOR A RANDOMIZED CONTROLLED TRIAL

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Purpose: Frailty leads to reduced mobility and a high risk of morbidity and mortality, especially among older adults. Exercise is a key strategy to counteract frailty-related physical impairment, but participation barriers, such as transporting patients to facilities, limit its application in treating patients. The purpose of this project, funded by the Italian Ministry of Research, is to evaluate the efficacy of a novel web-based smartphone application to prescribe and monitor the execution of a structured, personalized, home-based interval walking program (ARTIDE app).

Methods: This trial includes patients aged ≥ 65 years, hospitalized and nearing discharge. Inclusion criteria are: Fried FP score ≥ 2 , Barthel Index > 60 , ability to walk a little and to use smartphone. Exclusion criteria include: terminal illness, moderate-to-severe cognitive impairment (MMSE < 18), absolute contraindications to exercise. The primary outcome is the variation of SPPB score. Secondary outcomes are: 2-MWT, EQ-5D, GDS, Barthel Index, number of falls and hospitalizations. Outcome measures are administered at baseline (pre-discharge) and post-intervention, after 3 months. The intervention consists of daily interval walking training 1':1' walk:rest for 6–8 repetitions. The walking pace is set by a metronome and increased every two weeks from 60 to 80 steps/min, personalized for each patient. The app will guide patients through exercise sessions using a simple vocal assistance system. Researchers explain how to use the app and supervise the first exercise session. On the trainer-facing, the app allows to monitor adherence, gather feedback, and adapt the exercise in real-time.

Results: The trial aims to enrol 120 patients in two units (University of Ferrara, Italy and University of Cordoba, Spain). At the moment, 24 patients (11 Control, 13 Exercise) were recruited. We hypothesize that the home-based exercise training will be safe and effective. Indeed, we expect that at least 20% of patients in the exercise group will improve the SPPB by the clinically significant margin (≥ 1 point), in addition to improving quality of life and experiencing a lower rate of falls.

Conclusions: A simple, accessible application for an elderly and frail population could become a novel tool for home-based training. When validated, this low-cost, implementable in any setting intervention may empower frail individuals reducing at long term the costs and burden for the national healthcare service.

OC081 - INDIRECT ESTIMATION OF DYNAMIC RATE OF TORQUE DEVELOPMENT USING TIME TO PEAK VELOCITY

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Purpose: The assessment of the dynamic rate of torque development (RTD) still represents a significant gap between research and practical application in resistance training. While accelerometers or linear encoders offer a valuable opportunity to measure repetition velocity, peak velocity is influenced by the total impulse of the contraction. Consequently, time to peak velocity is emerging as a promising complementary metric, as it could be more sensitive to the force produced in the first milliseconds of contraction. The aim of this study is therefore to quantify the relationship between dynamic RTD and time to peak velocity.

Methods: Sixty-four young adults performed two isometric maximal voluntary contractions (MVC) and an incremental load test on a single-leg leg extension to determine their individual torque-velocity relationship. At each load, peak torque, peak RTD, peak velocity, time to peak velocity, and muscle activation of the vastus lateralis and medialis, quantified as root mean square of the first 50 ms (RMS50) of contraction through high-density electromyography, were measured. In data analysis peak torque, peak RTD and RMS were normalized to the corresponding MVC values. To investigate the factors affecting time to peak velocity, a linear hierarchical regression analysis was conducted. The first model included peak velocity and peak RTD as fixed effects, while the second model included peak velocity and RMS. In each analysis, repetition's peak torque was included as a covariate and peak velocity of each subject was considered as random effect.

Results: Time to peak velocity was mainly influenced by peak velocity ($F = 461.6$, $\beta = -7.4 \times 10^{-1}$, $\eta^2 = 0.80$, $p < 0.001$) but also significantly affected by peak RTD ($F = 141.3$, $\beta = -1.3 \times 10^{-3}$, $\eta^2 = 0.18$, $p < 0.001$). In the second model, peak velocity remained the main determinant of time to peak velocity ($F = 475.2$, $\beta = -7.4 \times 10^{-1}$, $\eta^2 = 0.77$, $p < 0.001$), with a significant contribution from RMS50 ($F = 91.9$, $\beta = -9.7 \times 10^{-3}$, $\eta^2 = 0.13$, $p < 0.001$). In both analyses, the effect of peak torque was negligible ($\eta^2 \leq 0.01$).

Conclusions: The results obtained support the theoretical relationship between rapid force production and time to peak velocity offering the possibility to monitor indirectly rate of torque development. Furthermore, the well-established role of early muscle activation (RMS50) in explosive contractions is reinforced, demonstrating a significant effect also on time to peak velocity.

OC082 - INTERNAL LOAD MANAGEMENT AS A TOOL FOR FATIGUE MONITORING: A COMPARISON BETWEEN MALE AND FEMALE RUGBY PLAYERS

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Purpose: This study aims to assess the utility of a fatigue monitoring protocol to investigate whether a player is approaching a 'red zone' condition (1) and to present the differences in using the same approach between male and female athletes. The hypothesis is that athletes will reach peak readiness on match day, with the lowest level occurring 48 h later, indicating a fatigued state.

Methods: The methodology entails a subjective assessment of specific dimensions of the athletes' perceived readiness (dRIs) and an objective evaluation of the readiness (RDs) with strength and range of motion tests. The first one involves administering a questionnaire via Google Form, with four questions: fatigue upon waking up, muscle soreness (DOMS), sleep quality, and mood using a five-point Likert scale (2). The second one consists of three field tests: the adductor squeeze test (AST) to measure the maximal force of this muscle group, the sit and reach test (SRT) to measure hamstring muscle extensibility, and the knee to wall test (KTW) to evaluate ankle range of motion. 16 male and female athletes took part in an eight-week competition period where they were tested over 4 consecutive days from the match day (MD): MD + 2, MD-3, MD-2. Pearson's correlation coefficient was calculated to measure the relationship between the dRIs and RDs.

Results: Results indicate no significant differences in dRIs monitoring among females, while males exhibited significant differences in fatigue levels from MD to MD + 2, MD-3, and MD-2 ($P = 0.004$, $p < 0.001$, $p < 0.001$ respectively), as well as in DOMS from MD to MD-3, MD-2 ($p < 0.010$, $p < 0.001$ respectively), MD + 2 to MD-2 ($p < 0.001$) and MD-3 to MD-2 ($p = 0.020$). In RDs monitoring a notable contrast was observed in female for AST between MD and MD + 2 ($p < 0.001$), whereas in male no significant discrepancies were detected. Furthermore, a comparison in load management between the two groups displayed significant differences in dRIs on MD ($p = 0.006$). In the end, the dRIs four questions' score was small correlated with RDs tests.

Conclusions: In conclusion, dRIs monitoring appears less suitable for fatigue perception in females probably due to the menstrual cycle influence. While in males it seems to follow the expected pattern, being the highest on match days and lower during the week. RDs tests in both cases reveal not to be very effective but they demonstrate to serve as effective tools for monitoring readiness with eventual ROM and strength differences.

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OC083 - EVALUATION OF VISUAL-PERCEPTUAL ABILITIES IN BADMINTON ATHLETES

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Purpose: Visual-perceptual abilities play a pivotal role in sports performance, particularly in disciplines requiring rapid decision-making and precise perception. In badminton, athletes have to follow fast-moving objects, anticipate opponent movements, and execute precise strokes. The present study aimed to assess and compare visual performance across a range of domains between competitive badminton players and age-matched controls. It was hypothesized that badminton expertise would be associated with superior performance on multiple visual and oculomotor function measures.

Methods: Seventy-two participants were recruited: 36 competitive badminton players (21M/15F, age 22.9 ± 2.4 years, 13.2 ± 3.1 years of practice) and 36 controls (21M/15F, age 22.3 ± 1.7 years). Visual-perceptual assessments were conducted using the Tetra[®] system and the EyeSwift[®] Pro system and included: binocular visual acuity (LogMAR), stereopsis (Wirt test), reaction time (ms), pursuit eye movements, saccadic latency and velocity (ms), contrast sensitivity ($0.5\text{--}12$ cpd), and fixation stability. Due to non-normal distributions in most variables, Mann-Whitney U tests were employed for continuous variables, with effect sizes calculated as $r = |Z|/\sqrt{N}$. Chi-square tests were used for categorical pursuit variables. Bonferroni correction was applied to control for multiple comparisons.

Results: After Bonferroni correction, badminton players demonstrated significantly superior performance in five visual domains. Visual acuity was markedly better in both left eye (-0.085 ± 0.08 LogMAR, $p < 0.001$, $r = 0.528$) and right eye (-0.079 ± 0.76 LogMAR, $p < 0.001$, $r = 0.524$). Reaction time showed the largest effect (0.269 ± 0.058 vs 0.411 ± 0.072 s, $p < 0.001$, $r = 0.760$). Overall contrast sensitivity was superior ($p < 0.001$, $r = 0.414$), and right eye saccadic latency was reduced ($p = 0.002$, $r = 0.364$). No significant differences were found in stereopsis ($p = 0.149$), left eye saccadic parameters, fixation stability, saccadic velocity, or pursuit movements after correction.

Conclusions: This comprehensive analysis provides evidence that competitive badminton players possess superior visual abilities across multiple domains. These findings support the hypothesis that high-level badminton participation is associated with enhanced visual performance, likely reflecting both self-selection of individuals with superior visual abilities and training-induced neuroplastic adaptations. The lack of group differences in saccadic peak velocity, despite shorter latencies in badminton players, may indicate that visual expertise in this population is primarily associated with faster initiation rather than alterations in the kinematic properties of eye movements. Future longitudinal studies should investigate the relative contributions of predisposition versus training-induced adaptations.

OC084 - INDIVIDUAL LOAD-VELOCITY RELATIONSHIP "IN SITU": A NOVEL APPROACH FOR 1 R.M. ESTIMATION

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Purpose: The traditional assessment procedure of the individual load-velocity relationship (tradL-V) requires multiple loads, and it can be time-consuming in settings where frequent testing or large groups are involved. As an alternative, we investigated the feasibility and 1 R.M. prediction ability of a L-V relationship assessed "in situ" (in situL-V)

by using lifting velocity data collected during simulated training sessions.

Methods: We retrospectively analyzed a publicly available dataset that contained data from 51 resistance-trained individuals who visited the laboratory five times: a familiarization, two testing, and two simulated training sessions. The individual 1 R.M. and the corresponding velocity (V_{1RM}) were measured during the first testing session; the individual tradL–V relationship was extrapolated from the second testing session; the individual in situ L–V relationship was extrapolated from the pooled data of the two simulated training sessions. The theoretical maximal load (L_0), the theoretical maximum movement velocity (V_0), the regression equation slope (LV_{slope}), the goodness of fit (R^2), and the estimation of 1 R.M. were extrapolated from both L–V relationships and compared between methods. Moreover, both L–V 1RM predictions were compared with the actual 1RM values.

Results: 1 R.M. and V_{1RM} mean values were 128 ± 37.6 kg and 0.35 ± 0.08 m s⁻¹, respectively. The comparison between L–V profiling methods displayed no significant differences in L_0 , V_0 , LV_{slope} , R^2 , and 1 R.M. estimations ($p > 0.05$). Moreover, both L–V derived 1 R.M. estimations demonstrated no significant differences ($p > 0.05$), extremely large correlation ($r \geq 0.97$), and small, not significant bias (tradL–V, bias = 1.7 kg, precision = 9.7 kg, $p > 0.05$; in situ L–V, bias = 0.7 kg, precision = 7.6 kg, $p > 0.05$;) with actual values of 1 R.M.

Conclusions: These findings suggest that an in situ L–V relationship is an equally valid, time and resources-efficient method for the estimation of maximal strength.

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References: (non obbligatorio).

OC085 - A NEW WATER POLO ERA! REDUCED PLAYING TIME AND COURT LENGTH: THE IMPORTANCE TO MINIMIZE LOST BALL POSSESSIONS TO GET SUCCESSFUL AMONG MEN'S ELITE TEAMS

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Purpose: The present study aimed to compare the technical and tactical factors of the 1st–4th (high ranking) and the 5–8th (low ranking) elite men's senior water polo team groups, playing the 2025 World Cup final phase (Podgorica, Montenegro, April 11–13), which has been the first official competition with the new post-Olympic rules (25 m of court length, and 25 s to play a single ball possession an experimental and 15 s for power-plays or further even actions).

Methods: A notational analysis applied on each team was performed for 12 matches (4 quarter-finals, 4 semi-finals, 4 finals), considering number of actions (also divided for quarters); actions in relation to playing situation (% ratio over total) such as complete (6 forwards vs 6 defenders, 5vs5) and incomplete (from 1vs1 to 4vs4) even actions,

primary ($\leq 3vs2$) and secondary ($\geq 4vs3$) counterattacks, power-play (after an opponent exclusion foul), and transition action (ended without an offensive arrangement); and transition (swimming phase before starting the playing arrangement) and ball possession durations. In addition, the outcomes of action have been analysed (goal, shot without goal, offensive foul, lost possession, exclusion foul with and without ball possession, penalty foul followed by penalty shot with or without goal) for the entire match and the specific above reported playing situations, also considering if they ended with a playing event involving the roles of centre forward/s or perimeter players. Non-parametric statistics was applied according to the aim of the study.

Results: Among all indicators, only lost ball possessions occurring during complete even actions ($p = 0.022$, ES = 0.4) discriminated high- (16 $\pm$ 9.8% of action in this situation) from low- (25.1 $\pm$ 9.1) ranking teams.

Conclusions: The need of playing an even action within a shorter time with respect to the past one (despite in reducer court length) could have probably determined a higher challenge to effectively play ball possession without a passing error or an opponent intervention. Therefore, this study could offer valuable insights for water polo coaches in adapting training with new fundamental playing rules, especially taking care in minimize offensive errors leading to a lost ball in playing even action with a complete or quite complete arrangement.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC086 - THE NEED FOR BRAKES: A FIELD-BASED INSIGHT INTO DECELERATION DEFICIT IN YOUTH FOOTBALL

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Purpose: Acceleration and deceleration are key components of football performance. While sprint ability often develops early in youth athletes, braking capacity may not develop in parallel, potentially leading to a neuromuscular imbalance between propulsive and braking abilities. This study investigated the association between sprint and deceleration ability, and biological maturation in U15 football players.

Methods: Thirty-two U15 male football players (age: 14.5 ± 0.3 years) were assessed for linear sprint performance over 10 m and 15 m distances and underwent an on-field deceleration test to calculate the deceleration deficit (DD)¹. Maturity offset (MO) and age at peak height velocity (APHV) were estimated using the Mirwald's equation. Based on 10 m sprint times, athletes were divided into tertiles (faster, moderate, and slower) for group comparisons. Pearson's correlations and one-way analysis of variance (ANOVA) with Tukey's post-hoc tests were used to examine relationships between sprint time, DD, and maturation variables. A simple linear regression was also conducted to evaluate whether sprint performance could predict DD.

Results: DD showed a significant negative correlation with 10 m sprint time ($r = -0.566$, $p < 0.001$), but no with MO and APHV. The one-way ANOVA revealed that slower players had significantly lower DD than both moderate ($p = 0.012$) and faster ($p = 0.006$) groups. No difference was found between faster and moderate athletes ($p = 0.978$). Linear regression confirmed that sprint time significantly

predicted DD ($\beta = -0.566$, $p < 0.001$), explaining 32% of its variance ($R^2 = 0.321$).

Conclusions: Faster young players tend to exhibit higher deceleration ability, independently of biological maturation. These findings highlight a neuromuscular mismatch between propulsive and braking abilities, underscoring the need for brakes in U15 youth football players through targeted deceleration-focused training.

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OC087 - HEART RATE VARIABILITY REACTIVITY IN ENDURANCE AND POWER ATHLETES: EFFECTS OF TWO DISTINCT MAXIMAL PROTOCOLS

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Purpose: Heart rate variability (HRV) is utilized in periodization due to its capacity to estimate recovery based on the imbalances created by each training session's load. This control aims to assess the return of vagal tone after training, in comparison to sympathetic tone, to optimize performance. However, little is known about how the autonomic nervous system of athletes with a history of constraint training, such as rugby (Rug) and endurance (End) athletes, reacts after two types of maximal exercise and whether their condition influences these responses. Then, the present study compared HRV and performance indices between Rug and End following an all-out (AOU) and incremental (INC) test.

Methods: ECG was recorded in ten semi-professional male rugby players and ten endurance athletes (eight male) from different modalities, who performed on a cycle ergometer an incremental ramp (INC, requiring a consistent increase of 30 W after one minute) and an all-out effort test (AOU, demanding maximal effort at a steady power peak rate), with both trials lasting until volitional exhaustion, randomized and separated by at least 72 h. Autonomic parameters were assessed through HRV analysis during both the resting and recovery phases. Performance metrics included peak power output (Peak_{pow}), time to achieve peak power in the AOU test (t_{peak}), and exponential power drop-off time during the AOU test (t_{brake}).

Results: A repeated-measures ANOVA (2×2) indicated significantly higher Peak_{pow} for Rug in the AOU test ($p < 0.001$) and comparable values for End in the INC test. Specifically, according to the AOU protocol, a T-test also confirmed a shorter t_{peak} for Rug ($p = 0.003$), while t_{brake} showed a longer duration for End runners ($p = 0.031$). From the HRV standpoint, a $2 \times 2 \times 2$ repeated-measures ANOVA, conducted before and after the tests, revealed significant interactions between test and time, indicating a similar autonomic stress response across groups but with notable challenges in vagal recovery after the INC test. Importantly, a significant interaction was noted between test, time, and group ($p = 0.017$) for the natural logarithm of LF, indicating better control from End athletes during the rest and recovery phases in the AOU test.

Conclusions: From the HRV viewpoint, both training types appear to induce similar stress responses during the INC test; however, the AOU effort exerted greater stress on the Rug through increased sympathetic tone reduction, coupled with a higher Peak_{pow}. This response indicates a unique autonomic strategy for endurance athletes in anaerobic tests, characterized by reduced sympathetic stress, which enables a longer duration at maximal efforts.

OC088 - DOES MATURITY STATUS REALLY MATTER? A COMPARISON OF METHODS FOR ESTIMATING MATURITY STATUS AND THEIR RELATIONSHIP WITH PERFORMANCE IN YOUTH SOCCER PLAYERS

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Purpose: Youth of the same chronological age may differ significantly in biological maturity, making it crucial to consider this when comparing physical performances within age groups, as maturity influences the development of specific fitness components [1,2]. Several predictive equations have been developed to estimate maturation status, either through age at peak at height velocity (APHV) or predicted adult height (PAH). This study examined the concordance among commonly used predictive methods for classifying players by maturation status and, to the best of our knowledge, explored for the first time whether differences in physical performance are more closely related to maturation or chronological age.

Methods: A total of 192 youth male soccer players (U14 = 55, U15 = 55, U16 = 43, U17 = 39) were tested. Measurements included anthropometry, sprint (10 m and 30 m), countermovement jump (CMJ), and endurance capacity (Yo-Yo Intermittent Recovery Test, YYIRT1). APHV was estimated using the methods of Mirwald, Moore, Moore2, and Fransen; PAH was calculated using the Khamis-Roche method [3]; players were classified by maturation status using both conservative and less conservative criteria. Agreement between APHV estimated was assessed via Bland-Altman analysis while classification agreement was evaluated using Fleiss' Kappa. The impact of maturation on performance was examined using two-step linear regressions to assess changes in R^2 .

Results: All predictive methods differed significantly in APHV estimates ($p < 0.05$); regression slopes were significant in all comparisons, indicating greater disagreement at higher APHV values. Classification agreement was weak for both criteria (Kappa = 0.521 and 0.549). For the 10 m and 30 m sprints, including maturation status significantly improved R^2 in most models ($\Delta R^2 = 0.025$ – 0.118), showing that maturation explained an additional 2–11% of variance. For YYIRT1, maturation did not improve models beyond age. For CMJ, the contribution of maturation was limited, with only four methods showing a significant R^2 increase.

Conclusions: Considering biological maturation independently of age is essential, as failing to do so confounds their effect. Maturation influences performance unevenly, showing stronger associations with sprint ability than with strength or endurance, highlighting the need for further research.

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OC089 - AUTONOMIC NERVOUS SYSTEM INDEX IN ELITE FOOTBALL PLAYERS: IMPACT OF GENDER, TRAINING ROUTINES AND PERCEIVED STRESS

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Purpose: Cardiac autonomic regulation is essential for performance in elite athletes and is usually assessed through heart rate variability (HRV). However, standard HRV interpretation is complicated by methodological variations and confounding factors such as age and sex. This study aimed to evaluate cardiac autonomic function using the Autonomic Nervous System Index (ANSI), a composite HRV-based metric, in both male and female elite football players, while considering playing position and perceived stress.

Methods: We evaluated 117 elite football players (74 men, 43 women) from three top-tier European First Division clubs. Cardiac autonomic regulation was assessed through beat-by-beat RR interval analysis and the Autonomic Nervous System Index (ANSI), expressed as a percentile (0–100) relative to reference population norms. ANSI consolidates multiple HRV components into a single measure, reducing the confounding factors related to sex and age. Players were categorized by sex, position (goalkeepers, defenders, midfielders, forwards), and perceived stress, assessed using a validated questionnaire on somatic symptoms. Data were collected at various points throughout the competitive season. Independent t-tests, ANOVA, and correlation analyses were performed to explore differences based on gender, position, and stress levels.

Results: Our findings indicate that ANSI values were significantly higher in male athletes compared to female athletes ($p < 0.001$). Among males, midfielders and defenders, who generally experience heavier physical loads, recorded the highest ANSI scores compared to other playing positions ($p < 0.05$). Conversely, female players showed lower overall ANSI values, especially among midfielders and forwards. Additionally, we found that female athletes reported significantly greater perceived stress ($p < 0.05$), particularly in positions with increased game-related responsibility. Notably, ANSI values demonstrated an inverse correlation with perceived stress ($r = -0.41$), underscoring ANSI's ability to distinguish players based on their stress levels and physiological balance.

Conclusions: ANSI provides a reliable, standardized method for assessing autonomic function in elite football. Its capacity to identify differences based on sex, playing position, and stress perception highlights its significance in both physiological monitoring and psychological profiling. By translating complex HRV data into a single, interpretable score, ANSI facilitates informed decision-making for performance optimization, training periodization, and early detection of imbalance or overload in professional football contexts.

OC090 - ACUTE EFFECT OF CONTINUOUS PERTURBATIONS OF THE BASE OF SUPPORT ON REACTIVE BALANCE RESPONSE

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Purpose: The understanding of the role of immediate previous experience to continuous balance perturbation in reactive postural responses and skill acquisition to an unexpected stimulus is warranted. Therefore, we aimed to investigate whether exposure to two different types of continuous perturbations (CP) of the base of support (i.e., random and wave-like platform translation) affects the postural response to a sudden unexpected perturbation (UP) of the base of support, compared to a control condition (CTRL) where no CP was applied.

Methods: Twenty-seven young adults participated in the study ($N = 27$; $F = 14$; 21.56 ± 1.31 yrs; 1.71 ± 0.14 m; 72.30 ± 16.06 kg). Postural balance was tested on a force plate (AMTI BP400600, USA) positioned on an electro-actuated movable plate (EnginLAB s.r.l., Italy). Subjects performed three different conditions in a random order assessed on three different days, namely: random (RND), sine wave (SIN), and control (CTRL). For each condition, in five out of ten trials, subjects did not randomly receive the UP to prevent them from always expecting a perturbation following the CP. The CP lasted 30 s, and the total displacement was the same for both SIN and RND perturbations. The UP had the following characteristics: forward direction, 50 mm of displacement, and 200 mm/s of ramp rate. The Area95, the mean velocity, the first peak, and the maximal oscillations (DCoPMax) of the center of pressure (CoP) trajectory were calculated in the 2.5 s window after the UP occurred. In the CP, the Area95 and the mean velocity were calculated over the 30-second perturbations.

Results: One-way ANOVA showed improvements in balance response to the UP following the RND ($p < 0.001$) and SIN ($p < 0.001$) compared to the CTRL condition for all the CoP-related parameters. Regarding balance control during the CPs, the two-way ANOVA showed a significant ($p < 0.001$) main effect of the condition (RND vs. SIN) with lower values in the SIN compared to RND for both the Area95 and the mean velocity.

Conclusions: These findings suggest that young, healthy subjects could benefit from acute exposure to continuous postural perturbations in the reactive balance response to a subsequent unexpected perturbation. Therefore, it would be interesting to investigate whether continuous perturbations may be used as training, regardless of their nature, to assist or improve the response of postural control to external perturbations.

OC091 - THE EFFECT OF OPPONENT AND BELONGING TEAM FINAL RANKING ON RATING OF PERCEIVED EXERTION AND MENTAL EFFORT DURING ELITE SOCCER MATCHES

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Purpose: Internal load quantification is a key aspect for the players' monitoring process in soccer [1]; thus, several approaches have been developed to provide comprehensive information about the load sustained by players like rating of perceived exertion (RPE) and mental effort (ME) based methods [2–3]. While player's RPE has been reported to be affected by the opponent and belonging team levels during soccer matches [4], no information is available about ME. Therefore, this study examined the effect of opponent and belonging team final ranking on both RPE and ME in soccer.

Methods: 41 elite soccer players (mean $\pm$ standard deviation; age: 25 ± 4 yrs, stature: 183 ± 6 cm, body mass: 79 ± 6 kg) belonging to the same first division soccer team (i.e. Serie A) were monitored during 5 competitive seasons (i.e., from 2019 to 2024). The RPE and ME were collected using the CR10 Borg's scale and a 0–10 Visual Analog Scale, respectively, 30 min after the end of each official match ($n = 110$) for a total of 593 individual records. A series of Linear Mixed Models (LMM; player as random effect) were constructed to examine the effect of opponent and belonging team final ranking—fixed effect—on RPE and ME.

Results: LMM revealed that RPE was significantly related to opponent team ranking ($p < 0.001$, *moderate*), with players reporting higher values when competing against higher-ranking teams. On the contrary, ME was not related to opponent ranking ($p = 0.352$, *small*). Also, players' RPE and ME values were significantly affected by the belonging team ranking (all $p < 0.001$, *moderate-large*), with the highest RPE and ME values observed when the team achieved the lowest ranking positions.

Conclusions: The findings demonstrate that competing against higher ranking soccer teams may increase the RPE response, likely due to the greater physical load achieved by players during these matches [5], without affecting the ME. When accounting for belonging team ranking, RPE and ME responses seem to trend partially differently, with players belonging to lower ranking teams undergoing to higher internal responses (i.e. both RPE and ME). These results should be considered for training and load management purposes, with both RPE and ME being collected for a more holistic monitoring process.

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OC092 - EXPLORING THE ROLE OF NASA-TLX SUBSCALES IN MONITORING PERCEIVED LOAD AND FATIGUE IN ENDURANCE ATHLETES

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Purpose: The concept of acute performance decrement (APD) was used to evaluate the validity of internal training load (TL) metrics. The National Aeronautics and Space Administration Task Load Index

(NASA-TLX), which comprises six subscales, has previously shown strong associations with APD and may provide a more integrative representation of both central and peripheral subjective stressors experienced during endurance exercise. This study aimed to analyze the individual NASA-TLX domains across four training sessions by examining the associations between APD and each NASA-TLX domain, as well as exploring the relationships between NASA-TLX domains and physiological parameters collected during these sessions.

Methods: Twelve well-trained male runners (10 males and 2 females; mean age 26.8 ± 6.9 y; mean body mass [BM] 63.3 ± 7.7 kg, mean height 1.74 ± 0.07 m, mean maximal oxygen consumption [VO_{2max}] 65.6 ± 6.4 ml·kg⁻¹·min⁻¹) completed an incremental test followed by five randomized experimental visits. A time to exhaustion (TTE) test was performed either at baseline or immediately after one of four training sessions: high-volume low-intensity training (LIT), moderate-intensity training (MIT), long-interval high-intensity training (HIT_{long}), or short-interval high-intensity training (HIT_{short}). APD was calculated as the percentage reduction in TTE relative to baseline. The NASA-TLX questionnaire was administered immediately after each training session and before the TTE to assess perceived workload across six domains: mental demand, physical demand, temporal demand, effort, frustration, and perceived performance.

Results: All training sessions resulted in a significant APD ($P = 0.041$). HIT_{long} elicited a significantly greater APD ($+ 16\%$, $P = 0.035$) than LIT. NASA-TLX were significantly higher for HIT sessions compared to LIT (all $P < 0.001$). Subscale analysis showed that LIT producing the lowest mental, physical, temporal, and effort scores (all $P < 0.001$). The Frustration domain did not differ significantly between conditions. All NASA-TLX subscales were significantly correlated with APD ($P < 0.001$). In addition, univariable analyses showed strong associations between the mental, physical, and effort subscales and both respiratory frequency and markers of carbohydrate and fat oxidation during exercise ($P < 0.001$).

Conclusion: These findings suggest that the NASA-TLX, particularly when analysed by subscales, may offer a sensitive and practical method for assessing exercise-induced fatigue in endurance athletes. The subscales captured different subjective fatigue components, reflected by their consistent association with APD and physiological parameters. This supports the ecological validity of the NASA-TLX and highlights its potential for individualized monitoring of internal load and fatigue in real-world training contexts.

OC093 - TESTING PROTOCOL AFFECTS THE LOAD-VELOCITY PROFILE IN SMITH MACHINE BENCH PRESS

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Purpose: To date no study has examined whether using different load-velocity profile (LVP) testing protocols affect the slope and the intercept of the linear relationship between barbell load and movement velocity in the Smith machine bench press (SMBP) exercise. Therefore, our aim is to compare three LVP protocols (standardized [LVP_{STND}], individualized [LVP_{IND}], and 2-point method [LVP_{2-POINT}]) created using two velocity metrics (mean velocity [MV], mean propulsive velocity [MPV]).

Methods: 17 males (25.1 yrs [$23.9; 26.1$]) completed 4 laboratory sessions, 48 hours apart. In the first session, participants performed a

one repetition maximum (1-RM) test in the SMBP and were familiarized with the exercise. In the remaining three sessions, the following LVP protocols were performed in randomized order: (i) LVP_{STND} (load increments: 10 kg for MPV > 0.5 m·s⁻¹, 1-5 kg for MPV < 0.5 m·s⁻¹; reps: 3 for MPV > 1.0 m·s⁻¹, 2 for MPV between 0.65–1.0 m·s⁻¹, 1 for MPV < 0.65 m·s⁻¹); (ii) LVP_{IND} (load used: 20%, 40%, 60%, 80%, and 90% 1-RM); (iii) LVP_{2-POINT} (load used: 50% and 80% 1-RM). A linear position transducer (Vitrue, 1000 Hz) recorded barbell velocity during each lift. For each protocol, individual linear regressions between load (dependent variable) and each velocity (independent variable) were performed. For each velocity, Friedman test, followed by Bonferroni corrected post-hoc Conover tests, was used to compare intercepts and slopes across methods (α was set at 0.025; results are presented as medians and interquartile ranges).

Results: LVPs slopes ($\chi^2_2 = 12.4$, $p = 0.002$) and intercepts ($\chi^2_2 = 17.7$, $p < 0.001$) of MPV, and intercepts ($\chi^2_2 = 12.1$, $p = 0.002$) of MV were affected by the testing protocol, whereas the LVPs slopes ($\chi^2_2 = 6.4$, $p = 0.041$) of the MV were not.

The LVP_{2-POINT} slopes (-72.4 [-77.8 ; -56.8] kg s m⁻¹) and intercept (99.2 [98.0; 110.6] kg) of the MPV were different from the slopes (-57.9 [-62.8 ; -49.9] kg s m⁻¹, $p = 0.008$; -56.7 [-68.1 ; -51.5] kg s m⁻¹, $p = 0.032$) and intercept (97.2 [89.6; 102.5] kg, $p = 0.001$; 97.2 [93.4; 111.4] kg, $p = 0.013$) of the LVP_{STND} and LVP_{IND}, respectively. For the MV, solely the LVP_{2-POINT} (100.3 [99.1; 112.3] kg) and LVP_{STND} (98 [90.9; 108.3] kg) intercepts were different ($p = 0.005$).

Conclusions: The LVP_{2-POINT} protocols yielded different LVPs compared to multi-point (i.e., LVP_{STND} and LVP_{IND}) protocols. Therefore, although the LVP_{2-POINT} protocol represents a less time-consuming and cumbersome test, its accuracy in prescribing velocity-based resistance exercise training should be further investigated.

Acknowledgments: (non obligatorio).

References: (non obligatorio).

OC094 - TRACKING SEX AND AGE DIFFERENCES IN PERFORMANCE RELATED PARAMETERS IN HIGH LEVEL BIATHLETES DURING A TRAINING SEASON

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Purpose: Sex differences in competition speed of senior biathletes range from 12–16%, with men also showing 30–63% higher absolute VO_{2peak}. (1) In cross-country skiing, both sexes show a 6–7% increase in relative VO_{2max} from junior to senior levels, but only men improve in absolute VO_{2max}. (2) However, how maximal and submaximal performance related lab parameters vary between genders and across age groups in biathletes remains unclear. We aimed to compare these parameters in Tier 4 and 5 biathletes between males and females, and between juniors and seniors with data collected in summer and autumn to account for different periodization.

Methods: 34 Tier 4 and 5 biathletes (16 males, 18 females), including 17 juniors and 17 seniors, performed a laboratory roller ski test during the summer and autumn of 2024. The protocol included 5-min submaximal steps at fixed intensities, followed by a ramp to exhaustion. Ventilatory data and heart rate (HR) were continuously monitored,

and blood lactate was sampled from the earlobe after each step. A linear mixed-effects model was used to examine the effects of sex (males vs females) of class (junior vs. senior), and periodization (summer vs autumn), on VO_{2max}, VEmax, ramp duration (Tmax), speed, RPE, %HRmax and %VO_{2max} at 2 and 4 mmol/L lactate. Athlete ID was included as a random intercept.

Results: VO_{2max} (+ 1.5 l/min, 47% or + 10 ml/kg/min, + 17%), VEmax (+ 57 l/min, + 34%) and VO₂ at 4 mmol/L (+ 38%) and at 2 mmol/L (+ 40%) were higher for males (all $p < 0.05$), while %HRmax, % VO_{2max} and RPE were similar between genders both at 2 and 4 mmol/L (all $p > 0.05$). No differences in maximal physiological parameters were observed between age groups, however seniors outperformed juniors in ramp duration ($p < 0.05$). At 2 and 4 mmol/L lactate seniors had a higher speed than juniors, ($p < 0.01$) with no significant difference in %HRmax, % VO_{2max} and RPE (all $p > 0.05$). Periodization had an effect on VO_{2max} (summer > autumn), Tmax (autumn > summer), speed at 2 and 4 mmol/L (summer < autumn), %HRmax at 2 and 4 mmol/L (summer < autumn) and % VO_{2max} at 4 mmol/L (summer > autumn).

Conclusions: Male biathletes demonstrated significantly higher VO_{2max} (+ 17% relative, + 47% absolute) and VEmax (+ 34%) compared to females, confirming known physiological sex differences. Despite these maximal differences, submaximal responses of %HRmax, %VO_{2max}, and RPE at 2 and 4 mmol/L did not differ between sexes, indicating similar relative intensity. Seniors showed longer ramp durations and higher speeds at lactate thresholds than juniors, despite no differences in VO_{2max} or VEmax, suggesting enhanced endurance performance with age rather than superior physiological capacity. Training periodization also influenced several parameters, highlighting the importance of accounting for it when comparing test results between juniors and seniors performed during the same time of year.

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OC095 - THE FLYING PHASE OF SPRINT RUNNING FROM A BIOMECHANICAL PERSPECTIVE: WHAT REALLY COUNTS?

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Purpose: Sprint performance determinants have received considerable attention, mainly spatiotemporal, kinematic and kinetic

variables, but since biomechanical parameters of sprint are intertwined, no single variable is clearly associated with improved performance. Athletes often rely on training guides based on the practical experience of world-leading athletic coaches, becoming the best practice for sprint training. The aim of this study was to investigate in a sample of sprinters of different levels the parameters commonly considered by high level sprint coaches in a scientific research frame, showing which have the most determinant role in the flying phase speed.

Methods: 18 male sprinters (season's best running time -SBRT- ranging from 11.74 to 9.97 s) performed 2 all-out 60-m sprints on an instrumented indoor lane with a standing start, and 6-min rest between sprints. Data were recorded from the thirtieth to the fiftieth meter with a 12-camera motion capture system and 9 dynamometric platforms. 22 reflective markers were applied to each sprinter. The flying running time, measured via photocells, was analysed as dependant variable, as also the SBRT, whereas the biomechanics parameters aggregated in four categories (i.e., spatial, temporal, kinematic and kinetic) were considered as independent variables.

Results: The correlation between SBRT and flying time was 0.851 ($p < 0.001$). Across all parameters, the stepwise multiple linear regression analysis identified the contact time (r^2 : 0.21, q : 7.83, β : 33.17), the support angle at the midstance instant (r^2 : 0.30, q : 9.02, β : 0.05), as well as the braking impulse and the maximum vertical force as determinant factors of the was partially explained only by the braking impulse. Neither spatial, temporal, nor kinematic parameters were significantly related with the flying performance. Moreover, the support angle and the braking impulse discriminated the 9 fastest athletes compared to the other 9 sprinters.

Conclusions: At high level sprint running, the abilities to generate during the flying phase high vertical forces in a little amount of time and to reduce braking impulses seem more essential to produce high flying running speed and also better overall running performance (i.e., higher SBRT) than the capacity to produce high propulsive impulse or further refine the running technique.

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OC096 - COMBINED BIOCHEMICAL AND COAGULATION BIOMARKER ANALYSIS IN A ELITE ATHLETE WITH APC RESISTANCE

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Purpose: Elite athletes, despite their high fitness levels, may be at increased risk for venous thromboembolism (VTE) due to pro-thrombotic factors related to physical activity, such as dehydration, injuries, prolonged travel and the use of performance-enhancing supplements. This risk is even higher in athletes with genetic predispositions to clotting disorders. In this study, we investigated the biochemical and coagulation profiles of a professional basketball

player with a history of idiopathic pulmonary embolism and no family history of thrombotic events.

Methods: A standard biochemical and coagulation panel was carried out on serum and plasma samples. Moreover, a Thrombin Generation Assay (TGA), both with and without thrombomodulin (TM) was performed, including Lag Time, Peak Height, Time to Peak, Endogenous Thrombin Potential (ETP), ETP inhibition, Velocity Index and Start Tail.

Results: No alteration in biochemical parameters were found. A marked increase was observed only in testosterone levels (849 ng/dL). Thrombophilia evaluation highlighted an APCR positivity (0.68 NTR, r.v. > 0.75). APCR was later confirmed by PCR analysis that detected a heterozygous FV Leiden mutation. TGA showed an increase in Peak Height (266.7), ETP (1693) and Velocity Index (122 nM/min), all parameters related to hypercoagulability.

Conclusions: TGA provided a nuanced and functional characterization of the athlete's coagulation status, highlighting how APCR can disrupt regulatory mechanisms even in highly fit individuals. These findings emphasize the value of advanced diagnostic tools in sport medicine for personalized training to guarantee the safeguard of athlete's health.

OC097 - THE ROLE OF ADIPONECTIN IN EXERCISE-INDUCED INFLAMMATORY RESPONSES IN PROFESSIONAL BASKETBALL PLAYERS

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Purpose: Intense physical activity, including strenuous training and competitive performance, induces significant changes in various biochemical markers and leads to metabolic adaptations that may adversely affect professional athletes' performance and recovery. In particular, acute or excessive exertion has been associated with increased risk of muscular injuries, cardiovascular complications, infections, and inflammation. Adiponectin, a peptide hormone predominantly secreted by adipocytes, plays a pivotal role in the regulation of metabolic processes such as glucose homeostasis and fatty acid oxidation. Emerging evidence highlights the importance of adiponectin in the physiological response to exercise, with its involvement extending to the modulation of inflammation and the pathophysiology of energy metabolism disorders. In this scenario, our purpose was to investigate the role of adiponectin in intense physical activity and its correlation with the principal biomarkers of muscle damage and inflammatory response.

Methods: This is an observational study based on the comparison between ten professional basketball players and ten sedentary controls recruited in the seasons 2018/2019 and 2019/2020. The total serum adiponectin concentration was determined using an enzyme-linked immunosorbent assay (ELISA) and interleukin-6 (IL-6) serum

concentration was determined using a ProQuantum Human IL-6 Immunoassay Kit. Each sample was analyzed in duplicate, with two independent measurements performed for accuracy. We evaluated serum concentrations of biochemical, hormonal, and hematological parameters such as C-reactive protein, total cholesterol, Vitamin D, testosterone, and lymphocytes.

Results: Our findings revealed a significant increase in adiponectin levels in athletes from the 2018/2019 season compared to the control group (14.1 (IQR 12.8–14.5) vs. 11.6 (IQR 10.9–13.6), $p = 0.003$). Furthermore, in athletes from the 2019/2020 season, a positive correlation was observed between adiponectin and IL-6 ($\rho = 0.76$, $p = 0.032$), as well as between adiponectin and lymphocyte count ($\rho = 0.74$, $p = 0.040$), indicating a potential association between increased adiponectin levels and inflammatory parameters.

Conclusions: In conclusion adiponectin could have a role in inflammatory response caused by intense physical activity modulating the levels of IL-6 and lymphocytes.

OC098 - TACTICAL KNOWLEDGE AS A PREDICTOR OF COMPETITIVE LEVEL IN RUGBY: EVIDENCE FROM A SCENARIO-BASED COGNITIVE ASSESSMENT

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Purpose: This study investigated the role of Tactical Knowledge (TK) as a cognitive marker of competitive readiness in rugby, testing whether the quality of experiential exposure—rather than chronological age or training history—predicts athletes' tactical understanding and progression to elite levels.

Methods: TK was assessed in 107 male rugby players (mean age = 22.6 ± 6.42 years) using a 30-item Rugby Tactical Knowledge Questionnaire (RTKQ), integrating video-based procedural scenarios and declarative content. Competitive level was indexed via the Competence Experience Level (CEL), a five-level ordinal scale reflecting the complexity of the competitive environment, from 1 (regional) to 5 (international). Each player received a CEL score and was also classified as elite (national/international) or sub-elite (regional/interregional). Ordinal and binary regressions and ROC curve analysis were performed with TK as the dependent variable and CEL as the independent variable. Age and training years were included as covariates.

Results: TK scores increased significantly across CEL levels ($\chi^2(4) = 65.3$, $p < .001$, $\epsilon^2 = 0.616$), while age and years of rugby training (YRT) showed no significant contribution to CEL assignment. In ordinal regression, each one-point increase in TK was associated with a 1.76-fold increase in the odds of classification at a higher competitive level ($p < .001$), with a sharp rise in international-level probability above 26 points. In the binary logistic model, TK was the only significant predictor of elite status ($OR = 2.19$, $p < .001$), whereas age ($p = .476$) and YRT ($p = .346$) were not. The model explained 55% of the variance (pseudo- $R^2 = .5506$) and achieved 82.9% classification accuracy. ROC analysis confirmed excellent diagnostic accuracy ($AUC = 0.921$), identifying a 23-point cut-off distinguishing elite from sub-elite athletes (sensitivity = 95.5%, specificity = 76.6%).

Conclusions: TK emerged as a strong, independent predictor of competitive status in rugby. Unlike chronological age or YRT, TK reflects the quality of cognitive exposure within the athlete's development pathway. Its strong predictive value and the identification of a 23-point ROC threshold support its integration as an objective cognitive marker for elite-level classification. Early TK assessment may

enhance the accuracy and fairness of selection processes, promoting a more evidence-based and developmentally informed approach to talent identification.

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OC099 - JUMP HEIGHT SCALES LINEARLY WITH CONTACT TIME IN DROP JUMPS

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Purpose: The extent to which jump height scales with changes in ground contact time (GCT) remains unknown. Establishing this relationship would enable more accurate comparisons of rebounds with different GCTs. Currently, to reliably compare reactive strength index (RSI) values, it is necessary to consider only those with similar contact time parameters.

Methods: Elite young track and field athletes performed drop jumps from a 40 cm box under three distinct instructional conditions: (1) Trade-off strategy—minimizing GCT while maximizing jump height; (2) Maximizing jump height; (3) Minimizing GCT. A hierarchical linear regression model was applied, with GCT and sex (male/female) as independent variables and jump height as the dependent variable.

Results: Compared to the trade-off condition, focusing on short GCT led to a 21 ms reduction in GCT ($P < 0.0001$) but also a 5.9 cm decrease in jump height ($P < 0.0001$). Conversely, prioritizing jump height increased jump height by 4.8 cm ($P < 0.0001$) but prolonged GCT by 49 ms ($P < 0.0001$). However, RSI remained unaffected by instructions ($P = 0.567$). A significant main effect of GCT on jump height was observed ($\beta = 0.154$; $P < 0.00001$). The full model, incorporating random and fixed effects, accounted for 94% of the variance in jump height.

Conclusions: At the individual level, our findings confirm a linear relationship between GCT and jump height. This relationship underscores the importance of considering the GCT-jump height trade-off when assessing drop jump performance and highlights the need for evaluations across various GCT ranges rather than relying solely on one jump strategy.

OC100 - NEUROMUSCULAR FATIGUE IN WHOLE-BODY ENDURANCE EFFORT USING A NEW "BRAIN MAPPING" TECHNIQUE

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Purpose: How the cortex responds to fatigue in ultra-endurance remains an open field for discovery. This study is the first to examine motor cortical activity not only at the hotspot but also in surrounding areas, comparing measurements before and after sport-specific fatiguing tasks (SSFT). The goal is to develop a cortical response map that enhances our understanding of fatigue-related brain involvement.

Methods: Seven moderately trained subjects participated ($M = 4$; 35.6 ± 18.2 years; 169.8 ± 10.5 cm; 71.8 ± 16.6 kg). The experiment had two phases: a familiarization and baseline assessment at rest, followed by a 70 km cross-country ski race ($06:43:42 \pm 01:41:24$ h) and a post-fatigue assessment. To evaluate pre vs post, motor evoked potential (MEP) by transcranial magnetic stimulation (TMS) were recorded via surface electromyography (sEMG) using a bipolar configuration over the elbow flexors to assess biceps brachii (BB) function and the M-wave protocol was employed, and electrical responses were elicited through both TMS and electrical stimulation in BB. TMS was applied following a brain mapping protocol to compare cortical maps of the BB region before and after a fatiguing task, with MEP amplitudes used to assess changes in map area and center of gravity.

Results: Analysis of the area activated by TMS during the experimental task revealed a significantly larger area involved in task performance after the fatiguing task (36.4 ± 5.1 cm²) compared to before fatigue (19.9 ± 2.9 cm²; $p = 0.028$). Analysis of the center of gravity (COG) in the mediolateral (ML) ($p = 0.506$) and anteroposterior (AP) ($p = 0.518$) directions showed no significant effect of the fatiguing task. However, the overall displacement of the COG (regardless of direction) was significantly different from zero (14.8 mm; $p = 0.003$), confirming a general shift in the COG of the MEPs after the fatiguing task.

Conclusions: The results show a significant effect of the fatiguing task on the contribution of the brain region surrounding BB. Specifically, a larger cortical area was involved in contributing to BB muscle excitability elicited by TMS. Additionally, the center of gravity (COG) of the MEPs shifted, indicating that fatigue led to the recruitment of other brain regions to compensate for its effects.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC101 - EVALUATION OF 800 M RUNNERS: APPLICATIONS FOR PERFORMANCE AND TRAINING

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Purpose: 800 m athlete's evaluation and conditioning represents a difficult challenge for coaches and sport scientists. This competition is a unique blend of different energy requirements, speed and lactate management. Although the huge improvement in performance in the last year, knowledge of 800 m performance model and the consequent optimising training strategy still has some shades. The aims of the study are to assess 800 m runners through multiple tests and to define which parameters better correlate with race performance.

Methods: The aerobic, anaerobic and neuromuscular characteristics were evaluated on 13 well-trained male middle-distance runners. The evaluations consisted of a ramp test for $\dot{V}O_{2max}$ and vPeak; an all-out 120 m test for vLamax, and a lactate management test was assessed over 400 m at 800 m race pace with individual recovery lactate curve during the following 30 min. In that test lactate remotion ability (γ_2), maximal lactate production (Lamax) and difference (dLa) between Lamax and lactate after recovery were evaluated. Maximal Sprinting Speed (MSS) was assessed over 50 m. Test results were correlated with 800 m race time and with each other's.

Results: Heterogeneity in results was found in our sample. 800 m time significantly correlate in this study with γ_2 ($r = 0.66$, $p < 0.05$) and MSS ($r = -0.63$, $p < 0.05$). Race time in 800 m, furthermore, has a non-significant relationship with $\dot{V}O_{2max}$ ($r = -0.41$), vPeak ($r = -0.45$), Lamax ($r = -0.46$) and dLa ($r = -0.5$).

Conclusions: Maximal aerobic power and its associated speed are important parameters for the evaluation and the training programming. Glycolytic power does not seem to correlate with performance. Lactate management seems to have a different pattern of correlation based on different parameters of the test. Maximal sprinting speed is highly related to 800 m race, highlighting its importance in training design. It's fundamental to master the energetic and neuromuscular aspects, both for coaches and sports scientists.

OC102 - ASSESSMENT OF AVERAGE MUSCLE FIBRE CONDUCTION VELOCITY AND INTEGRATED MYOELECTRIC ACTIVITY DURING HEAVY- AND SEVERE-INTENSITY CYCLING EXERCISE

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Introduction: A fundamental tenet of human exercise physiology is the predictable reduction in the capacity of a muscle or muscle group to generate force or power during exercise. This phenomenon of 'muscle fatigue' has been extensively studied using surface electromyography (sEMG) during dynamic exercise. In most cases, the assessment of neuromuscular activity was confined to the analysis of sEMG amplitude as an indicator of integrated muscle activation (iEMG). Recent advances in EMG recording techniques, however, have enabled the exploration of a broader range of neuromuscular function parameters such as muscle fibre conduction velocity (MFCV). MFCV, however, has been exclusively characterised during dynamic, incremental exercise. We, therefore, investigated the temporal pattern of iEMG and MFCV during constant-workload exercise performed within the heavy- and severe-intensity domains.

Methods: Ten healthy, moderately trained adults participated in this study. After completing a ramp-incremental exercise test on a cycle-ergometer to determine gas exchange threshold (GET) and peak power output (POpeak), they returned to the laboratory to complete, in a randomised order, either a 30-min constant-load exercise bout in the heavy-intensity domain (15%Δ between GET and POpeak) or a time-to-exhaustion test in the severe-intensity domain (75%Δ). HD-sEMG signals from the vastus lateralis muscle were continuously recorded throughout each exercise session. MFCV was estimated using the cross-correlation method, and iEMG was computed. Both MFCV and iEMG were normalised to the initial 20 s of activity, which was defined as the baseline (100%).

Results: Linear mixed-effects model revealed that, compared to baseline, MFCV increased over time during heavy-intensity domain ($P < 0.01$), while it decreased during severe-intensity domain ($P < 0.01$). A significant main effect of exercise domains was observed ($P < 0.01$), along with a significant time $\times$ condition interaction ($P < 0.01$). In contrast, iEMG responses significantly increased over time in the severe-intensity domain ($P < 0.01$), but not during the heavy-intensity domain ($P = 0.28$), with no significant time $\times$ condition interaction ($P = 0.07$).

Conclusion: Our findings indicate that MFCV and iEMG exhibit distinct temporal patterns during constant-workload exercise in the

heavy- and severe-intensity domains. Further research exploring neuromuscular function during dynamic exercise should consider the intensity-dependent characteristics of these neuromuscular parameters.

OC103 - CORTICAL SIGNATURES ASSOCIATED WITH DECREASED RATE OF TORQUE DEVELOPMENT INDUCED BY REPEATED RAPID ISOMETRIC CONTRACTIONS

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Purpose: Fatigue is usually defined as a time-related loss of voluntary force-producing capacity, arising from peripheral or central alterations. Cortically, movements are preceded and accompanied by the Movement-Related Cortical Potential (MRCP), a slow potential detectable via electroencephalography (EEG), linked to voluntary actions and sensitive to fatigue. However, the role of electrocortical activity in the decline of rate of torque development (RTD) remains poorly understood in the current literature. The aim of the study is therefore to investigate cortical and peripheral changes induced by rapid isometric contractions.

Methods: Nineteen volunteers (10F, 9 M) performed 120 rapid isometric contractions with knee extensors while 64 channels EEG recorded cortical activity and high-density electromyography (HD-SEMG) recorded muscle activation of vastus lateralis and medialis. Torque expressed in 25 ms of time epochs (force25-150), root mean square (RMS), muscle fiber conduction velocity (CV) and MRCP potentials were quantified at each contraction. Before, and after the fatiguing task, participants performed maximal voluntary isometric contractions (MVC) to assess maximal voluntary torque (MVT) and electrical stimulations (M-wave and octet) were delivered to the femoral nerve allowed to assess fatigue at peripheral level. Data were divided into 4 equal-sized blocks: to assess fatigue, analysis focus on the top 20 contractions from each of the first (pre) and the last (post) block.

Results: In the post condition, both force production levels and RMS, normalized to MVT and M-wave amplitude, were significantly reduced ($p < 0.001$). M-wave normalized CV remained stable over time ($p = 0.6$) While evoked octet force, normalized to MVT, showed an increase ($p < 0.001$) in the post block. Lastly, neural efficacy (voluntary/octet force) significantly decreased ($p < 0.001$), and the amplitude of the MRCP was significantly reduced ($p < 0.001$) following the fatiguing task.

Conclusions: Results suggest that the task induced fatigue, as several variables showed a decline during the protocol. However, this does not appear to be due to peripheral fatigue, since CV remained stable whereas octet responses even increased during the protocol. Instead, it may be mainly explained by a reduced net neural drive, as shown by the decrease in neural efficacy. Finally, the reduction in MRCP amplitude may also reflect electrocortical involvement in central fatigue.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC104 - EXERCISING IN COLD AND HYPOXIC ENVIRONMENTS: THE EFFECTS ON CARDIAC AUTONOMIC RECOVERY RESPONSES

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Purpose: This study aimed to evaluate the independent and combined effects of hypoxia ($\text{FiO}_2 = 13.5\%$) and cold (-20°C) on heart rate recovery (HRR) responses to a discontinuous maximal incremental exercise test.

Methods: 14 trained males (age: 27 ± 2 years, $\text{VO}_{2\text{max}}$: 64 ± 5 mL/kg/min) randomly performed a discontinuous maximal incremental test (i.e., 4-min work and 2-min rest phases) on a motorized treadmill under four environmental conditions: Normothermic-Normoxia, Normothermic-Hypoxia, Cold-Normoxia, and Cold-Hypoxia. Starting speed was set at 30% of the maximal normoxic workload and increased by 10% per stage until volitional exhaustion. HRR responses were monitored throughout each exercise phase and analyzed in relation to lactate thresholds and volitional exhaustion.

Results: A main effect of hypoxia ($p < 0.001$) was observed on all investigated HRR responses, while neither cold exposure nor the cold $\times$ hypoxia interaction had a significant impact (all $p > 0.512$). Considering absolute exercise intensities, HRR30 was consistently reduced in hypoxia for each exercise phase (-15.3% , 95% CI $[-9.5, -21.2]$, ES = 0.37 small, $p < 0.001$), whilst HRR60 was reduced in hypoxia after the exercise phases at 70% (-18.8% , 95% CI $[-9.7, -27.7]$, ES = 0.76 moderate, $p < 0.001$) and 80% (-35% , 95% CI $[-25.2, -44.7]$, ES = 1.39 large, $p < 0.001$) of maximal normoxic workload (i.e., the last completed stage under hypoxic conditions). Considering relative exercise intensities, HRR30 (-30.3% , 95%CI $[-12.8, -47.8]$, ES = 0.72 moderate, $p < 0.001$) and HRR60 (-22.8% , 95%CI $[-11.8, -33.8]$, ES = 0.84 moderate, $p < 0.001$).

were reduced by hypoxia at the point of volitional exhaustion, but not at the first and second lactate threshold (all $p > 0.624$).

Conclusions: As previously described in the literature, the same absolute workload translates into delayed cardiac autonomic responses in hypoxia compared to normoxia, primarily due to the greater relative intensity in hypoxia. However, when workloads are appropriately normalized for their relative metabolic intensity, cardiac autonomic recovery is delayed in hypoxia only for intensities exceeding the second lactate threshold. Cold exposure does not appear to exert additive or interactive effects with hypoxia on HRR responses.

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OC105 - WEIGHT STATUS AND BASIC MOTOR COMPETENCE IN ITALIAN SCHOOLCHILDREN: INCLUSIVE ASSESSMENT APPROACHES

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Purpose: The global surge in childhood obesity presents a critical public health issue. Motor competence (MC), a pivotal factor in fostering physical activity engagement, is inversely related to obesity prevalence. Despite this, prior research often neglects comprehensive age ranges and inclusive frameworks. Basic motor competence (BMC), a foundational element of MC, is essential for participation in physical education and the development of advanced motor skills. An inclusive assessment framework that accounts for weight status may offer a more nuanced understanding of the BMC–obesity link.

Methods: We assessed BMC in a representative sample of 1,495 children, spanning preschool through grade 6 in Northern Italy, using the MOBAK instrument. Weight status was categorized via BMI z-scores. Associations between BMC and obesity risk were examined using adjusted logistic regression, while linear regression and bivariate analyses explored correlations between BMI z-scores and BMC domains. To enhance equity in assessment, we introduced BMI-normalized performance tables.

Results: BMC was inversely associated with obesity risk across sexes. The association was particularly strong for self-movement skills compared to object control. The most pronounced inverse relationships emerged in students from grades 3 to 5. Importantly, BMI normalization tables enabled more equitable evaluations, mitigating bias against children with higher BMI.

Conclusions: Our findings reinforce the inverse relationship between BMC and weight status and highlight the role of self-movement skills in obesity prevention strategies. Integrating BMI-based normalization in motor assessments represents a pivotal step toward inclusive and fair evaluation practices in school settings.

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OC106 - THE EUROPEAN PHYSICAL ACTIVITY DETERMINANTS FRAMEWORK FOR ADOLESCENT (EU-PAD-A): A MIXED-METHOD CONCEPT MAPPING STUDY

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Purpose: Most European adolescents do not meet recommended levels of physical activity (PA), thus increasing the risk of long-term health issues and contributing to the burden of non-communicable diseases. Since there is a need for evidence-based, age-specific frameworks to identify key determinants influencing PA behaviours during adolescence, this study aimed to develop a European Physical Activity Determinants for Adolescents (EU-PAD-A) conceptual framework and identify the most influential and modifiable determinants to inform public policies and interventions

Methods: The EU-PAD-A framework was developed using a group concept mapping approach involving over 300 multidisciplinary experts from 34 countries. 110 determinants were generated and subsequently analysed using Concept Systems® GroupWisdom™ software. Determinants were sorted into thematic categories based on perceived

similarities and rated for importance and modifiability on a 6-point Likert scale (1 = not important/not modifiable; 6 = very important/very modifiable). Multidimensional scaling and hierarchical cluster analysis organized the determinants into 9 thematic clusters. A two-step cluster analysis was applied to refine priorities, followed by a focus group (9 experts) to select the most actionable determinants. Finally, an online survey involving 60 policy makers and stakeholders assessed the potential impact and feasibility of implementing the top 10 determinants identified.

Results: 53% (n = 58) of the determinants were perceived high on both dimensions, with “Enjoyment” exhibiting the highest importance (mean 5.22) and “Knowledge/awareness of health benefits” the highest modifiability (mean 4.85). The most actionable determinant was “Availability of indoor and outdoor physical activity facilities”, showing the highest potential impact (61.7%) and feasibility (41.7%).

Conclusions: Results highlight school, family, and socio-cultural environments as critical settings for intervention. The EU-PAD-A framework offers a novel, interdisciplinary, and age-specific tool for understanding and addressing the complex drivers of adolescent physical activity. It provides concrete, consensus-based guidance for designing policies and programs that are feasible, impactful, and grounded on scientific evidence, an important step toward improving PA levels and reducing sedentary behaviour among adolescents across Europe.

OC107 - IS PLEASURE ENOUGH TO MOTIVATE EXERCISE? EXPLORING HOW ANTECEDENT APPRAISALS SHAPE CORE AFFECTIVE EXERCISE EXPERIENCES DIFFERENTLY BY GENDER

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Purpose: A growing body of research emphasizes the role of affective processes in shaping physical activity (PA) behavior, particularly in adolescence - a critical period for the formation of emotional associations with exercise. According to the Affective-Reflective Theory, PA behavior is driven by both reflective evaluations and affective valuations, the latter developing from repeated emotional responses to past activity. Affective Exercise Experiences (AFFEXX) represent the consciously accessible portion of affective valuation. According to this model, core affective exercise experiences (pleasure, energy, calmness) are informed by discrete antecedent appraisals, such as interest, competence, or honor. However, little is known about how these appraisals predict core affective responses, and whether these mechanisms differ by gender. Moreover, the model suggests that core affective experiences influence PA behavior indirectly, through the motivational orientation of attraction. This study investigated: (1) the role of cognitive antecedent appraisals in predicting core affective exercise experiences; (2) gender differences in these associations; and (3) whether the relationship between affective experiences and PA behavior is moderated by attraction.

Methods: Affective exercise experiences were assessed using the 36-item AFFEXX Questionnaire, with items rated between opposing statements about physical activity on a 7-point Likert scale. Weekly moderate and vigorous PA were calculated using the IPAQ-SF. Linear regression models tested whether antecedent appraisals predicted affective responses differently by gender. Moderation analyses examined whether attraction moderated the association between affective responses and PA behavior.

Results: A sample of 808 participants (age = 13 ± 1 ; 46% female) completed a battery of self-report measures. Interest ($b = 0.40$, $p < 0.001$), competence ($b = 0.35$, $p < 0.001$), and pride/honor ($b = 0.29$, $p < 0.001$) were significant predictors of pleasure. Gender moderated the effects of some appraisals on affect: for instance, competence predicted pleasure more strongly in females ($b = 0.40$) than in males ($b = 0.28$). Attraction significantly predicted vigorous PA ($b = 0.25$, $p < 0.001$), and moderated the relationship between pleasure and vigorous PA (interaction $b = 0.07$, $p = 0.014$). Simple slope analyses showed that the effect of pleasure on vigorous PA was significant at high levels of attraction ($b = 0.17$, $p = 0.019$), but not at low levels ($b = 0.02$, $p = 0.712$). No moderation effects were found for energy or calmness.

Conclusions: These findings highlight the importance of considering both gender-specific appraisal patterns and motivational orientations in understanding the affective basis of PA behavior. The interaction between pleasure and attraction may offer new insights for affectively informed intervention strategies.

OC108 - MENTAL HEALTH OUTCOMES OF SCHOOL-BASED PHYSICAL ACTIVITY INTERVENTIONS: FROM EVIDENCE TO EMINENCE

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Purpose: This study aims to synthesize reviews of physical activity (PA) interventions targeting mental health in children and adolescents. The specific objectives were: (1) to identify which types of PA interventions in different settings, with a special focus on the school setting, are most efficacious at three levels of prevention—universal, selective, indicated; and (2) to complement the information delivered by the scientific evidence synthesis with the priorities set and reported by a panel of expert scholars.

Methods: A meta-review of systematic reviews and meta-analyses of PA interventions for promoting mental health in school-aged children and adolescents was submitted to PROSPERO (ID 1067494) and is ongoing, following PRISMA-P guidelines. PICOS categories used for selection will also be used to guide data extraction. Reviews were selected from six databases, their overlap will be mapped, their quality assessed (AMSTAR-2), and subgroup syntheses will be performed as a function of moderators as participants' and PA characteristics and contexts. In parallel, an expert panel composed of 40 scholars with specific expertise contributes through structured online questionnaires, with a first round informing the development of the second round.

Results: *Meta-review.* From 7,967 records identified as potentially relevant (5,860 after duplicate removal), 360 were selected for full text screening and 126 included into the meta-review. Preliminary inspection reveals significant heterogeneity in how PA interventions are applied to children and adolescents and assessed across the levels of prevention, with only a minority of reviews targeting specifically the school setting. *Expert panel.* Subgroup syntheses, as well as the evaluation of the experts' feedback will be completed by the end of July 2025.

Conclusions: The discussion will focus on which type of PA interventions in which settings (with a special focus on schools) work for whom (with a special focus on neurodivergent populations), and which are eventual gaps in the literature with respect to the priorities indicated by experts. Also, the discussion will focus on research that encompasses physical health outcomes and their interconnectedness with those in the mental domain according to a holistic view on child and adolescent health.

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OC109 - EFFECTS OF A MOTOR PROGRAM BASED ON THE USE OF EXERGAMES ON GROSS MOTOR COORDINATION IN PRIMARY SCHOOL CHILDREN

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Purpose: The aim of this study is to assess the impact of a six-week motor program on the gross motor coordination (GMC) through the use of an exergame in 6–8-year children during academic hours.

Methods: Seventy-one children (6.69 ± 0.71 years; 36 girls, 24.99 ± 4.36 kg weight, 122.95 ± 5.99 cm height) were randomly assigned to an intervention group (IG; $n = 31$, 14 girls, 6.71 ± 0.59 years) and a control group (CG; $n = 40$, 22 girls, 6.67 ± 0.80 years) who did not perform any physical activity. Before the intervention, all children completed the Physical Activity Questionnaire for Children (PAQ-C) to evaluate their physical activity level. KTK3+ test battery was used to measure GMC before and after six-week period in both groups. The intervention performed by IG consisted of two 40-minute (min) sessions per week over a six-week period. Each session was organized in a 10-min-warming up phase, a 10-min-cooling down phase and a 20 min centrale phase in which dance sequences from “Just Dance” exergame, structured across three progressively intensive levels (low, medium, high), were performed. According to normality test results, t-test or Wilcoxon test for paired samples was used to evaluate significant differences within IG or CG, while ANCOVA test was used to assess significant differences for jumping sideways (JS), moving sideways (MS) and walking backward (WB) between IG and CG considering corresponding pre-intervention values as covariates. The significance was set with $p < .05$.

Results: PAQ-C results showed that IG and CG were physically inactive. Weight and height significantly increased in both groups after six-week period. GMC, JS, WB and eye-hand coordination (EHC) levels of IG were significantly higher in post-intervention than baseline, while these variables were unchanged in CG except for EHC after six-week period ($p < .030$). No significant differences were found in anthropometric measures (height, weight, BMI) between groups before and after the intervention. Post-intervention scores were significantly higher in IG than CG for jumping sideways ($p < .001$), moving sideways ($p < .001$), and walking backward ($p = .013$).

Conclusions: The CGM significant improvements in IG highlight the potential of interactive digital tools with recreational components as effective and engaging educational strategies in the school setting. These results support the integration of technology-based approaches within physical education programs to promote an active lifestyle in childhood.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC110 - EFFECTS OF A 4-WEEK TAEKWONDO PROGRAM ON MOTOR SKILLS AND PSYCHOLOGICAL VARIABLES IN MIDDLE SCHOOL STUDENTS

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Purpose: Physical activity in school settings is a valuable opportunity to promote motor, psychological, and social development during early adolescence (1). Martial arts such as Taekwondo integrate physical exercise with discipline, self-regulation, and emotional engagement (2). This study examined the effects of a four-week Taekwondo program on middle school students, focusing on motor skills,

executive functions, and psychological variables, including aggression and perceived fatigue.

Methods: Twenty-two middle school students (9 males, 13 females; age = 12.5 ± 0.7 years) participated in a four-week Taekwondo program. A single-group pre-post design was used. Anthropometric measures included weight, height, and BMI. Motor performance was assessed using the sit-and-reach test, 30-s sit-up test, vertical jump test, 30-m sprint test, and stroke stand test. Executive functions were measured through the Trail Making Test. Psychological variables were assessed using the Reactive-Proactive Aggression Questionnaire and the Rating of Perceived Exertion (RPE). Paired-samples t-tests were used for all pre-post comparisons. RPE values were analyzed using repeated-measures ANOVA.

Results: Significant improvements were found in the sit-up test ($\Delta = + 3.95$; $t(21) = - 6.22$; $p < 0.001$), vertical jump ($\Delta = + 7.50$ cm; $t(21) = - 7.73$; $p < 0.001$), and stroke stand test ($\Delta = + 8.55$; $t(21) = - 10.41$; $p < 0.001$). No significant changes were observed in the sprint or sit-and-reach tests. Trail Making Test results showed reduced completion times in both Part A (22.27 vs 15.82 s; $t(21) = 8.75$; $p < 0.001$) and Part B (28.32 vs 21.23 s; $t(21) = 6.09$; $p < 0.001$). Reactive and proactive aggression scores decreased significantly (reactive: 8.43 vs 5.10, $t(20) = 5.14$, $p < 0.001$; proactive: 3.00 vs 1.57, $t(20) = 2.62$, $p = 0.017$). RPE values varied significantly across sessions ($F(3,63) = 20.06$; $p < 0.001$), progressively decreasing (1.82, 2.27, 1.50, 1.09); post-hoc analysis confirmed differences, especially after session 2.

Conclusions: The four-week Taekwondo program produced significant improvements in motor performance (sit-up test, vertical jump test, and stroke stand test), executive functions, and psychological variables among middle school students. These findings suggest that Taekwondo is an effective physical activity to enhance not only physical fitness but also executive functions and emotional regulation in students during early adolescence. Incorporating martial arts into school physical education curricula may provide comprehensive benefits for the holistic development of youths.

References: Committee on Physical Activity, 2013. Linhares et al., 2022.

OC111 - QUALITY OF PHYSICAL EDUCATION. PHYSICAL ACTIVITY LEVELS AND PERCEIVED PHYSICAL SELF-EFFICACY IN RELATION TO MOTOR PERFORMANCE IN ADOLESCENTS

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Purpose: According to the World Health Organization, maintaining good physical and mental health in young people requires at least one hour of moderate to vigorous physical activity per day. During adolescence, regular physical activity—when supported by appropriate teaching methodologies—promotes the development of motor skills and perceived self-efficacy. In this context, UNESCO (2015) defines quality physical education as a planned, progressive, and inclusive learning experience that unfolds throughout the school years and serves as the foundation for sustained engagement in physical activity. This study aims to analyze the relationship between physical activity levels, perceived self-efficacy, and motor performance in adolescents, with particular attention to gender differences.

Methods: The study involved a sample of adolescents attending upper secondary schools in the province of Lecce, Italy. Two self-report instruments were administered: the Physical Activity Questionnaire for Adolescents (PAQ-A) to assess physical activity levels,

and the Perceived Physical Ability scale to measure physical self-efficacy. The motor performance tests included the Cooper test, standing long jump, 10 × 5 shuttle run, and sit-ups. In addition to descriptive statistics ($M \pm SD$), a two-way ANOVA (gender) was conducted to assess gender differences and correlations between motor variables and physical activity levels.

Results: The results showed statistically significant differences ($p < 0.05$) between males and females in all motor tests and in both self-report measures. Among females, the following correlations emerged: between self-efficacy and the 10 × 5 shuttle run ($r = -0.385$), between self-efficacy and standing long jump ($r = 0.331$) and between physical activity levels and the 10 × 5 shuttle run ($r = -0.318$). Among males, correlations were found between physical self-efficacy and the 10 × 5 shuttle run ($r = -0.318$), and between physical activity levels and sit-ups ($r = 0.408$).

Conclusions: The data confirm that perceived self-efficacy is a key cognitive factor in physical practice and motor development during adolescence. Beliefs in personal self-efficacy positively influence motivation, commitment, and perseverance, whereas sedentary lifestyles are associated with lower perceived competence and personal development. It is therefore crucial to adopt educational strategies that promote active and inclusive student engagement, while simultaneously fostering the development of motor skills and individual empowerment.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC112 - IDENTITY PROFILES OF ITALIAN STUDENT-ATHLETES AND THEIR LEVELS OF WELL-BEING

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Purpose: During their dual career pathways, student-athletes manage academic and athletic commitments thus developing different combinations of academic and athletic identity (Yukhymenko-Lescroart, 2024). The purpose of the present investigation is to cluster these different identities and to examine them in relation to satisfaction with academic and sport performance and well-being.

Methods: Two hundred twenty-three Italian student-athletes were involved in this study and completed a set of self-report measures: the Academic and Athletic Identity Scale (AAIS; Yukhymenko-Lescroart, 2014), two single items measuring the satisfaction with academic and sport performance (Arnold et al., 2017), the Athlete Psychological Well-Being Inventory (APWBI; Santi et al., 2024), and the Mental Health Continuum-Short Form measuring subjective, social and psychological well-being (MHC-SF; Keyes, 2002). Cluster analysis allowed to group participants according to their identity profiles, then three ANOVAs and one MANOVAs were run to observe difference in terms of satisfaction with performance and well-being.

Results: Cluster analysis revealed four clusters with committed student-athletes ($n = 79$), committed athletes and disengaged students ($n = 28$), committed students and disengaged athletes ($n = 39$), and disengaged student-athletes ($n = 77$). These four clusters differed in terms of satisfaction with academic ($p < 0.001$) and sport ($p < 0.001$) performances, precursors of well-being, athletic well-being ($p < 0.001$), and mental health ($p = 0.001$), with disengagement being generally prodromal of decreased satisfaction and poor well-being in one or more areas.

Conclusions: In conclusion, the present study shed light on how different identity profiles lead to diverse conditions of well-being and may suggest directions for intervention. In particular, student-athletes committed to both sport and studies show greater satisfaction with sport and academic achievements and higher levels of well-being. Being committed to one between sport and studies leads anyway to high levels of well-being. Being disengaged on both sport and studies leads to dissatisfaction with one's own sport and academic achievements and poor levels of well-being.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC113 - EFFECTS OF A METABOLIC PROTOCOL ON FATIGUE PERCEPTION AND PERFORMANCE AWARENESS IN FEMALE ARTISTIC GYMNASTICS

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Background: Women's artistic gymnastics is a discipline with a high metabolic demand, characterised by explosive efforts and periods of active recovery. In this context, the aerobic component is essential to sustain the prolonged workload, despite the predominance of anaerobic systems. However, young gymnasts themselves have rarely been directly involved in assessing their perception of fatigue and awareness of their personal aptitudes.

Purpose: The aim of the present study is to assess the effectiveness of a metabolic protocol focused on the adaptation of the aerobic system, on the perceptual increase in fatigue tolerance, and on the awareness of athletic aptitudes in artistic gymnastics.

Methods: The protocol was applied to 12 competitive gymnasts (aged 9–14) who integrated it into their regular technical training. The main assessment tool was the AGSET test, used to evaluate sport-specific endurance in artistic gymnastics. Data were collected both through objective physiological measurements, such as maximum heart rate and maximal aerobic speed (MAS), and through qualitative-quantitative questionnaires. A pre-post experimental design with a single group was used. The protocol involved the execution of circuits consisting of Jumping Jacks and Burpees, performed over four weeks, with an intensity ranging between zones 2 and 3 according to Bompa and Buzzichelli. The exercises were selected to stimulate choreographic and power components, respectively, which are typical of the discipline. The final assessment included a repeat of the AGSET test and the administration of the same qualitative questionnaire.

Results: The statistical analysis revealed significant improvements. In particular, an average reduction in maximum heart rate of 5.84% ($p = 0.004$) was observed, along with an increase in maximal aerobic speed of 4.85% ($p = 0.046$), a reduction in perceived fatigue of 11.03% ($p = 0.004$), and an increase in performance awareness of 11.47% ($p = .023$).

Conclusions: From a practical perspective, the protocol proved effective not only in improving physiological parameters, but also in enhancing the athletes' psychophysical well-being, with a direct impact on their perception of fatigue and awareness of their own abilities, thereby supporting a more effective approach to performance.

OC114 - ASSESSING FEASIBILITY AND PRELIMINARY EFFECTS OF A 30–30 HIGH-INTENSITY INTERVAL TRAINING PROGRAM: A PILOT STUDY IN PEOPLE WITH MULTIPLE SCLEROSIS

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Purpose: Reduced endurance is common in multiple sclerosis (MS), affecting motor performance and quality of life. Although high-intensity interval training (HIIT) is promising, early fatigability may limit its effectiveness in people with MS (PwMS). This pilot study (i) evaluates feasibility and preliminary effects of a novel 30 s–30 s HIIT paradigm to reduce fatigability and improve aerobic fitness, (ii) explores links between fatigue, fatigability, cortical excitability/inhibition, and interoception in PwMS with mild disability compared to healthy controls (HC).

Methods: In the first phase, we enrolled both PwMS and HC. Baseline assessment included: cardiopulmonary exercise test (CPET), 6-min walking test (6MWT), fatigue (Modified Fatigue Impact Scale-MFIS), fatigability (Pittsburgh Fatigability Scale), daily-life physical activity (International Physical Activity Questionnaire-IPAQ) and interoceptive accuracy via heartbeat tracking task. Cortical excitability/inhibition was measured using Transcranial Magnetic Stimulation. The second phase included only PwMS and consisted in 20 HIIT supervised sessions of 30 s intervals at 90%Pmax alternated with 30 s recovery at 45%Pmax (20 min/session). Evaluations were repeated after the intervention period.

Results: At baseline, N = 19 PwMS (EDSS: 1.95 ± 0.94) showed reduced 6MWT performance ($p = 0.001$) and greater physical fatigability ($p < 0.01$) than N = 20 HC. They showed significant correlations between fatigability and both decreased excitability ($r = -0.59$) and increased inhibition ($r = 0.53$). Moreover, PwMS interoceptive accuracy was strongly associated with cortical inhibition ($r = -0.81$). Three PwMS completed the training. After the intervention, they seemed to improve CPET parameters (VO_{2peak} : PRE = 19.3 ± 6.2 mL/kg/min; POST = 23.1 ± 3.2 mL/kg/min; HRpeak: PRE = 140.0 ± 10.1 bpm, POST = 150.0 ± 6.1 bpm, Pmax: PRE = 86 ± 36 W, POST = 105 ± 13 W), 6MWT (PRE = 465 ± 11 m, POST = 472 ± 24 m), IPAQ (PRE = 558.3 ± 756.4 MET-min, POST = 2786.2 ± 1584.3 MET-min) and interoceptive accuracy (PRE = 0.53 ± 0.1 , POST = 0.66 ± 0.1). MFIS appeared reduced after the intervention (PRE = 40.7 ± 10.5 , POST = 28.3 ± 21.7), as well as cortical excitability. No adverse events were reported.

Conclusions: The 30–30 s HIIT paradigm is a novel, feasible, and promising approach which may enhance aerobic capacity and reduce perceived fatigue in PwMS. Its potential to modulate factors related to endurance and fatigability, as neurophysiological and interoceptive mechanisms, supports further investigation in larger studies.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC115 - THE ROLE OF MUSCLE CAPILLARIZATION IN RESISTANCE TRAINING: A PREDICTOR OF ADAPTATION OR A REACTIVE MECHANISM?

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Purpose: In recent years, muscle capillarization has been proposed as a potential determinant of hypertrophic adaptation to resistance training (RET), especially in older adults. Adequate capillary supply may support muscle remodelling by facilitating oxygen, nutrient, and hormone delivery during and after RET. The aim of this study was to explore whether baseline levels of muscle capillarization can predict the hypertrophic response to RET in a heterogeneous cohort including both young and older adults, with and without metabolic impairments.

Methods: A cohort of 52 individuals (14 young adults and 38 older adults, including 8 with type 2 diabetes) underwent 12 weeks of progressive resistance training at 70–80% of 1RM. Muscle biopsies were obtained before and after the intervention to assess muscle capillary indices and fiber dimension (CSA). Muscle hypertrophy outcomes were assessed via DEXA.

Results: Linear regression analysis revealed a significant correlation ($p = 0.02$) between baseline capillary-to-fiber perimeter exchange index (CFPE index) and the increase in lower-limb muscle mass, explaining approximately 11% of the hypertrophic adaptation. However, when stratifying the cohort by the median baseline CFPE into LOW and HIGH capillarization groups, no significant main effect of capillarization level was detected. Nevertheless, hypertrophic gains appeared to be primarily driven by individuals in the HIGH capillarization group (i.e. fiber CSA: +30% in HIGH vs +19% in LOW; Leg lean mass: +4% in HIGH vs +2% in LOW). Notably, those with initially lower capillarization showed a significant increase in muscle capillary density following training (+24%, $p = 0.002$), an effect not observed in the HIGH capillarization group (+2%, $p > 0.05$).

Conclusions: These findings suggest that muscle capillary proliferation is a necessary adaptation to resistance training, particularly in individuals with low baseline capillarization. However, capillarization alone does not appear to be a strong standalone predictor of hypertrophic response to RET.

OC116 - ECCENTRIC CYCLING IN OLDER ADULTS WITH HEART FAILURE AND SARCOPENIA: FINDINGS FROM A 12-WEEK INTERVENTION

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Purpose: Sarcopenia and heart failure (HF) often coexist in older adults, compounding physical decline and functional limitations 1.

Eccentric cycling (EC), which delivers high mechanical load with low metabolic cost, may be particularly suited for individuals with limited exercise tolerance 2. However, evidence of its effects in those with both HF and sarcopenia remains scarce 2. This study aims to evaluate the efficacy of a 12-week EC intervention targeting sarcopenia-related outcomes (i.e., body composition and physical function) in this population.

Methods: Participants (N = 12, males and females, aged 60–85 years) with stable HF (NYHA I–III) and diagnosed sarcopenia, sarcopenic obesity, or pre-sarcopenia (3, 4) were enrolled. Assessments included anthropometrics (body mass index, waist (WC) and calf circumferences), body composition (total lean mass (LM), appendicular lean mass (ALM)), phase angle, muscle strength (handgrip, five chair stands (5CS)), muscle endurance (30 s chair stand (30 s-CS), 30 s arm curl (30 s-AC)), physical performance (Short Physical Performance Battery (SPPB)), and cardiovascular capacity (six-minute walk test). After a two-week familiarization period, participants completed supervised EC sessions (20–30 min, 2–3 × /week) for 12 weeks using a motorized ergometer (Cyclus 2), with training intensity guided by rate perceived exertion (10–14) and individualized progression.

Results: One participant withdrew. Among 11 completers (4 with sarcopenic obesity, 6 sarcopenic, 2 pre-sarcopenic), WC decreased significantly (-1.6% , $p < 0.01$), and total LM and ALM increased by 1.12% and 2.10%, respectively (both $p < 0.05$). Of the functional tests, only 5CS performance improved significantly (-15.2% time, $p < 0.001$), although non-significant increases were observed in the SPPB total score ($+5.6\%$), 30 s-CS ($+10\%$), and 30 s-AC ($+12\%$). No other significant changes were noted in the remaining outcomes.

Conclusions: These preliminary results indicate that a 12-week eccentric cycling (EC) program led to improvements in specific sarcopenia-related outcomes (i.e., muscle mass and certain functional parameters) in older adults with HF and sarcopenia. The combination of low cardiovascular strain and high mechanical load in EC may foster muscle hypertrophy and neuromuscular adaptations, supporting its potential as a targeted intervention in this population. Larger, controlled trials are needed to confirm its efficacy and clinical relevance.

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OC117 - REVISING BMI CUT-OFF POINTS FOR OVERWEIGHT AND OBESITY IN ATHLETES

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Purpose: In athletes, body composition is typically marked by substantial muscle mass and low levels of body fat (BF). As a result, elevated Body Mass Index (BMI) values in this population may reflect increased muscularity rather than excess adiposity. This study aimed to assess the suitability of the World Health Organization (WHO) BMI thresholds for overweight ($\geq 25 \text{ kg/m}^2$) and obesity ($\geq 30 \text{ kg/m}^2$) in able-bodied and Paralympic athletes involved in a range of sports in Italy.

Methods: In the first phase of the study, a total of 622 young adult male athletes (mean age 25.7 ± 4.7 years) were included. Participants were initially categorized using the WHO BMI classification and then reclassified according to adiposity levels, as determined by total body fat percentage (BF%) measured through dual-energy X-ray absorptiometry (DXA). A multivariable modeling strategy was employed to develop a predictive equation aimed at identifying the most appropriate BMI cut-off values for diagnosing overweight and obesity in this athletic population. The level of agreement between classification methods was assessed using the kappa (κ) statistic.

Results: Based on the WHO BMI classification, 451 athletes (72.5%) fell within the normal weight range, 148 (23.8%) were classified as overweight, and 23 (3.7%) as obese. However, when classification was based on total body fat percentage (BF%), 598 athletes (96.1%) were considered to have normal weight, while only 19 (3.1%) and 5 (0.8%) were identified as overweight and obese, respectively. These findings highlight a weak concordance between the BMI- and BF%-based classification systems ($\kappa = 0.169$). In contrast, newly identified BMI cut-off values ($\geq 28.2 \text{ kg/m}^2$ for overweight and $\geq 33.7 \text{ kg/m}^2$ for obesity) demonstrated a stronger alignment with BF%-based classifications, with a kappa statistic of 0.522.

Conclusions: The BMI thresholds currently recommended by the WHO are not appropriate for assessing weight status in young male athletes. Given the strong performance of the newly proposed cut-offs, their inclusion in future guideline revisions is warranted. A similar approach has been applied in the second part of the study, where we are conducting comparable analyses to evaluate whether the standard WHO BMI cut-offs accurately reflect weight status in other athletic populations, with particular attention to athletes with physical impairments.

OC118 - ROWING IN BREAST CANCER SURVIVORS: EVALUATING METABOLIC AND PERCEPTUAL RESPONSES FOR ACCURATE PRESCRIPTION

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Purpose: Epidemiological evidence indicates that cancer patients, who follow a comprehensive rehabilitation program, tend to experience better outcomes after surgery and adjuvant therapy¹. Numerous studies have demonstrated the benefits of physical activity (PA), including rowing^{2,3}. However, no studies to date have specifically evaluated whether recreational rowing meets the recommended intensity guidelines for breast cancer survivors, thereby limiting its integration into evidence-based exercise prescription for this population. No study has furthermore measured energy expenditure (EE) and perceived exertion during and after recreational rowing.

Methods: Nineteen breast cancer survivors (age: 56.16 ± 6.30 years; BMI: $24.58 \pm 2.81 \text{ kg/m}^2$; cancer stage I, II, or III; time since surgery ranging from 3 to 230 months) participated in a 30-min session

of recreational self-paced coxed double sculling at an average speed of 4.5 ± 0.8 km/h. Metabolic parameters were monitored using a portable metabolic system (K5, Cosmed, Italy). The rating of perceived exertion (RPE) scale (Borg CR-10) was administered at the end of the session (after 30 min).

Results: The average metabolic equivalent of task (MET) was 4.2 ± 1.1 , corresponding to a moderate intensity (3–6 METs). The average EE was 4.7 ± 1.2 kcal/min, corresponding to an estimated 280 kcal/h when extrapolated to a full hour. Caloric contribution per minute was estimated at 1.1 ± 0.8 kcal/min from fat oxidation and 3.8 ± 1.4 kcal/min from carbohydrate oxidation. The average RPE was 2.5 ± 1.2 , corresponding to a light intensity (1–3 RPE).

Conclusions: In our research project *Effect and efficacy of Rowing in breast CancEr survivors/The Same Boat (ERICE/TSB)*, the exercise protocol included one session of recreational rowing, one walking session, and two sessions of resistance training per week, each lasting one hour, with corresponding MET values of 4.2 (our data), 3.5, and 2.8 (Compendium of PA), respectively. The total weekly volume amounted to 798 MET-minutes. This protocol offers a feasible approach for exercise prescription and aligns with the recommended weekly target of 500–1000 MET-minutes per week¹.

Based on our findings, recreational rowing meets the criteria for moderate-intensity exercise and can be safely performed by breast cancer survivors. Finally, characterizing EE and RPE components may also promote personalized intervention strategies.

References:

¹Stefani et al., 2017.

²Real-Pérez et al., 2025.

³Moro et al., 2024.

activity, average walking speed (WS) registered during the test and estimated cardiorespiratory fitness (VO_{2peak}) assessed during each visit.

Results: Physical activity levels significantly increased and were maintained during the follow-up period (median MET-h/week 3.0, 12.0, and 9.0 at baseline, 6-, and 12 months, respectively; $p < 0.0001$). These results were associated with increasing mean WS (2.9, 3.9, 4.1 km/h, respectively, $p < 0.0001$), and VO_{2peak} (16.9, 20.0, 20.5 mL/kg/min, respectively, $p < 0.0001$).

Conclusions: The proposed intervention demonstrated a stable adherence to physically active lifestyle, along with improved walking speed and estimated VO_{2peak} in older patients with ACS. Results therefore highlight the importance of exercise testing and training and provide important information for the development of more efficient and patient-centered exercise-based secondary prevention programs.

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OC119 - STABLE IMPROVEMENT OF OLDER OUTPATIENTS WITH ACUTE CORONARY SYNDROME AFTER ONE YEAR OF EXERCISE-BASED SECONDARY PREVENTION PROGRAM. INSIGHTS FROM THE ITER REGISTRY

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Purpose: Among cardiovascular diseases, acute coronary syndrome (ACS) is the leading cause of morbidity and mortality. Cardiac rehabilitation and secondary prevention programs are highly recommended for the long-term management of patients, and physical activity has been recognized as core part of such interventions. However, despite the documented benefits, older patients diagnosed with acute coronary syndrome (ACS) are less likely to attend traditional center-based programs limiting the efficacy of the intervention. Therefore, more comprehensive and sustainable intervention strategies are advocated. In light of these considerations, the aim of the study was to examine functional changes of older patients with ACS involved in a hybrid center- and home-based secondary prevention program during the first year of intervention after the acute event.

Methods: A subsample of 254 consecutive patients (mean age 75 years) with ACS extracted from the ITER registry (NCT05817305) was analyzed. The intervention was composed of 6 individual on-site sessions including functional evaluation and continuous motivational reinforcement to reach exercise goals and stably maintain an active lifestyle. The home-based exercise prescription was based on the results of the validated 1 km-Treadmill Walking Test. Main outcomes were changes in self-reported weekly physical

OC120 - THE INTER AND INTRAINDIVIDUAL VARIABILITY OF THE GLUCOSE RESPONSE TO EXERCISE: A CROSS-OVER REPLICATE TRIAL

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Purpose: Continuous glucose monitoring (CGM) provides new insights for understanding glucose fluctuations in response to physiological stressors such as exercise and nutrition. Most research focuses on the variability of the glucose response to different nutrition conditions. With regard to exercise, it has been suggested that consuming carbohydrate before exercise could elicit a hypo-glycaemic response. However, the evidence for this is limited and the reproducibility of such a response has not been investigated, complicating personalized exercise prescriptions. This study aims to investigate the intra- and inter-individual variability in the acute glycaemic response to exercise in healthy individuals.

Methods: The study is a non-blinded randomized crossover trial with replicate rest and exercise conditions. Each participant completed a baseline visit followed by four test visits involving either: (1) a standardised test meal (60 g carbohydrate) + exercise (EX): a 30-min cycling session at 110% of ventilatory threshold, or (2) an identical test meal + rest (REST). Glucose levels were recorded for 2 h post-meal using both CGM and capillary blood sampling. Incremental area under the curve (iAUC) was analyzed using Pearson's correlations (inter-individual variability) and paired t-tests (intra-individual

variability). Incidents of hypoglycemia (< 3.9 mmol/L) were also recorded.

Results: Twelve healthy participants (9 male, 3 female) completed the trial. Glucose responses to exercise showed poor inter-individual reproducibility and high intra-individual variability, especially in CGM-derived iAUC values. Despite identical testing conditions, replicates differed markedly (e.g., CGM iAUC: -185 to 354 vs -75 to 131 mmol/L). Hypoglycemia occurred in several participants, though incidence varied by method (CG: 8 vs CGM: 4), likely reflecting CGM's lower sensitivity.

These findings question the reliability of single tests for personalized recommendations and align with prior work showing variability even under controlled conditions. A replicate crossover design strengthens the study's ability to detect true physiological differences.

Conclusions: Marked intra-individual variability and CGM limitations highlight challenges in using single tests for personalized exercise or nutrition advice. Frequent hypoglycemia in non-diabetic adults reveals under-recognized risks of postprandial activity. This study contributes to ongoing research on optimizing glucose management across populations, including those with and without Type 1 diabetes.

Acknowledgments: This study was supported by Innovation Zed LTD for providing materials and Research Ireland for funding (EBPPG/2023/627).

OC121 - STUDY OF PHYSICAL ACTIVITY, SLEEP, AND NUTRITION IN YOUNG STUDENTS WITH INTELLECTUAL DISABILITIES

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Purpose: Regular physical activity, adequate sleep, and a balanced diet are crucial for individuals with Intellectual Disabilities (ID) to mitigate the risk of comorbidities, prevent malnutrition, overweight, and obesity, and improve associated challenging behaviors and symptoms. This study aims to gather comprehensive data on these lifestyle factors in individuals with ID, thereby expanding current knowledge and generating insights to enhance their societal quality of life.

Methods: A validated questionnaire, developed by the University of Cambridge and subsequently validated in its Italian translation, was administered to 58 students from two upper secondary schools in the province of Padua, Italy. The sample included 18 individuals with ID (diagnoses of Down syndrome, Autism Spectrum Disorder and Cognitive-Relational Delay) and 40 typically developing (TD) peers, aged 15–20 years and spanning grades 1–5.

Results: No statistically significant differences were observed between the two groups for subjective variables such as gender, age, and Body Mass Index (BMI). Both the frequency and duration of physical activity were significantly higher in the TD group. Individuals with ID reported shorter sleep durations but superior sleep quality compared to their TD peers, who experienced longer sleep durations but lower quality. Dietary patterns were generally similar between the groups, with the notable exception of water intake; individuals with ID consumed significantly less water than TD individuals. Limitations include a sample primarily composed of high school students residing in Padua, which may limit generalizability. Furthermore, the small subgroup sample sizes precluded comparative analyses based on specific ID types or gender.

Conclusions: Our findings underscore the importance of promoting increased physical activity among individuals with ID, addressing sleep quantity while maintaining good sleep quality, and supporting adherence to dietary guidelines, particularly regarding hydration. The results partially align with limited existing research. More data is needed to guide health promotion interventions for those with ID.

Acknowledgments: (non obbligatorio).

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OC122 - ENHANCING MOTOR COORDINATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: THE IMPACT OF EXTRA-CURRICULAR SPORT TRAINING PROGRAM

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Purpose: Children with Autism Spectrum Disorders (ASD) are characterized by notable impairments in motor skills, which can significantly hinder their independence and increase their reliance on caregivers. In addition, children with ASD are generally more sedentary, which negatively affects their physical and cognitive development and further limits opportunities for motor skill improvement and social interaction. Given these challenges, the present study aimed to investigate the effects of a targeted, extra-curricular sport training program on motor coordination and overall functioning in children with ASD.

Methods: Fifty primary school children with ASD (ages 9.1 ± 1.7 years; 8 females) participated in a six-month self-chosen sport-based training program (i.e., swimming, team sports, individual sports). Before and after the program, total reaction time was evaluated using a simple (by identifying the targeted stimulus) and complex (by discriminating the targeted stimulus among confounding signals) reaction test, while fine and gross motor coordination was assessed by transferring pennies, jumping in place-same sides synchronized, tapping feet and fingers-same side synchronized, and the Flamingo test.

Results: The preliminary analysis (from 23 children) showed a significant reduction in total time for the simple (pre: 9.1 ± 4.6 s; post: 7.4 ± 2.9 s; $p = 0.007$; $d = 0.44$) and complex reaction test (pre: 11.5 ± 5 s; post: 9.7 ± 4.1 s; $p = 0.016$; $d = 0.39$). Similarly, the Tapping feet and fingers (right side) test approached a significant increase in performance (pre: 4.9 ± 3.3 pt; post: 6.6 ± 3.4 pt; $p = 0.052$; $d = 0.50$). Additionally, a significant increase ($p = 0.019$, $d = 0.47$) emerged for the performance of Transferring pennies test

(pre: 7.1 ± 3.7 pt; post: 8.9 ± 3.9 pt.). No significant differences emerged for the remaining tests.

Conclusions: An extra-curricular sport-based training program showed promising beneficial effects in children with ASD. Furthermore, among the proposed evaluations, the reaction test and the Transferring pennies test appeared to be especially effective at identifying progress, particularly in low-functioning children with ASD. These results underline the importance of participating in physical activity and sport programs during the developmental stage of children with ASD.

OC123 - EFFECTS OF A 10-DAY KETOGENIC DIET ON BODY COMPOSITION, FAT OXIDATION, ENDURANCE PERFORMANCE, MUSCLE GLYCOGEN, AND PREFRONTAL HEMODYNAMIC RESPONSES IN ENDURANCE-TRAINED ATHLETES

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Purpose: Although ketogenic diets (KDs) have gained popularity in endurance sports due to their potential to enhance fat oxidation and possibly spare muscle glycogen, their effects on performance remain controversial. On the other hand, the impact of short-term KD adaptation on muscle glycogen availability and high-intensity endurance performance has been poorly investigated. Furthermore, the proposed ergogenic effects of nutritional ketosis—through increased fat and ketone utilization and reduced fatigue perception—are still debated. This study aimed to investigate the effects of a 10-day KD on (1) metabolic and physiological adaptations during a glycogen depletion protocol, and (2) subsequent high-intensity endurance performance under glycogen-depleted conditions in endurance-trained athletes.

Methods: Fourteen endurance-trained athletes (age: 29.1 ± 5.4 years; $\dot{V}O_{2\max}$: 57.7 ± 7.4 mL/kg/min) completed a 7-day standardized diet (50% CHO, 2.0 g/kg/day protein) and were then randomized to either a KD (< 5% CHO, 2.0 g/kg/day protein) or a control diet (CD; 55% CHO, 2.0 g/kg/day protein) for 10 days while maintaining regular training. Body composition was measured pre- and post-intervention via DXA and BIA. After an overnight fast, participants performed a 2-h cycling protocol at 55% of peak power output to induce glycogen depletion. Respiratory quotient (RQ) and substrate utilization were measured every 15 min using a metabolic cart. Pre- and post-exercise muscle biopsies (vastus lateralis) were obtained to assess glycogen content. High-intensity performance was assessed with a time-to-exhaustion (TTE) test using an incremental protocol. Functional near-infrared spectroscopy (fNIRS) was used to evaluate prefrontal cortex hemodynamics during exercise.

Results: Preliminary data showed that KD led to significant reductions in total body water (− 3% vs. + 0.8%), intracellular water (− 3% vs. + 0.9%), and body mass (− 3% vs. + 0.5%) compared to CD. Fat oxidation during exercise increased markedly in the KD group (+ 102%) versus CD (− 2%), but gross efficiency declined (− 2% vs. + 0.3%). TTE was reduced in the KD group (− 7 min vs. + 7 min), indicating impaired high-intensity performance.

Conclusions: Short-term KD adaptation enhances fat oxidation and reduces body water and body mass but may impair exercise efficiency and high-intensity endurance performance. Increased sample size and ongoing analyses of muscle glycogen content and prefrontal cortex hemodynamics will provide further insights into the physiological mechanisms underlying these observations.

OC124 - EFFECTS OF A 6-MONTH MULTICOMPONENT TRAINING ON PSYCHOLOGICAL DISTRESS AND COPING STRATEGIES IN CANCER SURVIVORS: A RANDOMIZED CONTROLLED STUDY

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Purpose: Multicomponent training (MT) has demonstrated effectiveness in reducing anxiety, depression, and cancer-related fatigue among cancer survivors. Beyond its physiological benefits, MT may exert psychologically active effects by enhancing adaptive coping resources. This study aimed to assess whether MT leads to improvements in psychological symptoms and whether these improvements are associated with changes in coping strategies.

Methods: A randomized controlled longitudinal study was conducted with 31 cancer survivors (mean age = 63.2 ± 8.9 years; 62% female), who were assigned to either a multicomponent training group (MTG; n = 16), participating in a structured 6-month program (aerobic, resistance, flexibility, and breathing exercises; 60 min, twice weekly), or a wait-list control group (CG; n = 15) with no structured physical activity. Psychological outcomes were measured at baseline (T0) and post-intervention (T1) using the State-Trait Anxiety Inventory (STAI-Y), Beck Depression Inventory (BDI), Fatigue Severity Scale (FSS), and Brief COPE questionnaire.

Results: Compared to the CG, participants in the MTG showed significantly greater reductions in anxiety, depression, and fatigue, along with improvements in adaptive coping strategies (all $p < 0.001$). Within the MTG, regression analyses on change scores (Δ) revealed that increases in adaptive coping significantly predicted reductions in anxiety ($\beta = -4.86$, $p < 0.05$), depressive symptoms ($\beta = -4.16$, $p < 0.01$), and fatigue ($\beta = -2.75$, $p < 0.05$).

Conclusions: MT emerges as a psychologically active intervention, capable of promoting both symptom relief, namely reductions in anxiety, depression, and fatigue, and meaningful changes in coping strategies. These improvements play a crucial role in supporting psychological adjustment among cancer survivors, reinforcing the value of MT as a key component of integrated, non-pharmacological survivorship care. Future research should explore the long-term sustainability of these psychological benefits, examine underlying neuropsychological mechanisms, and assess the scalability of MT protocols across different cancer populations and care settings.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC125 - ASSOCIATION BETWEEN ACCELEROMETRY-DERIVED PHYSICAL BEHAVIOUR PROFILES AND FUNCTIONAL FITNESS IN OLDER ADULTS

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Purpose: Traditional variable-centred approaches often analyse physical behaviours (sedentary behaviour [SB], light physical activity [LPA], moderate-to-vigorous physical activity [MVPA]) in isolation, potentially masking the impacts of their interplay. This study applied latent profile analysis, a person-centred approach, to identify distinct physical behaviour profiles in older adults and examined their associations with measures of functional fitness.

Methods: This cross-sectional study included 1,095 older Portuguese adults (≥ 65 years; 765 females). SB, LPA, and MVPA were assessed using accelerometry and expressed as percentages of waking time. Latent profile analysis was used to identify distinct profiles of physical behaviours based on these percentages. Functional fitness was evaluated objectively using the Senior Fitness Test battery and subjectively using the 12-item Composite Physical Function questionnaire. Generalised linear models, adjusted for age, were used to examine associations between profiles and functional fitness outcomes. The significance level was set at $p < 0.05$.

Results: Three distinct profiles emerged for both sexes: "balanced movers" ($\sim 50\%$ SB, $\sim 46\%$ LPA, $\sim 4\%$ MVPA), "intermediate movers" ($\sim 66\%$ SB, $\sim 32\%$ LPA, $\sim 2\%$ MVPA), and "highly sedentary" ($\sim 80\%$ SB, $\sim 20\%$ LPA, $< 1\%$ MVPA). The generalised linear models revealed a significant association between physical behaviour profiles and functional fitness outcomes, for both females and males. Compared to the "highly sedentary" groups, both the "balanced movers" and "intermediate movers" groups demonstrated better performance in functional fitness tests and reported higher physical function. Notably, the "intermediate movers" groups performed similarly to the "balanced movers" groups in most functional fitness tests.

Conclusions: The application of a person-centred approach, utilising latent profile analysis, provides valuable insights into complex behavioural patterns that may be obscured by traditional variable-centred analyses. Our findings reveal the existence of distinct physical behaviour profiles among older Portuguese adults. Specifically, profiles characterized by lower SB and higher LPA, even when MVPA recommendations were not fully met (e.g., the "intermediate movers" profile), were associated with superior functional fitness compared to the "highly sedentary" profile. These results underscore the critical importance of reducing SB and promoting LPA alongside MVPA for enhancing functional fitness in older adults.

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OC126 - EMOTIONAL AND RESTORATIVE EFFECTS OF VIRTUAL REALITY AND OUTDOOR EXCURSIONS IN ONCOLOGY PATIENTS

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Purpose: This study investigates the emotional impact and perceived restorativeness of immersive virtual reality (VR) and outdoor excursions in female oncology patients. Considering the emotional vulnerability linked to diagnosis, treatment and recovery phases, this study explores how these two approaches may support affective regulation during different stages of the oncological treatment path. VR sessions were conducted in three contexts: pre-surgery, post-surgery and during acupuncture. Group excursions included patients, companions and healthcare staff.

Methods: A total of 209 participants completed the Positive and Negative Affect Schedule (PANAS) questionnaire immediately before and after the VR session ($n = 62$) or excursions ($n = 147$) to assess emotional state. The Perceived Restorativeness Scale (PRS) questionnaire was administered after the experience to measure perceived restorativeness. One-way ANOVAs and repeated measure ANOVAs were used to evaluate the differences in affect and PRS scores across roles and over time.

Results: VR participants reported significantly lower positive affect and higher negative affect at baseline compared to excursion participants ($p < 0.001$). After the experiences, all groups showed an increase in positive affect ($p < 0.001$). However, only the VR groups, especially pre- and post-surgical patients, showed a significant reduction in negative affect ($p < 0.001$), while excursion participants reported an increase. PRS scores significantly varied by role ($p < 0.001$), with higher restorativeness reported by excursion participants and acupuncture VR patients. The group $\times$ time interaction revealed that excursions were more effective in enhancing positive affect ($p = 0.038$), whereas VR was more effective in reducing negative affect ($p < 0.001$).

Conclusions: The findings suggest that both immersive VR and outdoor excursions provided measurable emotional and restorative benefits when integrated in oncological care. Excursion supported the increase of positive emotions and perceived restorativeness, while VR immersion proved more effective in mitigating negative emotions. These complementary interventions represent promising and accessible tools in integrated oncological strategies to support the psychological wellbeing throughout the cancer treatment path.

OC127 - ENERGETIC OPTIMIZATION OF STRIDE FREQUENCY DURING FLAT AND UPHILL WALKING IN YOUNG ADULTS

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Purpose: At flat terrain, the metabolic cost is lower at a self-selected stride frequency (SSSF) and length (Minetti et al., 1995). While the pendulum-like mechanism primarily explains this specific adjustment at the level gradient (Peyré-Tartaruga et al., 2021), the possible

energetic optimization at the uphill gradient is a significant area that requires further exploration (Gomeñuka et al., 2014). We aimed to evaluate the ventilatory and metabolic responses at different SSSF during flat and uphill slopes. We expected that the behavioral attribute of stride frequency would be adjusted to an optimized metabolic adjustment.

Methods: To test our hypothesis, we asked two young adult men to walk (treadmill) at SSSF and at -15% and $+15\%$ of SSSF during flat (4.5 km/h) and 10% uphill (3.5 km/h) slopes. We registered the ventilatory and metabolic data using a gas analyzer (Q-nrg, Cosmed, Italy).

Results: For both subjects, the optimal frequency was similar to SSSF, reaching values of -5 and -4% (for both individuals) of SSSF at level, and values of -0.1 and -0.2% of SSSF at 10% slope. The metabolic cost at forced conditions ($+15\%$ and -15% of SSSF) was, in general, higher than at SSSF, considering the minimal clinically important difference. While the minute ventilation and respiratory efficiency (minute ventilation/carbon dioxide production) remained unchanged, the respiratory frequency was lower at SSSF.

Conclusions: The gait metabolic optimization previously found at level conditions (Minetti et al., 1995) remains present at the uphill slope. Interestingly, the respiratory frequency is related to the SSSF, suggesting a possible temporal coherence between the respiratory and muscular actions. Although metabolic cost was highly dependent on step frequency, ventilatory efficiency was unaltered. Also, the mechanical determinants of the optimization on an uphill slope are unknown and warrant further investigation.

These findings not only support the idea that individuals can spontaneously select an economic gait pattern and maintain stable ventilatory responses even under varying mechanical demands but also inspire further research and potential applications in mountain sports and gait interventions for health.

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OC128 - FEASIBILITY AND SAFETY OF A 3-MONTH ORIENTEERING PROGRAM FOR PEOPLE WITH MILD COGNITIVE IMPAIRMENT AND HEALTHY OLDER ADULTS: THE ORIENTAGE STUDY

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Purpose: Orienteering, which integrates orientation ability with movement, holds promise as an unconventional way to mitigate cognitive decline while also exercising. Aim of this study was to test safety, feasibility, and health effects of a 3-month orienteering in people with mild cognitive impairment (MCI) and age and sex-matched healthy older adults.

Methods: Orienteering was performed twice a week for 12 weeks. Sessions were structured by gradually increasing the difficulty, from simple delimited routes to broader itineraries in natural environments. Before and after the intervention, major cognitive, psychosocial, and motor-functional outcomes were assessed.

Results: Twenty-nine participants (mean age: 74.48 ± 6.00 years; mean BMI: 26.36 ± 3.90) including thirteen healthy older adults (mean age: 75.08 ± 3.80 years; MOCA: 27.65 ± 2.73) and sixteen

MCI (mean age: 74.00 ± 7.43 years; MOCA: 22.32 ± 7.38) were recruited. Adherence was high ($>90\%$) in both groups. No adverse events or injuries were reported. At baseline, the two groups were comparable in all outcomes but MOCA, general health and depression, with MCI showing significantly worse values/scores (all $p < 0.05$). Following the intervention, Wilcoxon testing revealed a significant increase in the memory subscale of the ACE-R in the MCI group ($+2.85$ pts; $p = 0.013$), while depression assessed by Beck Depression Inventory was found decreased only in the healthy group (-1.44 pts; $p = 0.034$). For the motor-functional domain, repeated measures ANOVA revealed significant changes in both groups in comfortable 10-m walk (healthy: -7.72% ; $p = 0.047$; MCI: -7.05% ; $p = 0.023$), and fastest 4-m walk (healthy: -21.80% ; $p = 0.003$; MCI: -16.29% ; $p = 0.004$). Regarding perceived mental and physical effort during the orienteering sessions, as estimated by Borg scale, both MCI and healthy groups reported significant increases only in mental effort from first to last session ($p < 0.005$ and $p < 0.05$, respectively; no difference between groups: $p = 0.73$). **Conclusions:** Based on these preliminary data, orienteering can be safely administered as a feasible sport activity for healthy elderly and people with MCI. Given the study design which prioritized safety and feasibility, future, ad hoc planned effectiveness trials will have to confirm the here observed health effects and practical relevance of orienteering in the prevention and management of cognitive decline in aging populations.

OC129 - THE EFFECTS OF DIFFERENT EXERCISE TRAINING PROTOCOLS ON BIOMARKERS OF MITOCHONDRIAL FISSION AND FUSION IN SKELETAL AND CARDIAC MUSCLES OF RATS

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Purpose: Mitochondrial fission and fusion both contribute to maintaining mitochondrial function and optimizing bioenergetic capacity. Several experimental studies have shown that different variables could influence mitochondrial dynamics, including exercise training. However, there is very little data on the effects of exercise training, and even less on the comparison between different protocols. Therefore, the aim of this study was to compare the effect of aerobic and resistance training on mitochondrial fission and fusion markers in skeletal and cardiac muscles of Wistar rats.

Methods: 24 male Wistar rats were randomly divided into four groups of moderate-intensity interval training (MIIT), high-intensity interval training (HIIT), resistance training (RT) and control (CON). The MIIT and HIIT groups performed treadmill exercises with an intensity of 60–65% and 80–85% of the maximum speed, respectively, while the RT group performed resistance training with an intensity of 30–60% of the rat's body weight for 8 weeks. The soleus (SOL), extensor digitorum longus (EDL) and left ventricular tissues were used to evaluate markers of mitochondrial fission and fusion PGC-1 α (fusion/fission), Opa-1 (fusion), Fis-1 (fission), Drp-1 (fission), Mfn-1 and Mfn-2 (fusion) genes expression.

Results: In all three tissues, a significant increase in some mitochondrial fusion markers was observed after 8 weeks of training ($p < 0.0001$ – 0.0452). Furthermore, a significant decrease in cardiac mitochondrial fission markers was observed in all three groups

($p = < 0.0001$ – 0.0156). This reduction in some markers was evident in the SOL tissue of the HIIT group ($p < 0.0001$ for Drp-1 and $p = 0.0007$ for Fis-1) and in the EDL tissue of the RT group ($p = 0.0005$ for Fis-1 and $p = 0.0012$ for Drp-1). The mitochondrial fission/fusion markers in the heart ($p = 0.0007$ – 0.0449) and SOL ($p = 0.0050$ – 0.0258) tissues of the HIIT group had more changes than the RT group, while the mitochondrial fission markers in the EDL tissue of the RT group had a lower level than the HIIT ($p = 0.0087$ for Drp-1) and MIIT ($p = 0.0130$ for Fis-1 and $p = 0.0010$ for Drp-1) groups.

Conclusions: Our study demonstrated that HIIT, through better regulation of mitochondrial fusion and fission than RT, improves mitochondrial dynamics in cardiac and SOL tissues.

OC130 - EXERCISE TRAINING AND CARDIOVASCULAR HEALTH: A PRELIMINARY REPORT OF THE MICROFIT STUDY. FOCUS ON EXERCISE PERFORMANCE

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Purpose: Arterial hypertension is a major cardiovascular risk factor and is influenced by exercise training. The gut microbiota has been shown to regulate pathways associated with exercise training. However, literature lacks information on the relationship between exercise training and gut microbiota. We aim to test the exercise performance modifications after the assumption of probiotics in comparison with physical training.

Methods: This randomized partially double-blinded controlled trial (NCT05967715) enrolled 75 controlled and stable hypertensive patients (aged from 40 to 65 years, in primary cardiovascular prevention, without diabetes and inflammatory disorders), randomized into 3-month intervention arms: exercise training; probiotics; placebo. The exercise group performs high intensity interval training 1 h thrice a week; probiotic group receives multi-strain probiotics for three months. Probiotic and placebo groups are double blinded. Clinical, familial and drug history are obtained. Before and after the intervention, fitness assessment is performed measuring muscle force of the upper limb (HandGrip Test) and of the lower limb (30-s Chair-Stand Test—30 s-CST), functional capacity (6-min walking test—6MWT) and aerobic capacity (Step test). In 30 patients, another measure of exercise ability is obtained by cardiopulmonary exercise testing (CPET), also referred to as VO_2 (oxygen consumption).

Results: This preliminary report is based on 52 patients who first completed the 3-month intervention. Analysis was blinded to the intervention group. We observed substantial homogeneity of the baseline characteristics among the 3 groups, except for slight variation in the 30 s-CST and in time of exercise and watt percent on the CPET. After the intervention, the fitness assessment showed significant improvement in the 30 s-CST and in the Handgrip Test dx in the 3rd group; moreover, it showed a significant reduction in the Mean

Heart Rate both at the Step Test and the 6MWT in the 1st group, but a significant increase in the 3rd. Regarding the CPET, data before and after the intervention showed an improvement in both percent increment of $\text{VO}_{2\text{peak}}/\text{kg}$ and variation of $\text{VO}_{2\text{peak}}/\text{kg}$ in the 2nd and 3rd group, but the small sample size did not allow to show statistical differences.

Conclusions: Preliminary blinded results demonstrate a separation of the three arms concerning strength performance after the intervention, while a non-significant trend was observed in aerobic performance.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC131 - EXPLORATORY STUDY ON ADHERENCE TO PHYSICAL ACTIVITY AND THE MEDITERRANEAN DIET IN PATIENTS WITH CHRONIC LYMPHOCYTIC LEUKEMIA

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Purpose: Chronic lymphocytic leukaemia (CLL) is one of the most common types of leukaemia in adults. Fitness and physical activity level decrease in blood chronic cancers patients while sedentary behaviours increase. Studies have highlighted the significant role that moderate aerobic activity and muscle-strengthening can play in supporting treatment and influencing the immune system of these patients. Moreover, obesity and overweight seem to be linked to more aggressive disease. Studies in the CLL setting related to physical activity and diet are still lacking. The study aims to evaluate adherence to Physical Activity (PA) and Mediterranean Diet (MD) guidelines to understand patients' lifestyle and optimize management of treatment and comorbidities; evaluate correlations between PA, MD and sociodemographic parameters; assess differences between patients in- or off-treatment.

Methods: An anonymous 39 points questionnaire was submitted to CLL patients, aging > 40 years, from 8 Italian cities, to explore: epidemiological data, PA and MD. PA included questions about actual PA and preferred workout.

Results: A total of 140 questionnaires were collected from 1st March to 1st June. Median age of participants was 71 years, 93 males, 47 females. Preliminary results showed that 68% of participants are retired; 18% received treatment for CLL, 49% are ongoing for anti-neoplastic treatment, 33% never received therapy. 27% are engaged in intense PA, 43% in moderate (at least one day a week); light workout is performed by 63% of patients for two or more days a week. Only 49% are interested in a workout program for CLL patients, 28% are not interested, 23% are undecided, yet. Looking at dietary habits, most patients seem to be following MD. Despite this, 52% are overweight, with 29% in obesity status.

Conclusions: PA is linked to reduced cancer risk and improved survival, with up to 40–50% lower mortality in breast, colon, and prostate cancers. Evidence in hematologic cancers is limited, due to sporadic studies. Our findings appear to confirm a general adherence of the study population to MD, despite the observation of a high

prevalence of overweight individuals. Most patients reported engaging in light exercise, whereas only a small proportion meet the WHO recommendations for moderate or vigorous physical activity. Further researchers are needed to evaluate the effect of multidisciplinary approaches, including PA and diet, in the management of CLL disease.

OC132 - SHOULDER ADAPTATIONS IN PROFESSIONAL MALE VOLLEYBALL PLAYERS: A MULTIMODAL ASSESSMENT OF MUSCLE TONE, JOINT MOBILITY, AND GLENOHUMERAL STABILITY

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Purpose: Repetitive overhead movements in volleyball place asymmetric demands on the shoulder, potentially leading to joint and neuromuscular adaptations. This study aimed to evaluate differences between dominant and non-dominant shoulders in joint range of motion (ROM), glenohumeral stability, and muscle activation in professional male volleyball players.

Methods: Twenty professional male volleyball athletes (mean age 21.5 ± 2.9 years; height 180 ± 6.7 cm; weight 76.0 ± 8.7 kg) were included in this cross-sectional study. Shoulder ROM (flexion, extension, abduction, internal and external rotation) was measured using BTS inertial sensors. Glenohumeral joint alignment was evaluated through musculoskeletal ultrasound in both neutral and stressed positions. Surface electromyography (sEMG) was used to assess muscle activation of the anterior deltoid, medial deltoid, infraspinatus, and upper trapezius during shoulder flexion, abduction, and external rotation. The recorded sEMG data were subsequently expressed as a percentage of MVC. Comparisons were made between the dominant and non-dominant limbs.

Results: External rotation and flexion ROM were significantly greater in the dominant arm (external rotation: $p = 0.025$; flexion: $p = 0.049$), while no significant differences were observed for internal rotation, extension, or abduction. Ultrasound measurements showed a significantly lower omento-cutaneous distance in the dominant shoulder ($p = 0.018$) and a significantly higher gleno-cutaneous distance ($p < 0.001$), suggesting posterior humeral head translation without signs of instability under stress conditions. sEMG analysis revealed consistently higher muscle activation in the dominant limb across several movements, particularly in the anterior deltoid (31.02 vs 17.57 %MVC $d = 0.93$) and infraspinatus (66.15 vs 44.55 %MVC $d = 1.09$), indicating a neuromuscular adaptation to the specific functional demands of the dominant side.

Conclusions: Professional male volleyball players show side-specific shoulder adaptations in joint structure and muscle function. Increased mobility, altered joint alignment, and greater activation in the dominant shoulder highlight the need to monitor asymmetries and apply targeted training strategies for injury prevention and performance balance.

OC133 - STRESS-RECOVERY BALANCE IN ELITE FEMALE SOCCER PLAYERS: COMPARISON BETWEEN REGULAR SEASON AND PLAY-OUT PHASES

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Purpose: Previous evidence suggested that sleep quantity and quality, together with Heart Rate Variability (HRV) and stress-recovery balance in athletes, may fluctuate across different phases of the sport season, therefore impacting both recovery and performance (1;2). This study aimed to investigate changes in sleep, HRV and stress-recovery balance between the regular season and the play-out phase in elite female soccer players. Particularly, actigraphy-based sleep monitoring (3), smartphone-based HRV (4) and a stress-recovery balance questionnaire (5) were considered.

Methods: Seventeen female field pro-players underwent 12 week-nights of sleep recordings using ActiGraph GT3X (ActiGraph, Pensacola, USA), HRV measurement through HRV4Training smartphone app and answered the 36-item Recovery-Stress Questionnaire (RESTQ-Sport-36) for Italian athletes every two weeks, during both regular season and play-out period of the 2024–2025 women's Serie A. A within subject RM-ANOVA was performed to compare the psychophysical state of the players between the regular season or play-out.

Results: RM-ANOVA showed better metrics in the sleep parameters during play-out compared to regular season. Specifically, Sleep efficiency, increased from $79.2 \pm 3.1\%$ to $81.3 \pm 3.5\%$ ($d = 0.53$; $F_{1,16} = 4.85$; $p = 0.043$); sleep regularity index going from 51.2 ± 14.8 to 57.0 ± 17.2 ($d = 0.53$; $F_{1,16} = 4.72$; $p = 0.045$); and wake after sleep onset which decreased from 49.6 ± 19.9 to 42.3 ± 20.3 min ($d = 0.54$; $F_{1,16} = 4.99$; $p = 0.040$). No significant changes were observed either for other actigraphy metrics, HRV or self-reported values.

Conclusions: Previous studies found sleep and autonomic imbalance during high-stress periods during the season (2). However, this study shows that sleep quality improved during the play-out phase, suggesting a context-sensitive adaptation of sleep patterns in elite female soccer players. This was not reflected in either perception or the autonomic nervous system, which may be influenced by athletes' individual coping strategies and contextual factors (6).

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OC134 - TALENT ISN'T FLAT: A 9-YEAR LONGITUDINAL ANALYSIS OF REGIONAL PERFORMANCE GAPS IN ITALIAN U16 ATHLETICS (2015–2024)

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Purpose: This study examines regional disparities in competitive outcomes at the Italian U16 Athletics Championships. The main objective was to determine whether the distribution of medals varies significantly across Italian geographical zones—North, Center, and South—based on event type: sprints/hurdles, middle- and long-distance, jumps, and throws.

Methods: A total of 2673 podium placements (1st to 16th place) were collected from the official FIDAL website, covering nine editions of the championships from 2015 to 2024. Each event was categorized by discipline type, and each athlete's region was grouped into one of three geographical zones. A Chi-square test of independence was conducted to assess whether medal distribution by event type differed significantly between zones. Observed versus expected frequencies were compared, and percentage deviations were calculated to quantify over- or under-representation relative to expected values. An odds ratio with 95% confidence interval was calculated to assess the likelihood of medaling by geographical origin.

Results: The analysis revealed a statistically significant association between geographical zone and event type ($\chi^2(6) = 17.23$, $p = 0.008$). Athletes from Southern Italy were significantly less likely to reach the podium than those from the North and Center, with an odds ratio of 0.52 (95% CI 0.40–0.69), indicating nearly 50% lower odds of medaling. Northern regions showed consistent overrepresentation in technical and speed events, particularly sprints (+ 12.2%) and jumps (+ 8.4%). In contrast, Southern regions were markedly underrepresented in sprints (– 52.7%) and jumps (– 19.5%) but obtained 47.5% and 26.0% more medals than expected in middle-distance and throwing events, respectively. The Central region displayed a relatively balanced distribution, with a moderate over performance in middle-distance events (+ 22.9%) and a slight underperformance in throws (– 10.0%).

Conclusions: Athletic success at the youth level in Italy is significantly associated with both geographical origin and event type. Northern regions tend to dominate across most disciplines, suggesting stronger infrastructures. These findings may guide future regional development strategies and promote a more equitable national talent pipeline.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC135 - NEUROCOGNITIVE PERTURBATIONS IN NONCONTACT ACL INJURIES IN PROFESSIONAL FOOTBALL PLAYERS

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Purpose: While prior research has largely focused on biomechanical aspects, considering playing situations and athlete behaviour may better explain the nature of ACL injuries. Evidence suggests that athletes with lower cognitive function are at higher risk of non-contact knee injuries, emphasizing the relevance of neurocognition. Thus, this study aims to investigate neurocognitive perturbations involved in non-contact ACL injuries in professional football players through video analysis.

Methods: A validated video analysis framework was used. Cases were systematically selected with the following inclusion criteria: complete ACL injuries (2010–11 onwards) in elite competitions, available video coverage, noncontact mechanism preceded by neurocognitive perturbations. Videos were analyzed using Kinovea to extract contextual factors: game situation, score, match minute, action preceding injury, body orientation, pitch location, playing position and opponent pressure. A gross biomechanical analysis by at least three operators assessed injury mechanism, situational pattern, and biomechanics. Distributions homogeneity was tested with Chi-squared tests.

Results: Preliminary data from 42 players were analyzed. Most injuries occurred in defensive situations (69%), often during pressing (55%) with sidestep biomechanics (55%). A deceiving action preceded injury in 50% of cases (534–0 ms before IC). Injuries mostly occurred with the ball present (83%), under opponent pressure (88%) and without spatial constraints (40%) in a 3-m radius. When pressure was present, one opponent was involved in 81% of cases, mainly positioned in front (55%). In 98% of cases, players were focused on the ball both at perturbation and initial contact. Although scanning was present in 55% of cases, scan frequency was minimal: 69% performed 0–1 scans in the previous 3 s, and 43% in the previous 5 s.

Conclusions: Findings confirm previous evidence: ACL injuries often follow an opponent's deceiving action triggering an unplanned defensive response. Effective decision-making appears critical in such scenarios. Limited scanning may increase vulnerability to unexpected actions, contributing to altered movements. This study emphasizes neurocognitive errors and visual focus as relevant risk factors for ACL injury. Training should integrate biomechanical and neurocognitive demands inherent in real game situations.

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OC136 - ACUTE EFFECTS OF TRAINING SESSION ON POSTURAL BALANCE AMONG DINGHY SAILORS

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Purpose: Sailing is a complex and dynamic sport characterized by the uncertainty and instability of the environment. The control of the sailboat is related to athlete's ability to maintain the best trim of the boat and the sail, by keeping control of the forces produced by wind and water. The aim of the study was to examine the short-term effect of training on postural balance among young dinghy sailors. By measuring sway path and sway area of the center of pressure (CoP), the objective was to investigate whether these parameters can change influenced by training sessions on a sailboat.

Methods: A total of twelve sailors (mean age 14 ± 2.9 years; mean weight 49.17 ± 11.54 kg; mean height 159 ± 0.13 cm; BMI

$19.2 \pm 2.5 \text{ kg/m}^2$) competing in Optimist and Laser Radial class performed a set of balance tests on both stable and unstable surfaces, with open and closed eyes, measured over three days. The first day served to familiarize the participants with the testing protocol. On the second and third days, CoP sway path and sway areas were assessed at three time points: pre-, during- and post-training session using a Wii Balance Board (WBB). Pre-measurement was performed in resting conditions before training. The second measurement, during-training, was carried out approximately 45 min after its beginning and the post-training measurement approximately 30 min after the conclusion of the training session.

Results: A general improvement in postural balance control was observed in most of the assessed variables. Statistical analysis (RM ANOVA) demonstrated significant reductions in sway path and sway area with closed eyes on an unstable surface comparing pre-, during- and post-measurement on the second day ($p < 0.05$), and for sway path with open and closed eyes on an unstable surface on the third day ($p < 0.05$).

Conclusions: The findings of the present study revealed an acute effect of training sessions on balance control, suggesting that a training session can induce a short-term improvement in postural balance amongst dinghy sailors. Moreover, using equipment such as the WBB presents a reliable and contemporary approach for balance assessment. Finally, measuring postural balance control using WBB allows researchers to perform field measurements outside in a training environment, rather than in a laboratory setting. Considering that balance is an essential skill in sailing, future studies should investigate long-term effects of training on postural balance control.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC137 - IMPACT OF COVID-19 LOCKDOWNS ON MOTOR PERFORMANCE IN U9 SOCCER PLAYERS: LESSONS FROM THE COVID-19 ERA

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Purpose: The COVID-19 pandemic and lockdowns created unprecedented challenges for youth sports. Studies have reported significant reductions in physical activity (Abate Daga et al., 2021) and adverse effects on well-being (Abate Daga et al., 2022). This study aimed to assess the impact of these disruptions on U9 soccer players' physical performance, comparing pre- and post-lockdown cohorts.

Methods: Data from 147 U9 soccer players were analysed for this study. Groups were set as "pre-lockdown" ($n = 60$, seasons 2017–18 and 2018–19) and "post-lockdown" ($n = 87$, seasons 2021–2022; 2022–23; 2023–2024). Tests included standing long jump (explosive power), shuttle dribble (agility with ball), shuttle run (speed/agility), and Mini Cooper (aerobic endurance). Body weight, height, and BMI were recorded. Comparisons used Mann–Whitney U tests ($p < 0.05$), and ANOVA (Kruskal–Wallis tests) explored differences across cohorts.

Results: Post-lockdown players showed significantly better performance in the standing long jump ($p < 0.001$) and shuttle run ($p < 0.01$), suggesting enhanced explosive power and resistance to speed. No significant differences were observed in Mini Cooper performance ($p = 0.176$). However, shuttle dribble results were worse post-lockdown ($p < 0.001$), indicating a decline in technical-agility skills. ANOVA (Kruskal–Wallis tests) analyses revealed significant

differences across categories: players from 2015 achieved the best standing long jump ($p < 0.001$) but underperformed in shuttle dribble ($p < 0.001$). For the shuttle run, ANOVA showed significant differences across categories ($p < 0.001$), with 2009 players performing worst and 2013 players achieving the best results, highlighting variations in resistance to speed across groups.

Conclusions: Post-lockdown training adaptations may have improved explosive power and resistance to speed in U9 players, likely through targeted, adaptable approaches. However, technical-agility skills, such as shuttle dribble performance, worsened, highlighting the need for integrated technical training post-disruption. These findings highlight the resilience and adaptability of young athletes while opening questions and offering new insights to rethink and enhance youth training methods.

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OC138 - HANDGRIP STRENGTH AS A PREDICTOR OF PHYSICAL FITNESS AND WELLBEING IN AMATEUR PADEL PLAYERS

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Purpose: This study aimed to investigate the relationship between handgrip strength (HGS) and physical fitness performance in amateur padel players, while also examining the association between padel practice and health-related quality of life.

Methods: A cross-sectional study was conducted with 87 amateur padel players (45 males, 42 females; mean age 38.7 ± 9.3 years). Participants underwent assessments for HGS using a Jamar Plus + dynamometer, physical fitness tests (agility T-test, counter-movement jump, 20 m sprint, Yo-Yo Intermittent Recovery Test Level 1), body composition analysis via bioelectrical impedance (BIA Akern), and completed the SF-36 questionnaire for health-related quality of life. Correlation and regression analyses were performed to evaluate relationships between variables, controlling for age, sex, BMI, and training volume.

Results: HGS showed moderate-to-strong correlations with all physical fitness parameters ($r = 0.57$ to 0.72 , $p < 0.001$), with the strongest association observed for countermovement jump height ($r = 0.72$). Phase angle from BIA was significantly correlated with HGS ($r = 0.68$, $p < 0.001$). Regression analyses confirmed HGS as an independent predictor of physical fitness performance ($\beta = 0.54$, $p < 0.001$). Padel practice volume was positively associated with both physical ($r = 0.47$) and mental ($r = 0.39$) component summary scores of the SF-36 ($p < 0.001$).

Conclusions: HGS is a valid and practical indicator of overall physical fitness in amateur padel players, with strong associations to agility, power, and endurance. Regular padel participation is linked to improved health-related quality of life, highlighting its potential as a beneficial recreational activity. These findings support the use of HGS as a screening tool and underscore the holistic benefits of padel for amateur athletes.

OC139 - HIGH-INTENSITY FUNCTIONAL TRAINING COMPARED TO TRADITIONAL MILITARY PHYSICAL TRAINING ADAPTATIONS IN ALPINE SOLDIERS

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Purpose: High-Intensity Functional Training (HIFT) has become popular in military context due to its focus on improving general physical preparedness and sustaining high energy demands. This study aimed to explore the effects of HIFT and Traditional Military Training on body composition, physical fitness, perceived physical demand and mood in novice Alpine soldiers.

Methods: 152 novice Alpine soldiers (87 males, 65 females) were randomly assigned to two groups which underwent different 8-week basic military training programs. The experimental group (EXP) followed 45-min HIFT sessions combining high-intensity running and full-body strength exercises. The traditional group (TRAD) followed 90-min sessions focusing on running or strength training. Measurements were done before, mid-way, and after the 8-weeks, including: body weight; questionnaire and scales on motivation (BREQ), mood (ITAMS), expectation on training protocol; physical fitness battery "Royal Marines Advanced Personnel Fitness Assessment" (including 2-min push-ups, sit-ups, pull-ups and a multi-stage running test). Soldiers also kept daily training diaries, rating their training session perceived effort (sRPE). Training efficiency was calculated as the difference between the final and initial fitness scores, divided by total training volume over the 8-week period. Mixed Models analysis was used for Time and Group effects ($p < 0.05$).

Results: There were no significant differences between groups for their initial fitness level, motivation and expectation on the training programs. Each variable of the physical test battery significantly improved at the end of the 8-weeks period compared to the beginning ($p < 0.001$), with no differences between groups. If we consider fitness delta scores (the final minus the initial fitness test scores), TRAD group performed significantly better for the sit-ups score while EXP performed significantly better for the multi-stage score ($p < 0.05$). But, if we consider the training efficiency, EXP has significant higher training efficiencies both for sit-ups and multi-stage ($p < 0.05$) compared to TRAD. No difference between groups for pull-ups and push-ups deltas and training efficiencies.

Conclusions: We confirmed that both training protocols improved physical fitness in novice Alpine soldiers. The TRAD program produced greater sit-ups performance gains while EXP enhanced more multi-stage performance. However, considering groups' differences

in total training volume, the EXP was more time-efficient in improving both sit-ups and multi-stage performance than TRAD.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC140 - EVALUATION OF FATIGATED STATES IN YOUNG MALE RUGBY PLAYERS DURING SIX NATIONS FESTIVAL USING A 4-DIMENSION READINESS INDEX

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Purpose: Six Nations Under 18 Festival is a highly demanding 10-day rugby competition, during which each national team plays 3 matches. Here we assessed the readiness of young rugby players during the festival exploring 4 specific dimensions (fatigue upon waking, FW; mood, Mo; sleep quality, SQ; and muscle soreness, MS) (1) in correlation with GPS tracking data collected on match day (MD) and 2 field tests (FTs).

Methods: 29 young male rugby players (age: 17.8 ± 0.2 yrs) were assessed over 4 consecutive days: MD-1, MD, MD+1 and MD+2 (2). All dimensional indexes (e.g., FW index, Mo index, etc.) were evaluated via a daily questionnaire and calculated as "MD score/seasonal athlete's personal best score": these ratios allowed to determine the subjective athlete's dimensional Readiness Index (dRI, value 0 to 1) as their weighted average (3). The FTs were: Adductor Squeeze Test (AST) and Sit and Reach Test (SRT). Also, for AST and SRT a RI was similarly calculated. GPS data metrics, assessed using GPS tracking devices (K-Sport, 50 HZ), included total distance covered (TD) and the number of efforts $> 20 \text{ km} \cdot \text{h}^{-1}$ (nAE); data were split into the first and second halves (H1 and H2).

Results: The average dimensional RI of all athletes on MD was evaluated as 0.76 ± 0.12 . dRI showed significant differences between MD and MD+1 ($p < 0.01$) and between MD+1 and MD-1 ($p < 0.001$). The FW and MS score showed significant differences between MD and MD+1 ($p < 0.001$ and $p < 0.01$ respectively). Furthermore, a small to moderate positive correlation was found between dRI and the FT scores, especially with AST ($r = 0.36$, $p < 0.001$). The GPS tracking data displayed a small/medium negative correlation with the dRI and dimensional single scores on MD + 1, but for Mo which displayed a small positive correlation. In addition, significant differences were observed between TD and dimensional daily scores on MD for both H1 and H2.

Conclusions: The average dRI on MD + 1 was 30% lower compared with athletes' best scores, suggesting a fatigued state to be monitored for injury prevention. Athletes who played over 40 min, covered more than 4000 m and performed over 20 sprint efforts showed a higher fatigued state on MD + 1, demonstrating that those GPS-based thresholds are associated with a fatigue zone. Those athletes showing a dRI > 0.8 on MD performed better, supporting the potential efficacy of dRI in monitoring fatigue. Between the 2 FTs, AST proved to be most informative.

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OC141 - CARDIOMETABOLIC, NEUROMUSCULAR AND PERCEPTUAL RESPONSES TO DIFFERENT LOADINGS OF A SHORT SPRINT INTERVAL TRAINING SESSION

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Introduction: Short Sprint Interval Training (sSIT) is an efficient means for improving health and physical fitness. The sSIT sessions typically involve very short repeated 'all-out' efforts (≤ 10 s), while eliciting comparable beneficial adaptations compared to Wingate-based SIT. However, 'all-out' efforts may not be suitable for all populations. Following previous research, near 'all-out' efforts or lower cycling torques may represent an alternative to induce similar physiological adaptations while inducing a more favourable perceptual responses. However, whether these different schemes can induce comparable physiological and perceptual responses has not yet been investigated. We, therefore, compared the physiological and perceptual responses to 'all-out' vs. non 'all-out' vs. low torque sSIT sessions.

Methods: Eight healthy, young adults completed an incremental exercise test on a cycle ergometer, followed by three different sSIT sessions. Each session consisted of 8×5 -s efforts, interspersed with 45-s of active recovery, and included one of the following schemes: (i) 'all-out' efforts performed against a Wingate torque factor (TF = 0.7 N m/kg); (ii) perceptually self-regulated near 'all-out' efforts targeting $\sim 90\%$ of maximum intensity (TF = 0.7 N m/kg); or (iii) 'all-out' efforts performed at $90\%TF = 0.63$ N m/kg. Power output, cadence, pulmonary gas exchange and ventilation data, along with high-density electromyographic (HD-sEMG) signals, were collected throughout the sessions. Blood lactate and ratings of perceived exertion (RPE) were also measured.

Results: A two-way RM-ANOVA revealed no significant differences in $\dot{V}O_2$, or muscle oxygenation responses between sSIT protocols ($P > 0.05$). However, the perceptually self-regulated near 'all-out' protocol resulted in a significantly lower power output ($P < 0.01$), along with lower muscle activation, blood lactate levels, and RPE (all $P < 0.01$). Cadence was significantly higher in the $90\%TF$ condition ($P < 0.05$).

Conclusion: Our findings suggest that the current sSIT loadings were similar for ventilatory and muscle oxygenation responses while differed in mechanical, blood lactate, HD-sEMG and perceptual responses. Further studies should verify if these acute response are related to chronic adaptations.

OC142 - INTER-SYSTEM RELIABILITY BETWEEN SMART LIVE AND HAWK-EYE

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Purpose: In elite football, accurate tracking data is essential for performance analysis. Serie A clubs use systems like Smart Live (real-time) and Hawk-Eye (post-processed) to monitor player movements and external load metrics. Since these systems are often used interchangeably, this study evaluates their inter-system reliability across key performance indicators.

Methods: Data were collected from 50 official Serie A matches using the Dynamix platform (K-Sport), which integrates inputs from both Smart Live and Hawk-Eye. For each match, 1,424 data points per parameter were analyzed. Metrics included: total distance covered, distances covered at speeds greater than 15 km h^{-1} , 20 km h^{-1} , and 25 km h^{-1} , as well as distances within the $15\text{--}20 \text{ km h}^{-1}$ and $20\text{--}25 \text{ km h}^{-1}$ ranges. Additionally, we examined the distance covered during accelerations $> 2 \text{ m s}^{-2}$, decelerations $< -2 \text{ m s}^{-2}$, and the peak speed (km h^{-1}) recorded during each match.

Results: The inter-system reliability analysis demonstrated excellent agreement across all measured parameters. Specifically, the ICC values were excellent for: total distance showed an ICC of 0.999, distance covered at speeds greater than 15 km h^{-1} was 0.997, greater than 20 km h^{-1} was 0.998, and greater than 25 km h^{-1} was 0.987. For the intermediate speed zones, the ICC for distance covered between $15\text{--}20 \text{ km h}^{-1}$ was 0.994, and between $20\text{--}25 \text{ km h}^{-1}$ was 0.995. The reliability for distance covered during accelerations greater than 2 m s^{-2} , and decelerations less than -2 m s^{-2} , were both 0.960. Peak speed, while still showing excellent reliability, had a slightly lower ICC of 0.905.

The Bland-Altman analysis revealed the following mean differences and 95% limits of agreement (± 1.96 SD) between the two systems: for total distance 50.4 m with limits of 206.9 and -106.0 m; for distance $> 15 \text{ km h}^{-1}$ was 48.2 m (38.2; -134.6); for distance $> 20 \text{ km h}^{-1}$, 4.1 m (46.1; -37.9); and for distance $> 25 \text{ km h}^{-1}$, 12.9 m (42.6; -16.8). The distance covered between $15\text{--}20 \text{ km h}^{-1}$ showed a mean difference of -52.1 m (26.0; -130.2), while the $20\text{--}25 \text{ km h}^{-1}$ range was -8.8 m (33.9; -51.5). For accelerations $> 2 \text{ m s}^{-2}$, it was -43.3 m (32.6; -119.3), and for decelerations $< -2 \text{ m s}^{-2}$, it was 19.8 m (111.3; -71.7). The mean difference in peak speed was -0.3 km h^{-1} with limits of 1.4 and -2.9 km h^{-1} .

Conclusions: The inter-system reliability between Smart Live and Hawk-Eye is excellent across all measured parameters, indicating that both systems can be used interchangeably for most external load metrics in professional football. However, the slightly lower reliability for peak speed (ICC = 0.905) suggests that practitioners requiring high precision in this metric should interpret the data with caution or consider system-specific calibration.

Acknowledgments: We Acknowledge the use of K-Sport data and express our gratitude to K-Sport for their support.

OC143 - MODERATE TO LOUD MUSIC WHILE RUNNING MASKS THE REAFFERENT RHYTHM OF FOOTSTEPS AND...BREATHS: A STUDY OF REPEATED, RANDOM EXPOSURES TO MUSIC AND NO-MUSIC IN YOUNG CASUAL RUNNERS

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Purpose: Listening to music while training has been linked with several advantages, such as improved adherence to exercise programs, a lower rate of perceived effort (RPE), and other psychophysiological boosts.^{1,2} However, it remains uncertain whether music listening influences ventilatory or biomechanical responses during running.

Methods: This pilot study with randomly ordered, repeated exposures to no music and up-tempo music (128 beats per minute) at 85-decibel volume while running on a treadmill for 15-min stints at 8 km/h was carried out on young casual runners. Outcome measures included ventilation (VE), breath frequency (BF) and tidal volume (VT), VO₂ and VCO₂ concentrations, as well as ventilatory equivalents for oxygen (VE/VO₂) and carbon dioxide (VE/VCO₂), all assessed by ergospirometry. Blood lactate (BL) was measured at baseline, at 1-min and 5-min after the end of each running stint; RPE was measured using a Borg 6–20 scale. Running biomechanics was assessed by a optoelectrical system to determine space–time parameters.

Main effects of Condition (music/no-music), Sex (male/female) and Condition*Sex interaction were tested by repeated measures ANOVA (RM ANOVA).

Results: Nineteen physically active volunteers (10 M, 9F, mean age: 25 years) were included. RM ANOVA revealed significant music-induced increases: VO₂ and VCO₂ (+ 1.7 and +2%, $p = 0.001$, $p = 0.003$, respectively), and VE (+ 6.1%), BF (+ 11.5%; $p < 0.001$). VT decreased by 5.7% ($p < 0.001$). When comparing sexes, only women showed an 4.5% increase in VE/VCO₂ ($p = 0.025$). BL revealed comparable internal load between conditions.

Running biomechanics were influenced by music in the second third of the stint, as shown by increased swing time (+ 2%, $p = 0.04$), and a trend toward significance for stride time (+ 0.9%).

Conclusions: Listening to music while running led to significant ventilatory changes that seem to reflect a suboptimal respiratory pattern characterized by higher breathing frequency and lower tidal volume. We offer that the lack of reafferent sounds from foot impacts as well as from breathing acts may have contributed to the observed changes in ventilation.

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OC144 - OPTIMIZING PERFORMANCE AND STRESS RESPONSE: A COORDINATIVE WARM-UP INTERVENTION IN ELITE SOCCER PLAYERS

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Purpose: In elite soccer, coordination supports the integration of technical, physical, and tactical performance. Emerging evidence demonstrated the link between neuromotor control and cognitive efficiency during a match. This study investigated the effects of a structured coordinative warm-up protocol specifically designed by the authors on technical performance and stress-related hormonal responses in elite soccer players. The protocol aimed to enhance neuromotor efficiency and technical execution, with the hypothesis that the resulting improvement in sport-specific technical confidence and control would contribute to a more adaptive regulation of cortisol levels in response to competitive demands.

Methods: Thirty-two male soccer players (mean age: 24.7 ± 3.1 years) from two top-tier regional teams were randomly assigned to an experimental group (EG; $n = 18$) or control group (CG; $n = 14$). Over a 12-week period, the EG integrated a targeted warm-up routine focused on motor coordination, incorporating four progressive upper-and lower-limb drills with varying types of balls, performed four times weekly - including match days. The CG maintained their standard pre-activity routine centered on joint mobility and muscle activation. Performance was evaluated pre- and post-intervention using the Y Pre-Planned Agility Test, Y Reactive Agility Test, Illinois Change of Direction Test (with and without the ball), and the Loughborough Soccer Shooting Test. Urinary biomarkers (cortisol) were also measured before and after the training cycle.

Results: Statistical analysis (RM-ANOVA) revealed significant improvements in the experimental group across multiple performance metrics. Notably, the EG showed superior post-intervention results in the Illinois Ball Test and Technical Index ($p < 0.001$), as well as in the Unplanned Y Test and Reaction Index ($p < 0.001$), compared to the CG ($p < 0.05$). Shooting accuracy, as assessed by the Loughborough Test, also improved markedly in the EG ($p < 0.001$). From a physiological standpoint, the EG exhibited a significant post-intervention reduction in cortisol levels ($p = 0.0007$), with intergroup comparisons ($p = 0.003$) and delta analysis ($p = 0.036$) confirming a more favorable hormonal adaptation than the CG.

Conclusion: The findings demonstrate that a coordinative-focused warm-up can significantly enhance agility, technical precision, and stress regulation in elite soccer players. The inclusion of neuromotor elements in warm-up routines proves to be an effective strategy not only for improving performance but also for promoting physiological readiness—due to a more efficient modulation of cortisol levels induced by the experimental training. These results suggest that targeted coordinative protocols can help athletes better manage the psychophysiological demands of competitive play.

References: (non obbligatorio).

OC145 - CONSTRUCT-CONVERGENT VALIDITY OF TAEKWONDO ANAEROBIC INTERMITTENT SPORT-SPECIFIC TESTS AND THEIR ASSOCIATION WITH MUSCLE POWER PERFORMANCE

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Purpose: The Multiple Frequency Speed of Kick Test (FSKT_{mult}) and the Chest Taekwondo Anaerobic Intermittent Kick Test (TAIKT_{chest}) are the most studied taekwondo anaerobic intermittent tests.¹ However, their interchangeability has not been established, while the relationship between the ability to repeat high-intensity intermittent efforts and muscle power, assessed by countermovement jump (CMJ) test, requires further investigation. This study aimed to: (1) establish the construct-convergent validity between the FSKT_{mult} and TAIKT_{chest}; (2) investigate the relationship between anaerobic tests (FSKT_{mult} and TAIKT_{chest}) and muscle power test (CMJ).

Methods: Twenty-two national/international-level taekwondo athletes (11 males and 11 females; age: 17 ± 2 years; height: 170.6 ± 6.1 cm; body mass: 57.3 ± 8.1 kg) took part in the study. Athletes conducted two experimental sessions. On the first day, three CMJ and the FSKT_{mult} were performed. After 24 hours, the TAIKT_{chest} was executed. During the FSKT_{mult} and TAIKT_{chest}, heart rate (HR) was continuously measured using a heart rate monitor strap, while blood lactate ([La]) concentration was recorded 3-minutes after the end of the tests, using a lactate analyzer. Immediately at the end of the anaerobic intermittent tests, rating of perceived exertion (RPE) was evaluated using the Borg 6–20 scale.

Results: FSKT_{mult} total kick performance, as well as absolute and relative peak and mean power performance, showed high significant correlations ($r = 0.79$ – 0.96 , $R^2 = 62$ – 91% , $p < 0.001$) with respective TAIKT_{chest} performance. Instead, fatigue-related indexes revealed no significant correlations. HR, [La], and RPE responses in the FSKT_{mult} showed high significant correlations ($r = 0.61$ – 0.92 , $R^2 = 37$ – 85% , $p < 0.01$) with respective TAIKT_{chest} responses. Total kick performance and fatigue-related indexes were significantly higher ($p < 0.05$) in FSKT_{mult} than in TAIKT_{chest}. In contrast, absolute and relative power performance were significantly higher ($p < 0.001$) in TAIKT_{chest} than in FSKT_{mult}. HR, [La], and RPE responses were significantly higher ($p < 0.01$) in the FSKT_{mult} than in TAIKT_{chest}. FSKT_{mult} performance showed high significant correlations ($r = 0.500$ – 0.721 , $p < 0.05$) with respective CMJ performance. Only the absolute peak power performance of TAIKT_{chest} was highly correlated ($r = 0.576$, $p = 0.005$) with respective CMJ performance.

Conclusions: FSKT_{mult} performance can be predicted from the respective TAIKT_{chest} performance and vice versa. However, it is important to consider that the specific time-motion structures of these tests generate distinct performance and physiological and perceptual responses. Also, lower limb muscle power positively influences the ability to repeat high-intensity intermittent efforts.

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OC146 - FEASIBILITY AND EFFECTIVENESS OF A CLIMBING TRAINING EMPOWERED BY A MINDFULNESS INTERVENTION IN YOUNG ATHLETES: A PILOT STUDY

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Purpose: Mindfulness interventions are currently being employed in many sport disciplines with reported benefits in terms of stress management, concentration and motor awareness. In this pilot experimental study, we aim to investigate whether integrating mindfulness into climbing training can improve young athletes' performance.

Methods: A pool of young athletes aged 7 to 16 attending a local climbing gym has been invited to participate in the study. Upon enrolment, athletes were asked to choose between an experimental (Exp) and control group (Con). Athletes of both groups underwent the same physical training lasting 8 weeks and encompassing a 2-times per week, 1-h schedule. In addition, the ones who choose Exp group, an 8-week, 1-h mindfulness intervention was provided with exercises in: Mindful Breathing, Sound Listening, Body Scan, Mindful Eating and Mindful Walking.

Before starting the study, and after the 8-weeks training period, athletes were exposed to two specific tests: the Boulder test (BT), which measures the number of blocks completed in a defined time and the Circuit test (CT) that assesses endurance and the ability to complete a climbing route.

Results: A total of 23 participants (12 females, mean age 10.81) agreed to take part in the study. All athletes completed the 8-week interventions without any adverse events. The Exp group was joined by 16 athletes, while the remaining 7 chose the Con group. At baseline, no significant differences were present between the two groups.

At the end of the interventions, a significant improvement in the BT test was observed in Exp group only (3.06 holds, $p < 0.001$ versus 0.85 holds). More favourable results were also observed in CT, with a significant difference between the Exp and Con groups (6.56 holds, vs. 4.71 holds, $p = 0.001$).

Conclusions: This study shows that the integration of mindfulness into climbing training can improve athletes' performance, both physically and mentally. Our preliminary results suggest that mindfulness can be a valuable tool to increase concentration, reduce stress and improve emotion management during sports performance. Further research is needed to isolate the specific effect of mindfulness and to explore its potential in other sports disciplines.

Acknowledgments: (non obbligatorio).

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OC147 - THE CONTRIBUTION OF SWIMMING TURNS TO THE REDUCTION OF ENERGY COST IN FRONT-CRAWL PERFORMANCE

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Purpose: Swimming performance is the result of the combination of different race segments: start, clean swimming, and turns. Turning phases are typically performed at higher average speeds than clean swimming, leading to an increase in overall mean swimming speed (turns + clean) in short course performance. Although turn contributes to a reduction in total race time, the specific effect of turns on energy demands has been largely neglected due to technical constraints. However, neglecting their energetic contribution may lead to misinterpretations in estimating overall energy cost (C). Therefore, the aim of this study is to investigate the effect of turns on C and their influence on aerobic performance.

Methods: Eleven male swimmers participated in the study. Each participant performed two randomized controlled-velocity testing sessions: one in short course (SC) and one in long course (LC). The test included five 400 m trials performed at constant speed based on their personal best in the 400 m front crawl in LC. During trials conducted at the same percentage of maximal velocity, turn and clean swimming speeds were maintained equal between SC and LC, although the number of turns was doubled in SC. Kinematic (mean overall speed (vmean), stroke frequency), energetic (oxygen uptake, aerobic, anaerobic and total energy, C) and physiological parameters (lactate, heart rate (HR) and RPE) were assessed and compared between SC and LC and between intensity. A repeated-measures ANOVA with Bonferroni correction was applied to verify the trend of physiological, kinematic and energetic parameters within the same group under SC and LC conditions at equal intensity, while a LMM was used to compare the trend of HR. The significance level was set at $p < 0.05$. Differences in modeled C between SC and LC were assessed using a Student's t-test.

Results: For all the variables analyzed, no significant differences were found between SC and LC ($p > 0.05$), except for HR, which showed a significant difference ($p = 0.042$). The modeled C at the same speeds was significantly different between SC and LC ($p < 0.01$). Moreover, at vmean, C in SC was, in average, 5.9% lower compared to LC.

Conclusions: Swimming turn reduces the energy demands of aerobic performance at the same overall mean swimming speed. Therefore, at the same speed, SC swimming requires a lower metabolic power compared to LC.

Conversely, for a given maximal metabolic power, higher speeds can be achieved in SC due to the lower C.

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OC148 - A LAST DECADE LONGITUDINAL STUDY ON SERIE A FOOTBALL PLAYERS: INTERACTIONS OF TACTICAL ROLES, STRINGS OF YEARS, AND TEAM RANKING

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Purpose: The present study aimed to analyze if role, strings of years (years), team ranking (ranking), and their interactions, of Serie A football players could be affected by the occurrence of goal and assist.

Methods: 3594 Serie A (33 clubs) football players were recruited for this study. Players were classified in relation to tactical role (i.e., defender, DF; midfielder, MF; forward, FW), years (i.e., 2014/15–2018/19, OLD; 2019/20–2023/24, NEW), ranking (i.e., 1st–7th position, EUR; 8th–14th, MIDDLE; 15th–20th, LAST). All data (i.e., individual goals, assists, playing duration, goals/playing duration in min ratio, assists/playing duration in min ratio) were obtained by Transfermarkt online database. Non-parametric statistics were applied.

Results: For role comparison, each parameter showed a significance ($p < 0.001$) excepting for assists between MF and FW. For years, significant differences emerged for assists ($p = 0.007$) and assists ratio ($p = 0.005$) with higher values for NEW (assists = 2.22, assists ratio = 866.13 min) than OLD (assists = 2.06, assists ratio = 955.14 min) recent years. For ranking, effects ($p < 0.001$) emerged for each parameter, excepting for playing duration between EUR and MIDDLE level. For same role and different ranking, differences regularly emerged, excepting for goals, assists, and assists ratio scored by DF in EUR vs MIDDLE, and MIDDLE vs LAST teams; whereas for same ranking and different roles, differences always emerged excepting for assists performed by MF and FW both in MIDDLE and LAST clubs. On the contrary, for years and role interactions, there were no significance, excepting for assists ($p = 0.014$) and assists ratio ($p = 0.013$) performed by DF (NEW: assists = 1.55, assists ratio = 1167.19 min; OLD: assists = 1.30, assists ratio = 1317.21 min). Finally, as expected, years per ranking interactions showed no significance for different years and same ranking, while, for the opposite scenario, a scoring improvement significantly emerged for higher position clubs.

Conclusions: Goals and assists seem to be able to strongly discriminate Serie A players' performance in relation to different role, year (only for assists), and ranking. However, considering factor interactions, some peculiarities emerged for DF, which is not influenced by ranking, but, on the contrary, it is the unique role affected by years in terms of occurrence of assists. As a consequence, role belonging could be highlighted as the most crucial factor among those observed, emerging as crucial even if interacted with strings of years and team ranking.

OC149 - PARACANOE AND PADDLING TECHNIQUE: AN EXPLORATORY ANALYSIS OF DEVIATIONS FROM THE OLYMPIC OPTIMAL STROKE PROFILE

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Purpose: The cyclic nature of kayaking makes technique a key element for optimizing performance, requiring athletes to continuously

seek refinement of each stroke to maximize propulsive effectiveness (Garnier et al., 2023). López et al. (2011) defined an “Optimal Stroke Profile” (OSP), obtained as the average trajectory from a homogeneous sample of six elite Olympic athletes in sprint kayaking. This OSP represents an ideal trajectory that defines the functional space of an optimal stroke, where any significant deviation is potentially associated with a reduction in propulsive effectiveness. The objective of this study was to verify whether paracanoe athletes exhibit paddle trajectories consistent with the OSP, or if specific adaptive strategies emerge.

Methods: Four Olympic paracanoe athletes (two KL1 and two KL3) performed maximal tests on a Dansprint kayak ergometer. Kinematic data were acquired using an optoelectronic system (BTS), placing reflective markers on the paddle ends and, on the ergometer, to define a spatial reference system. For each athlete, the mean paddling cycle was calculated, and a normalized representative cycle (from 0 to 100%) was selected, related to the main kinematic variables: paddle advance (PA), paddle separation (PS), frontal angle (FA), and lateral angle (LA), defined from paddle entry to subsequent entry. Subsequently, a comparative analysis of the athletes’ representative cycles with the OSP model defined in the literature was conducted, using Z-score calculations.

Results: The results indicated that none of the analyzed paracanoe athletes fully reflected the OSP defined for Olympic athletes. KL3 athletes showed marked deviations for FA and LA, exceeding the critical limit of ± 2 SD of the Z-score, indicating greater paddle verticality compared to the OSP. However, PA and PS were generally within elite variability limits ($|z| \leq 2$). KL1 athletes exhibited even more pronounced deviations from the OSP, with all analyzed kinematic variables surpassing the critical limit ($|z| \geq 2$).

Conclusions: The observed deviations likely reflect functional adaptive strategies. Future studies should aim to update the OSP model for elite Olympic athletes by expanding the sample to achieve a more accurate definition. Similarly, the sample of Paralympic athletes should be increased in order to assess the potential presence of significant differences and, if confirmed, to define an optimal stroke profile specific to paracanoe.

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OC150 - UNITY IS STRENGTH: COMBINING THE INTEGRATED BEHAVIOR CHANGE MODEL AND THE THEORY OF EFFORT MINIMIZATION IN PHYSICAL ACTIVITY TO EXPLAIN PHYSICAL ACTIVITY BEHAVIOR

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Purpose: The present study integrates two theoretical frameworks—the Integrated Behavior Change (IBC) model and the Theory of Effort Minimization in Physical Activity (TEMPA)—to develop a more comprehensive understanding of physical activity behavior. It aims to provide a renewed perspective on the factors influencing physical activity by combining the traditional social-cognitive variables described in the IBC model with the approach-avoidance tendencies to physical effort and fatigue highlighted in the TEMPA framework.

Methods: A total of 697 individuals from the general population (43.8% female; $M_{age} = 24.7$ years, $SD = 8.9$) completed a series of questionnaires assessing physical and mental fatigue, motivation, attitudes toward physical activity, subjective norms (SN), perceived behavioral control (PBC), behavioral intentions, approach-avoidance tendencies to physical effort, planning, and physical activity behavior. Data were collected via the online platform SurveyMonkey, and preliminary analyses were performed using SPSS 29.0 and WarpPLS 8.0 to evaluate the proposed Structural Equation Model.

Results: The tested model showed a good fit with the data ($APC = 0.22$, $p < 0.001$; $ARS = 0.21$, $p < 0.001$; $AARS = 0.21$, $p < 0.001$; $AVIF = 1.82$; $AFVIF = 2.44$; $GoF = 0.41$). Specifically, the results revealed significant negative associations of physical and mental fatigue with autonomous motivation ($\beta = -0.23$, $p < 0.001$; $\beta = -0.09$, $p = .006$) and with the approach tendency toward physical effort ($\beta = -0.21$, $p < .001$; $\beta = -0.09$, $p = .007$). In contrast, physical and mental fatigue were positively related to the avoidance tendency toward physical effort ($\beta = 0.22$, $p < 0.001$; $\beta = 0.08$, $p = 0.021$). Autonomous motivation also showed significant positive associations with attitudes ($\beta = 0.53$, $p < .001$), SN ($\beta = 0.14$, $p < .001$), PBC ($\beta = 0.57$, $p < .001$), intention ($\beta = 0.51$, $p < 0.001$), and physical activity behavior ($\beta = 0.19$, $p < 0.001$). In turn, attitudes, SN, and PBC were all significantly associated with the intention to engage in physical activity ($\beta = 0.11$, $p = 0.002$; $\beta = 0.07$, $p = 0.035$; $\beta = 0.30$, $p < 0.001$), and intention was significantly related to physical activity behavior ($\beta = 0.16$, $p < 0.001$). Finally, the tendency to avoid physical effort significantly and negatively moderated the relationship between intention and behavior ($\beta = -0.11$, $p = 0.002$). Unexpectedly, the tendency to approach physical effort and planning also showed significant, but negative, moderating effects on this relationship ($\beta = -0.24$, $p < 0.001$; $\beta = -0.11$, $p = 0.002$).

Conclusions: The findings support the utility of an integrated framework combining the IBC model and TEMPA to deepen our understanding of physical activity behavior. This combined model provides a valuable foundation for developing innovative, evidence-based strategies to effectively promote physical activity in the general population.

OC151 - TRACKING FUNCTIONAL FITNESS PROGRESS IN PRIMARY SCHOOL: A 9-MONTH STUDY

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Purpose: The study investigated the longitudinal development of Functional Fitness (FF) components in 46 primary school students (mean age = 8.01 ± 1.17 ; male = 22; female = 24) from 1st to 4th grade. The hypothesis was that FF components would improve after PE interventions and be retained after summer break.

Methods: A longitudinal design was employed with three assessment points over nine months. Standardized FF tests (i.e. Handgrip, Standing Long Jump, PACER, Throw&Catch, Kick&Receive, Supine to Stand & Go) were administered during each data collection phase to evaluate changes and retention over time. RM-ANOVA data analysis was performed.

Results: RM-ANOVA showed significant time effects for handgrip strength ($F(2,84) = 47.46$, $p < .001$, $\eta^2 = 0.031$), lower limb

explosive strength ($F = 22.51$, $p < .001$, $\eta^2 = 0.096$), and cardiorespiratory fitness ($F = 29.07$, $p < .001$, $\eta^2 = 0.162$). The improvements were recorded during the school period and was maintained post-summer break. A significant Time*Grade interaction emerged for handgrip strength ($F(6,84) = 2.78$, $p = .016$, $\eta^2 = 0.005$), with 4th grade students showing greater improvements compared to 1st grades students at all three assessment points.

Conclusions: The improvements in some components of FF may reflect maturational effect, which are consistent with findings in the literatures; however, the greater increase in handgrip strength among 4th students, who were the only group taught by a specialized PE teacher, suggests a possible additional contribution of specialized instruction.

Acknowledgments: We would like to thank the “De Amicis” school of Enna for supporting us in developing this study.

References: (non obbligatorio).

OC152 - THE DEVELOPMENT OF FUNDAMENTAL MOTOR SKILLS IN SCHOOL-AGE CHILDREN: A COMPARATIVE PERSPECTIVE BETWEEN MOTOR EDUCATION AND MOTOR-EXPRESSIVE ACTIVITIES

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Physical literacy (PL), conceptualized as an integrated set of physical competencies embedded within perceptual, experiential, cognitive, and anticipatory processes, reflects a holistic construct encompassing confidence and motivation, knowledge, and understanding. It is recognized as a key predictive factor for lifelong engagement in physical and sport-related activities. PL, conceptualized as an integrated set of physical competencies embedded within perceptual, experiential, cognitive, and anticipatory processes, reflects a holistic construct encompassing confidence and motivation, knowledge, and understanding (Rudd et al., 2021). It is recognized as a key predictive factor for lifelong engagement in physical and sport-related activities. This study aims to evaluate the effectiveness of motor-expressive activities in promoting the progressive development of structured and functional motor skills, within the theoretical framework of non-linear pedagogy applied to movement. This study investigates the impact of motor-expressive activities on the development of fundamental motor skills in a sample of 353 children aged 8 to 9 years. Participants were categorized into three groups based on their responses to a structured, ad hoc questionnaire on extracurricular motor activity engagement: no practice (38%), sport-based activities (22.9%), and motor-expressive activities (39.1%). *Fundamental motor skills were assessed using the MOBAK 3–4 test battery, which provides two core indices: object movement and self-movement.* Statistical analyses included one-way ANOVA, followed by ANCOVA to control the effect of age. Gender differences were examined using univariate ANOVA. Analysis of the results shows significant differences between the groups. In both object movement and self-movement domains, children in the “motor-expressive activities” group achieved significantly higher mean scores ($M = 1.16$; $M = 1.56$, respectively) compared to those in the “no-practice” group ($M = 1.00$; $M = 1.31$) and the “sports” group ($M = 0.67$; $M = 0.93$). In both cases, the differences between groups remained significant ($p < 0.001$) even after controlling for age using ANCOVA. Gender-based analysis revealed that boys scored significantly higher in object control skills ($Mb = 1.17$; $Mg = 0.84$),

while females tend to prevail (although not significantly) in self movement ($Mb = 1.27$; $Mg = 1.34$), suggesting the presence of distinct motor profiles between sexes. The findings suggest that engagement in motor-expressive activities may have a beneficial impact on the acquisition of fundamental motor skills, promoting the development of more complex and harmonized motor competencies. These results support the notion that motor literacy may improve the promotion of diversified educational pathways oriented towards the holistic integration of movement variations, consistent with the construct of PL.

OC153 - FAIRCOACHING ENHANCES ATHLETES' WELL-BEING, MOTIVATION, PROSOCIAL BEHAVIOR AND REDUCES INTERPERSONAL VIOLENCE

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Purpose: Coaches' behavior, communication, and leadership modalities strongly influence athletes' experience. A good coach-athlete interaction tends to foster well-being, enhance motivation, promote prosocial behaviour and inhibit antisocial behavior, and reduce burnout. On the contrary, a negative coach-athlete interaction mostly if affected by interpersonal violence (verbal, psychological, physical) tend to affect well-being and motivation, inhibit prosocial behavior and promote antisocial behavior, and foster burnout. The study aimed to evaluate the effects of the coach-athlete interaction, interpersonal violence, and coaches' transformational leadership on well-being, motivation, prosocial and antisocial behavior, and burnout in women and men athletes.

Methods: As part of a project promoted by the Municipality of Cremona, Assist and University of Verona, an online questionnaire was administered to 404 women (202) and men (202) athletes ($M_{age} = 27.93 \pm 9.04$ y.o.) practicing individual and team sports. Descriptive statistics, independent sample t-tests, Pearson's bivariate correlations, and Linear regression analyses were conducted.

Results: Independent sample t-tests showed that men athletes perceived a more positive coaches' behavior and transformational leadership modalities, a higher level of well-being while practicing sport but also a greater level of psychological violence and antisocial behavior if compared to women athletes. A positive coaches' behavior correlated with well-being, enjoyment, and prosocial behavior, while negative coaches' behavior correlated with antisocial behavior and burnout in athletes. Coaches' verbal and psychological violence correlated with burnout in athletes. Coaches' transformational leadership fostered athletes' well-being and a coaches created mastery (task-involving) climate enhanced athletes' enjoyment and prosocial behavior. A positive coaches' behavior reduced the interpersonal violence (verbal, psychological, physical) while a negative coaches' behavior enhanced the interpersonal violence (verbal, psychological, physical) perceived by athletes.

Conclusions: Findings suggested coaches' transformational leadership, coaches created mastery (task-involving) climate, and positive coaches' behavior as protective factors for athletes' well-being, enjoyment, prosocial behavior, and perceived interpersonal violence (verbal, psychological, physical). From an applied perspective, to pursue a faircoaching is a priority.

OC154 - SLEEP QUALITY AND BODY IMAGE IN AMATEUR ATHLETES AND SEDENTARY PEOPLE

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Purpose: Since sleep quality and body dissatisfaction influence mental health and physical performance in athletes and sedentary individuals, this study examined the effect of team sport participation and sedentary behavior on body dissatisfaction and sleep quality, also considering sex differences.

Methods: 72 participants (age: 23.3 ± 3.1 yrs) were allocated into four groups: female Volleyball players (VP, N = 16), male Football players (FP, N = 20), sedentary females (SF, N = 19), and sedentary males (SM, N = 17). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which provides a global score of sleep quality, with values > 5 indicating poor sleep. The Body Image Dimensional Assessment (BIDA), consisting of four silhouette-based items assessing Body Dissatisfaction (BD), Sexual BD (SxBD), and Comparative BD (CBD), was used to calculate the composite BD Index (BDI) as the mean of the absolute values of BD, SxBD, and CBD, expressed as percentage. One-way ANOVA was used to assess group differences ($p < 0.05$) in BDI and PSQI score. Pearson's correlation coefficients (r) were used to examine the relationships between PSQI and BDI scores within each group.

Results: Significant differences across groups emerged for BDI (FP: $8.2 \pm 4.9\%$; VP: $13.3 \pm 9.2\%$; SM: $13.7 \pm 7.6\%$; SF: $18.2 \pm 11.3\%$; $p = 0.006$) and PSQI (FP: 3.8 ± 1.3 ; SF: 4.9 ± 2.5 ; SM: 6.1 ± 2.1 ; VP: 6.2 ± 3.1 ; $p = 0.007$). Post hoc analysis showed lower ($p = 0.02$) PSQI values in FP than in SM and VP. For BDI, SF showed a higher value than FP ($p = 0.003$). Correlation analyses revealed a significant positive association between PSQI and BDI in the FP ($r = 0.52$, $p = 0.018$) and SF ($r = 0.5$, $p = 0.029$) groups.

Conclusions: SF had higher BDI than FP, indicating that a sedentary lifestyle and female sex may increase body dissatisfaction. VP and SM showed PSQI scores above the clinical threshold, indicating poor sleep quality. The absence of significant differences in PSQI scores between SF and VP suggests that amateur volleyball participation may not confer sleep quality benefits over a sedentary lifestyle in female individuals. Insufficient sleep-hygiene leaves female amateurs players with sleep deficits similar to sedentary controls, compromising recovery, performance, and psychosocial health. Additionally, the moderate correlations between sleep quality and body dissatisfaction in both FP and SF suggest a link between psychological well-being and sleep across activity levels, as a positive perception of one's own body may promote healthy behaviors, such as good sleep quality.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC155 - SELF-EFFICACY, PHYSICAL FITNESS AND ENJOYMENT OF PHYSICAL ACTIVITY IN OLDER WOMEN

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Purpose: Activities of daily living are paramount to ensure a high quality of life. Moreover, self-efficacy and physical activity (PA) are recognized as two crucial factors for healthy aging. However, their interaction and the extent to which self-efficacy in activities of daily living correlates components of physical fitness and affective responses like enjoyment, are not yet fully understood. Therefore, this study aimed to investigate the relation between self-efficacy in daily activities, multiple components of physical fitness, and enjoyment of PA in a cohort of active older women.

Methods: 125 active and healthy females (age 76.8 ± 5.1 y; height 1.58 ± 0.06 m; weight 65.2 ± 13.0 kg; BMI 26.2 ± 5.0 kg/m²) were recruited. Self-efficacy on activity of the daily living was assessed with a 5-item Likert scale ad hoc questionnaire. Enjoyment of PA was measured with the PA Enjoyment Scale (PACES). Physical fitness was evaluated with the Senior Fitness Test (SFT) battery (30" Chair Stand, Back Scratch, 8-Foot-Up-and-Go, 30" Arm Curl, 6-Min Walk Test and Sit and Reach test) and with Handgrip Strength test. As part of a preliminary statistical analysis, Cronbach's α and McDonald's ω were used to evaluate the internal consistency of the self-efficacy questionnaire, while Pearson's correlation was used to examine the interactions between all the test results.

Results: The self-efficacy questionnaire showed high internal consistency (Cronbach's $\alpha = 0.883$; McDonald's $\omega = 0.910$). Self-efficacy was positively correlated with PACES ($r = 0.358$, $p < 0.001$). Furthermore, self-efficacy significantly correlated with most SFT components: 30" Chair Stand ($r = 0.319$, $p < 0.001$), Back Scratch ($r = 0.306$, $p < 0.001$), 8-Foot-Up-and-Go ($r = -0.333$, $p < 0.001$), 30" Arm Curl ($r = 0.195$, $p = 0.031$), and 6-Min Walk Test ($r = 0.194$, $p = 0.033$). No significant correlation was found with the Sit and Reach test ($p = 0.700$) and with Handgrip Strength test ($p = 0.098$).

Conclusions: In active older women, higher self-efficacy is associated with greater enjoyment of PA and better performance in strength, endurance, and agility, which may lead to an enhanced quality of life. These findings could inform the adaptation of educational and PA projects proposed by kinesiologists, suggesting that PA programs for older adults should account for both the physical and cognitive components of movement. Adopting such a cognitive embodiment perspective may be crucial for simultaneously enhancing physical fitness and self-efficacy, thereby contributing to healthy aging.

Acknowledgments: We thank CUS Bergamo for the collaboration and Giulia Gherardi and Valeria Sala for their contribution in data collection.

References: (non obbligatorio).

OC156 - MOTOR DEVELOPMENT, EXECUTIVE FUNCTION AND SELF-PERCEPTION IN FOREST KINDERGARTEN CHILDREN: ASSOCIATIONS WITH AGE, SEX AND BMI

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Purpose: This study explores the associations between executive function (EF), perceived motor competence, enjoyment, motor skills, and body mass index (BMI) in children attending a forest kindergarten. It also investigates the role of age and sex in these developmental domains. The research was conducted in an outdoor educational context specifically designed to foster motor and cognitive development through daily nature-based activities.

Methods: Fifteen children (age range: 3.78–6.27 years; 8 females) were assessed using standardized motor tests (static and dynamic balance, long jump, medicine ball throw), the Day/Night test for EF (Gerstadt et al., 1994), and Likert-scale (1–4) self-assessments of motor competence and enjoyment. Spearman’s rho correlations and Mann–Whitney U tests were used for data analysis.

Results: Perceived motor competence was positively correlated with medicine ball throw ($p = 0.29$), right-leg balance ($p = 0.25$), and EF ($p = 0.57$; $p = 0.034$). BMI was negatively correlated with long jump ($p = -0.36$), but positively with perceived competence ($p = 0.28$). EF was weakly associated with dynamic balance ($p = 0.26$) and not with static balance. No significant sex differences were found. Age showed strong positive correlations with motor performance: long jump ($p = 0.89$), medicine ball throw ($p = 0.57$; $p = 0.03$), dynamic balance ($p = 0.52$), and static balance ($p = 0.29$), confirming progressive improvements with age. These data suggest that EF—especially inhibitory control—supports postural coordination in dynamic tasks.

Conclusions: Dynamic motor skills such as medicine ball throwing and long jump improve with age and are strongly correlated with chronological age. Executive function moderately supports dynamic balance and may facilitate motor planning and postural control. Perceived competence aligns with actual motor skills and EF. Forest kindergarten environments appear effective in fostering integrated cognitive and motor development in early childhood.

Acknowledgments: We thank all the educators of the forest kindergarten, Nicola Marabello and colleagues, all the parents, and children who participated in the study.

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OC157 - MOTOR COMPETENCE CORRELATES WITH PHYSICAL ACTIVITY LEVELS IN MALE ADOLESCENTS

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Purpose: Motor competence (MC) can be defined as the ability to perform a variety of movements, integrating motor and cognitive skills, to cope with everyday motor challenges and to adapt to new contexts. MC has been shown to be associated with the Physical Activity Level (PAL; Stodden, 2008). At present, investigations on the relationship between PAL and MC neglected possible effects of gender. Considering the effects of PAL on health, this information seems fundamental to tailor specific physical activity programs. Therefore, the aim of this study is to explore the existence of a correlation between PAL and MC in this population separately for females (F) and males (M).

Methods: MC and PAL were assessed in eighty-seven adolescents of both sexes comparable in terms of age, stature and PAL (F: $n = 39$; Age: 12.6 ± 1.0 years; Mass: 47.8 ± 9.5 kg; Height: 1.54 ± 0.09 m; PAL: 2.62 ± 0.58 ; M: $n = 48$; Age: 12.9 ± 0.9 years; Mass: 53.5 ± 13.3 kg; Height: 1.57 ± 0.11 m; PAL: 2.62 ± 0.57) using the Test of Gross Motor Development 3 (TGMD-3; Ulrich, 2016) and the Physical Activity Questionnaire for adolescents (PAQ-A), respectively. For the TGMD-3, the total (TGDMTOT), the locomotor (TGMDLOC) and object control (TGMDOBJ) scores were computed. Correlation analyses were carried out separately for gender to verify the presence of a relationship between PAL and TGDMTOT and PAL and TGMDLOC and TGMDOBJ. Separate Mann–Whitney U test were carried out to verify differences between F and M in the thirteen skills composing the TGMD-3.

Results: In M, significant correlations were observed between PAL and TGDMTOT ($r = 0.321$, $p = 0.026$) and PAL and TGMDLOC ($r = 0.401$, $p = 0.005$). No significant correlations were observed between PAL and TGMDOBJ in both groups. Lower TGDMTOT and TGMDOBJ was observed in F compared to M. Mann–Whitney U test showed that F had higher scores than M for galloping ($p = 0.033$) and catching ($p = 0.013$), whereas M demonstrated higher scores in two-hand strike ($p = 0.008$), one-hand strike ($p = 0.006$), stationary dribbling ($p = 0.009$), kicking ($p < 0.001$) and overhand throwing ($p = 0.010$).

Conclusions: Our results show that the MC-PAL relationship is gender dependent. Females demonstrated lower scores in total MC and object control skills than M. Physical activity teachers should consider these results when planning physical education classes designed to improve MC.

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OC158 - THE EFFECT OF COGNITIVE TRAINING ON EXECUTIVE FUNCTIONS AND MOTOR COORDINATION IN ADOLESCENTS

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Purpose: Cognitive development has a beneficial impact on the physical, mental, and social domains of health across the life course. However, adolescence represents a critical life stage where cognitive development should be strongly developed. Therefore, this study aimed at evaluating the effect of a computerized cognitive training program on executive functions and motor coordination in adolescents.

Methods: Seventy-two students were divided in the experimental (EXP, $n = 38$) and control (CON, $n = 34$) group and tested on attention and memory, interlimb coordination (inphase and antiphase hand-foot flexion and extension at 80, 120, 180 bpm), and static and dynamic balance (with open or closed eyes). The EXP group performed a cognitive training program (BrainHQ, Posit Science Corporation, USA) 1 h per week, for 4 months.

Results: A reduction in mistakes (Pre: 5.9 ± 1.5 pt; Post: 5.1 ± 1.5 pt; $p = 0.001$; $d = 0.53$) and an increase in successes (Pre: 19.1 ± 1.5 pt; Post: 19.9 ± 1.5 pt; $p = 0.001$; $d = 0.53$) emerged in the EXP group for the attention test. EXP group showed a greater improvement for inphase (Δ -Post-Pre-test: EXP = 52.5 ± 27.9 s; CON = 20.6 ± 21.7 s; $p = 0.010$; $d = 0.092$) and antiphase (Δ -Post-Pre-test: EXP = 40.6 ± 21.8 s; CON = 22.1 ± 27.9 s; $p = 0.044$; $d = 0.057$) interlimb coordination compared to control group. An improvement in occupied area of displacement (Open eyes: $p = 0.035$; $d = 0.51$; Closed eyes: $p = 0.02$; $d = 0.44$), length displacement of centre of mass (Open eyes: $p = 0.001$; $d = 0.42$; Closed eyes: $p = 0.011$; $d = 0.44$) and speed displacement of centre of mass (Open eyes: $p = 0.001$; $d = 0.43$; Closed eyes: $p = 0.01$; $d = 0.44$) emerged in the EXP group for the static balance test compared to the control group.

Conclusions: The computerized cognitive training program had a positive impact on some domains of cognitive and physical functioning in adolescents. Specifically, an improvement emerged for attention skills, and interlimb coordination and balance abilities.

These results highlight the potential benefit of integrating school-based activities with cognitive training to promote physical and cognitive well-being in adolescents.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC159 - MARATHON TRAINING PREPARATION AND PHYSIOLOGICAL ADAPTATIONS IN A RECREATIONAL ATHLETE WITH TYPE 1 DIABETES: A ONE-YEAR CASE STUDY

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Purpose: Physical exercise exerts different effects on the glycemic trend in people with type 1 diabetes (T1D), depending on its frequency, intensity, duration and various additional factors. Endurance training requires the combination of exercise prescription, insulin

adjustment and nutritional strategies to enhance performance while maintaining metabolic stability. For this reason, the aim of this study is to examine the physiological and metabolic adaptations observed in a recreational athlete with T1D during the year-long structured training preparation for the Berlin Marathon 2024.

Methods: A 32-year-old female Caucasian recreational athlete with 21-year history of type 1 diabetes underwent from September 2023 a 12-month periodized marathon training. The program comprised 5 weekly sessions: 3 running and 2 functional strength training. Monthly running volume is 70 ± 15 km and workouts alternated interval training sessions, tempo runs and long slow distance runs. Training volumes progressively increased while a tapering phase was implemented during the two weeks prior to the marathon. All training sessions were monitored by a sport watch and heart rate reserve (HRR) values were used to adapt workloads. Every 3 months, a 10-km test was performed to estimate VO_{2max} , diabetes-related clinical parameters were assessed and consequently insulin therapy and carbohydrate intake revised. Body composition measurements were performed at baseline and post-marathon using bioelectrical impedance analysis (BIA).

Results: Over the 12-month training program, the athlete showed a progressive improvement in aerobic outcomes and the marathon was finished with the time of 3:39:21. VO_{2max} increased from 50 to 52 ml/kg/min while resting HHR decrease from 61 to 55 bpm leading an enhanced training efficiency at submaximal intensities. Glycemic control remained stable with HbA1c of 6.27% while daily time in range slightly increase. In addition, the total daily dose of insulin requirement showed a 27% increase since the endurance practice required more daily carbohydrates intake (from 146 to 210 g). BIA reported that fat free mass increased from 92.4 to 93.7% while fat mass decreased from 7.6 to 6.3% and phase angle values remain within the same range of 6.9%.

Conclusions: Our results highlighted that an individualized and well-structured approach is necessary for each individual with T1D to manage endurance sport. A multidisciplinary intervention is the key to safely enhance physical performance because exercise practice has to be complemented by adequate insulin therapy and appropriate nutritional strategies.

OC160 - WHOLE-BODY ELECTROSTIMULATION TO ENHANCE PHYSICAL AND COGNITIVE PERFORMANCE IN OLDER ADULTS AT RISK OF DEMENTIA: A RANDOMIZED CONTROLLED TRIAL

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Purpose: This randomized controlled trial (RCT) aimed to evaluate the effects of a 12-week intervention—comprising two 20-min sessions per week—combining aerobic exercise with whole-body electromyostimulation (WB-EMS), on physical and cognitive performance in the elderly.

Methods: A total of 61 participants (age = 71 ± 5.64 years), either healthy or at risk for dementia, were randomly assigned to an experimental training group (ETG, $n = 33$) or a control group (CON, $n = 28$). Participants engaged in 20-min aerobic sessions with progressive intensity (60–80% of heart rate reserve, HRR), performed either with or without continuous WB-EMS stimulation (35 Hz, 350 μ s). The control group performed aerobic training three times per week without WB-EMS stimulation.

Results: Significant time/effects for both the ETG and CON were found in the physical performance tests, with significant time*group interactions favouring the ETG for the arm curl test ($p < 0.001$) and the sit-to-stand test, with significant differences between groups ($p = 0.001$), as well as for the hand grip test ($p < 0.001$) and the 6-min walking test ($p < 0.001$), with significant time*group interactions ($p = 0.003$). Both groups improved their performance on the soda pop test ($p < 0.001$). ETG outperformed CON in memory performance (PROSA, $p = 0.046$; RAVLT immediate recall, $p < 0.001$) and on selective attention and visuospatial processing (attention matrices, $p = 0.014$). Some cognitive tests showed no significant improvement, likely due to the short intervention period for cognitive function (MMSE, $p = 0.628$; TMT, $p = 0.698$; Stroop error, $p = 0.188$) or memory performance (PROSA, $p = 0.338$).

Conclusions: The absence of cognitive decline indicates a potential protective effect of physical activity. When combined with aerobic training, WB-EMS appears to amplify physical and cognitive benefits, supporting its role in counteracting cognitive decline in older adults.

OC161 - LIFETIME PHYSICAL ACTIVITY AND AUTONOMIC RESPONSES IN ADULTS WITH TYPE 2 DIABETES

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Purpose: Cardiac autonomic dysfunction is a common, often silent, complication of diabetes type 2 (T2DM) that increases cardiovascular risk [1]. Heart rate variability (HRV) is a sensitive, non-invasive biomarker of autonomic balance, yet its relationship with habitual PA, independent of metabolic and anthropometric factors, remains underexplored [2,3]. We compared HRV indices in active versus inactive T2DM adults and assessed whether associations with physical activity (PA) persisted after adjusting for clinical covariates.

Methods: 41 T2DM adults (mean age 61.85 ± 10.55 years) were classified as physically active ($n = 22$) or inactive ($n = 19$) using the short-form International Physical Activity Questionnaire (IPAQ-S). Anthropometric and metabolic parameters were collected, and participants underwent 10-min resting HRV recordings under controlled conditions. Time- and frequency-domain HRV metrics were analyzed, including SDNN, RMSSD, LF, HF, and LF/HF ratio. Non-normative outcomes and covariates (HbA_{1c}, triglycerides, cholesterol, BMI, waistline) were rank-transformed for ANCOVA.

Results: No significant between-group differences were observed in anthropometric or metabolic markers. In unadjusted analyses, the PA group exhibited significantly higher SDNN, RMSSD, LF, and HF values. After rank-based adjustment, SDNN ($p = 0.049$) and HF power ($p = 0.049$) remained significantly associated with PA, whereas RMSSD and LF associations were attenuated. The LF/HF ratio did not differ between groups but was inversely predicted by triglyceride levels.

Conclusions: Habitual PA independently enhances cardiac vagal modulation, especially SDNN and HF power, in T2DM, irrespective of glycemic or adiposity status. SDNN appears most robust for detecting early autonomic changes. Although sympatho-vagal balance (LF/HF) did not differ by PA, its inverse association with triglycerides aligns with prior reports and highlights lipid control's role in sympathetic function [4]. Promoting modest, sustainable PA could improve autonomic health before measurable metabolic benefits

occur, and HRV, particularly SDNN and HF, could inform personalized exercise interventions in clinical care.

Acknowledgments: (non obbligatorio).

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OC162 - SIMILAR EARLY NEURAL ADAPTATIONS TO RESISTANCE TRAINING IN YOUNG AND OLDER ADULTS

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Purpose: Age-related reductions in muscle force have been linked to alterations in motor unit (MU) behavior, including slower discharge rates and impaired recruitment patterns. While resistance training can induce early neuromuscular adaptations, the time course of these changes, particularly beyond the initial 4–6 weeks, remains underexplored. This study examined MU adaptations to an 8-week resistance training program in young (YA) and older adults (OA), focusing on potential age-related differences in the time course of neural responses.

Methods: Twelve YA (23 ± 2.4 yrs) and eleven OA (71.4 ± 5.2 yrs) completed a progressive 8-week resistance training regimen targeting the knee extensors. Assessments were conducted at baseline (T0), after 4 weeks (T4), and post-intervention (T8). Participants performed maximal voluntary isometric (MVF) and submaximal trapezoidal contractions (35%, 50%, 70% MVF) of the knee extensors. High-density surface EMG was recorded from the vastus lateralis and decomposed to extract MU spike trains. MU recruitment thresholds (RT), derecruitment thresholds (DERT), and discharge rate at recruitment (DR Recr) and steady-state (DR SS) were quantified. Changes over time were analyzed using generalized mixed-effects models.

Results: MVF increased significantly across time in both age groups (time effect, $p < 0.001$), with gains of approximately 10% from T0 to T4, 9% from T4 to T8, and 20% from T0 to T8 (all $p < 0.001$). DR Recr increased over time ($p < 0.001$), with a significant group $\times$ time interaction ($p < 0.001$). Both YA and OA exhibited significant increases from T0 to T4 ($p = 0.003$ and 0.033 , respectively), but only YA showed further improvements by T8 ($p < 0.001$). Similarly, DR SS increased significantly over time ($p < 0.001$), with different adaptation patterns between groups (group $\times$ time interaction: $p < 0.001$). YA showed robust increases from T0 to T4 and T8 ($p < 0.001$), while OA exhibited a smaller improvement by T4 ($p = 0.033$) and no additional change by T8 ($p = 0.338$). Conversely, no significant changes were found in normalized MU RT or DERT.

Conclusions: Both YA and OA showed early increases in MU discharge rate following resistance training. However, only YA exhibited continued improvements beyond the initial four weeks. As MU discharge rate reflects the level of neural drive to the muscle, these findings underscore a similar initial responsiveness of the neuromuscular system across ages, followed by divergence in longer-term plasticity.

OC163 - COMPARATIVE EFFECTS OF MULTICOMPONENT AND AEROBIC TRAINING ON ANTHROPOMETRIC PARAMETERS, PHYSICAL FITNESS, AND QUALITY OF LIFE IN CANCER SURVIVORS: A 24-WEEK RANDOMIZED CONTROLLED TRIAL

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Purpose: Cancer is a major global public health challenge. Patients often undergo repeated treatments, resulting in long-term physiological and psychological side effects such as muscle atrophy, weight fluctuations, reduced aerobic capacity, diminished strength and flexibility, and impaired quality of life (QoL). This study aimed to compare the effects of a multicomponent training program versus aerobic training on anthropometric parameters, physical fitness, and QoL in cancer patients.

Methods: Forty-seven cancer patients (mean age 56.7 ± 8.4 years; BMI 27.34 ± 4.95 kg/m²) voluntarily participated in a 24-week randomized controlled study. Participants were assigned to one of three groups: multicomponent training group (MTG; 8M, 8F; cardiorespiratory, resistance, flexibility and breathing exercises; 60', 2d-wk-1), aerobic training group (ATG; 9M, 7F; aerobic-only training; 60', 2d-wk-1) or a wait-list control group (CG; 6M, 9F; no structured Physical Activity). Anthropometric parameters were measured using a stadiometer, digital scale (Seca®) and bioelectrical impedance analysis (Akern 101 Biva). Physical fitness was assessed through the 30-s chair stand (30CST), timed up and go (TUG), handgrip strength (HGS), back stretch (BS), chair sit and reach (cS&R), and 2-min step test (2MST). QoL was assessed using the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30).

Results: After the intervention, both MTG and ATG showed significant improvements in anthropometric measures ($p < 0.001$), physical fitness ($p < 0.001$) and QoL ($p < 0.05$) compared to the CG. When comparing MTG to ATG, the multicomponent program demonstrated significantly greater improvements in body composition ($p < 0.05$) and specific physical fitness outcomes including handgrip strength (HGS), lower limb strength (30CST), and flexibility (BS, cS&R) ($p < 0.05$).

Conclusions: Multicomponent exercise training led to significant enhancements in anthropometric status, physical fitness, and quality of life in cancer patients. While both exercise modalities were beneficial, the multicomponent protocol proved more effective in improving body composition, lower limb strength, hand grip strength and flexibility. These findings support the integration of multicomponent exercise programs as part of supportive care strategies in oncology, reinforcing the role of physical exercise as an effective non-pharmacological adjunct therapy in cancer management.

OC164 - EFFECTIVENESS OF AN EXERCISE-BASED INTERVENTION FOR POSTPARTUM DIASTASIS RECTI ABDOMINIS: THE ROLE OF THE KINESIOLOGIST

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Purpose: This study investigates the condition of diastasis recti abdominis (DRA) in the postpartum period and highlights the critical role of the kinesiologist in its management. DRA, defined as the separation of the rectus abdominis muscles, is a common yet often underdiagnosed condition associated with pregnancy and childbirth. The study aims to examine the anatomical, etiological, and biomechanical aspects of DRA, and to evaluate the effectiveness of a targeted exercise program in improving abdominal function and quality of life in affected women.

Methods: The study includes a comprehensive literature review of the abdominal wall, diaphragm, and pelvic floor, emphasizing their interconnections. Assessment methods such as manual palpation, calipers, and ultrasound are discussed alongside challenges in diagnostic standardization. An experimental intervention was conducted with postpartum women (aged ≥ 18) presenting DRA between 2–5 cm, 40 days to 5 years post-delivery. Exclusion criteria included pregnancy, recent abdominal surgery (except cesarean section), pregnancy complications, chronic illness, or BMI > 30 kg/m². Participants underwent a structured exercise protocol incorporating Pilates, hypopressive techniques, and core stability training, with progressive intensity and a focus on transverse abdominis activation.

Results: Participants demonstrated a measurable reduction in the inter-rectus distance through palpation, enhanced muscle strength and endurance, decreased symptomatology, and reported improvements in daily functioning and overall quality of life.

Conclusions: This study confirms the efficacy of a targeted, exercise-based rehabilitation program in managing DRA during the postpartum period. The findings underscore the importance of early and individualized intervention led by kinesiologists or specialists in adapted physical activity. A multidisciplinary approach may further optimize outcomes in trunk function and postnatal recovery.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC165 - IN-PERSON VS ONLINE SUPERVISED TRAINING IN CHILDREN WITH OBESITY: ARE BOTH EFFECTIVE IN ENHANCING CARDIOMETABOLIC HEALTH? A NON-RANDOMIZED CONTROLLED TRIAL

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Purpose: Remote physical activity programs have emerged as a promising strategy to improve adherence to exercise guidelines, specifically among pediatric patients with obesity. We investigated the effectiveness of in-person versus virtual supervised training in improving cardiometabolic health in children and adolescents with obesity.

Methods: Forty-six children and adolescents (BMI z-score ≥ 2 SD; aged 8–16) were enrolled and assigned to either in-person or online supervised combined training. All participants underwent a 12-week, thrice-weekly exercise program (36 sessions total), and the Metabolic Syndrome (MetS) z-score was used to assess metabolic risk. To evaluate the changes between and within groups, we performed a generalized linear mixed model using Rstudio.

Results: Both online and in-person supervised training led to improvements in the primary outcome, MetS z-score, within each group. Specifically, the online group showed a mean reduction of -0.26 ($p = 0.014$), while the in-person group showed a greater reduction of -0.44 ($p < 0.001$). Both interventions also improved waist-to-height ratio and blood pressure ($p < 0.01$). Only the in-person group showed significant reductions in fasting glucose ($p < 0.001$), triglycerides ($p < 0.001$), and BMI z-score ($p = 0.004$), while the online group showed a greater improvement in diastolic blood pressure ($p < 0.01$).

Conclusions: Both in-person and online supervised training programs significantly improved cardiometabolic health in children with obesity, with reductions in MetS z-score observed across groups. While in-person training produced more pronounced effects on key metabolic parameters such as fasting glucose, triglycerides, and BMI z-score, online training showed greater improvements in diastolic blood pressure, suggesting potential context-specific advantages. These findings underscore the clinical value of remote exercise interventions as a flexible and scalable option, particularly in scenarios where access to in-person training is limited. Future research should explore the long-term sustainability of these benefits and investigate hybrid models that integrate the strengths of both approaches.

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OC166 - COMPARATIVE EFFECTS OF MULTICOMPONENT TRAINING VERSUS AEROBIC TRAINING ON PHYSICAL FITNESS IN OLDER ADULTS: A RANDOMIZED CONTROLLED STUDY

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Purpose: The progressive aging of the population is a well-established demographic trend. As life expectancy increases, the health burden has shifted from infectious to chronic-degenerative conditions. In this context, healthy aging, closely linked to active aging, highlights the importance of multisectoral strategies aimed at preserving autonomy and functional capacity. This study aimed to compare the effects of two exercise interventions, Multicomponent Training (MCT) and Aerobic Training (AT), on physical fitness and identify the more effective approach for promoting active aging and preventing frailty.

Methods: Sixty-two apparently healthy older adults (mean age 65.6 ± 3.4 years; BMI 26.7 ± 3.1 kg/m²) were randomly assigned to either the MCT group (7M, 24F; $n = 31$) or the AT group (9M, 22F; $n = 31$). Both groups completed a supervised 12-week training program (60 min, 2 d wk⁻¹). MCT protocol included progressive cardiorespiratory, resistance, mobility, and breathing exercises while the AT protocol involved moderate-intensity continuous aerobic activities such as brisk walking. Physical fitness was assessed using the 30-Second Chair Stand Test, 8-Foot Up-and-Go Test, Timed Up and Go, Handgrip Strength test, Back Scratch Test, Chair Sit and Reach, and 2-min step test and frailty by the Tilburg Frailty Indicator (TFI).

Results: After 12 weeks, both groups showed significant improvements in physical fitness ($p < 0.001$) and TFI ($p < 0.05$). The MCT group demonstrated greater gains compared to the AT group ($p < 0.05$). Aerobic capacity improved significantly in both the AT and MCT groups ($p < 0.01$). TFI scores, indicating frailty, decreased significantly in both groups ($p < 0.05$), with the MCT group showing a notable reduction in social frailty ($p < 0.05$).

Conclusions: Both MCT and AT effectively enhanced physical fitness and quality of life in apparently older adults. However, MCT resulted in superior functional improvements and a significant reduction in social frailty, underscoring its potential as a comprehensive strategy to promote active and socially engaged aging. Future longer-term studies are recommended to further investigate psychosocial outcomes and adherence to these exercise interventions.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC167 - EXPLORING PHYSICAL ACTIVITY AND GLYCEMIC VARIABILITY IN YOUTH WITH TYPE 1 DIABETES AT A SUMMER CAMP

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Purpose: Physical activity (PA) represents an important factor that may help children and adolescents with type 1 diabetes (T1D) maintain adequate blood glucose levels in conjunction with insulin therapy and diet. This study aimed to explore whether changes in PA, tracked through steps count, could impact blood glucose levels or help improve glucose forecasting in children and adolescents with T1D during a summer camp.

Methods: Thirty participants (13.1 ± 1.8) attended a 10-day summer camp, engaging in three different physical activities each day. PA was tracked using Fitbit Inspire HR or Fitbit Ace devices (Fitbit Inc., San

Francisco, California, USA), depending on participants' age. Blood glucose levels were measured seven times per day, with concurrent recording of carbohydrate (cho) intake and insulin adjustments (ins.adj). Glucose-step covariation was tested using linear regression, glucose time effects with repeated measures ANOVA, and subject variability with linear mixed-effects analysis. Finally, two glucose levels' forecast models were built using autoregressive integrated moving average (ARIMA). Model_1 used cho, ins.adj while model_2 used cho, ins.adj and steps. Forecasting accuracy was tested by comparing root mean squared errors (RMSEs) and mean absolute errors (MAEs) of those two models.

Results: A preliminary check of covariation did not show a linear relationship between glucose levels and step counts ($r = -0.012$, $p = 0.59$). There were approximately no random effects of subjects on the variability of glucose levels (random effect ICC% = 6 and $\sigma^2 = 0.94$). ANOVA revealed a significant increase of glucose throughout the observation period ($F(1,1917) = 15.86$, Greenhouse–Geisser corrected $p < 0.01$). For 28 subjects there was enough data to perform ARIMA and RMSE of model_1 (cho, ins.adj) 0.61 ± 0.15 a.u. was significantly larger than the RMSE of model_2 (cho, ins.adj, steps), 0.58 ± 0.14 a.u., $t = (27) 3.67$, $p\text{-value} < 0.001$. MAE confirmed a lower forecasting accuracy of model_1 (0.48 ± 0.11 a.u.) compared to the MAE of model_2 (0.46 ± 0.11 a.u.), $t = (27) 3.27$, $p\text{-value} < 0.01$.

Conclusions: Although baseline data were lacking, a significant increase in glucose levels was observed, not related to step count. However, including steps alongside cho intake and ins.adj improved glucose forecasting accuracy. These results support the value of tracking PA in children with T1D.

OC168 - PLAY-BASED MOTOR AND POSTURAL TREATMENT TO IMPROVE AUTONOMY IN DEVELOPMENTAL AGE IN 22Q11 DELETION SYNDROME: A CASE REPORT

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Purpose: The aim of the study was to analyse the efficacy of an Adapted Physical Activity (APA) program on postural control, motor skills and overall quality of life in developmental deletion 22q11 syndrome.

Methods: A 12-year-old subject was recruited, to whom an APA program was applied, with educational, preventive and rehabilitative aims. The intervention was carried out over 10 months with a frequency of three weekly sessions of one hour each. The APA programme was customised according to the subject's functional and clinical characteristics, taking into account his or her specific needs. Various instruments and tests were used for the evaluation, including the baropodometric platform and the Short Physical Performance Battery, adapted to the case. The motor activities proposed included the use of proprioceptive cushions, medicine ball, elastic bands, 1 kg ankle bands, gymball, step aerobics and playful-motor paths.

Results: Adapted physical activity showed a positive impact on postural tone, basic motor skills and individual autonomy. The subjects involved showed increased active participation, improvements in motor control and a general increase in psychophysical well-being.

Conclusions: The results suggest that APA, if correctly structured and integrated in a multidisciplinary pathway, represents a valid and

effective tool for supporting the development of children with 22q11 deletion syndrome. In particular, the role of the kinesiologist is emphasized, as they promote the improvement of functional abilities and greater participation in daily life activities.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC169 - IMPLEMENTATION OF A SIMPLE EXERCISE-BASED MODEL TO IMPROVE FUNCTIONAL CAPACITY AND QUALITY OF LIFE IN DIALYSIS PATIENTS IN ITALY, SPAIN AND FRANCE: RESULTS OF A NON-RANDOMISED PRAGMATIC TRIAL

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Purpose: People with end-stage kidney disease (ESKD) are exposed to a low quality of life and a high risk of mortality. Despite the evidence that exercise is effective in improving QoL and reducing adverse events, it remains an under utilised intervention due to the difficulties involved in implementing it in patient care. This non-randomised pragmatic trial (NCT04282616) [1] evaluated the effectiveness of an intervention aimed at reducing sedentary behaviour and improving functional outcomes in dialysis patients in three countries: Italy (IT), Spain (ES) and France (FR).

Methods: Each dialysis centre was assigned an Exercise Facilitator (EF), who was an expert in physical exercise. The EFs contacted patients to offer different types of intervention: (I) in-hospital supervised walking and resistance training (SUP); (II) structured home-based walking exercise; (III) performance assessment only. The primary outcome was mobility (measured with distance covered in the 6-min walking test, 6MWD). The other outcomes, collected at baseline and the end of the three-month programs were: walking speed (10-m walking test, T10m) and strength of lower limbs (5-time sit-to-stand test, 5STS). The present ancillary analysis focuses on the outcomes of subjects who chose the SUP option in the three countries.

Results: A total of eighty people chose the SUP intervention (IT n = 49, ES n = 9, FR n = 22). There were no significant differences between the groups of participants from the three countries at baseline (mean age: 73 ± 13 ; 28% female). Despite the differences, the participation rate was similar across the centres (95% of the expected training sessions were completed). The outcomes observed for the various interventions were consistent across all study centres. At the end of the program, the primary outcome significantly improved in all centres without any between-site difference: 6MWD (IT: 29 ± 42 m; FR: 47 ± 36 m; ES: 32 ± 67 m; $p = 0.24$). In addition, also secondary outcomes did not show any between-site differences: 5STS (IT: -2.5 ± 3.1 s; FR: -2.9 ± 4.0 s; ES: -4.7 ± 3.9 s; $p = 0.19$); T10m (IT: -1.0 ± 2.8 s; FR: -0.9 ± 2.1 s; ES: -1.1 ± 3.0 s; $p = 0.88$).

Conclusions: A simple exercise program, carried out before dialysis treatment with the supervision of an EF, significantly improved the study outcomes in all the three centres throughout Europe. The proposed training intervention, requiring low equipment and resources, could be easily spread in the care of ESKD people in any dialysis centre.

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OC170 - A SYSTEMATIC REVIEW AND META-ANALYSIS OF ADHERENCE TO EXERCISE INTERVENTIONS IN PEOPLE WITH MULTIPLE SCLEROSIS

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Purpose: Multiple Sclerosis (MS) is a chronic inflammatory neurologic disease of the central nervous system. The clinical manifestations of MS are varied and include sensory, motor, cerebellar, or visual system abnormalities. Non-pharmacologic approaches, such as exercise training, help to alleviate most of MS-related symptoms. Exercise training is well-tolerated and effective in promoting multiple health-related benefits, but, unfortunately, most people with MS do not adhere to exercise interventions. The magnitude of the poor adherence to exercise interventions in people with MS, however, are not fully elucidated. Hence, the present study synthesised reported adherence data from randomised controlled trials (RCT) of exercise interventions in people with MS.

Methods: A systematic search of empirical articles was conducted in three electronic databases (PubMed, Web of Science, and Scopus) and supplemented by screening reference lists. Eligible studies comprised RCT of exercise interventions involving people with MS. The search strategy employed combinations of the terms 'adherence', 'exercise', and 'multiple sclerosis'. Abstracts and full texts were screened and selected for inclusion by two independent reviewers. A quality assessment process evaluating the studies methodological quality was conducted. Seven of the reviewed studies were considered eligible for a meta-analysis.

Results: The literature search identified 65 eligible studies, of which eleven studies met the inclusion criteria and were incorporated into the systematic review. The methodological quality of the included studies, ranged from moderate to high. Among these studies, 7 reported adherence to the exercise intervention, with a considerable variation in adherence rates. A meta-analysis of six RCT of exercise interventions showed a pooled adherence estimate of 64% (95%CI 58%-70%). When comparing groups, the pooled ORs was 0.66 (95%CI 0.37-1.18), favouring non-exercise groups, although non significantly ($p>.05$).

Conclusions: Our findings indicate a considerable variability in adherence to exercise interventions among people with MS. However, most studies, some of which reporting good methodological quality, reported that exercise adherence rates in the MS population are still problematic. Our results highlight the need for further research aimed at identifying the key barriers and determinants influencing long-term exercise adherence in people with MS.

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OC171 - PHOTOPROTECTION HABITS AND BEHAVIORS AMONG OLYMPIC-LEVEL ROWERS FROM FOUR DIFFERENT COUNTRIES: A CROSS-SECTIONAL STUDY

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Purpose: Outdoor athletes are at increased risk of ultraviolet (UV) radiation-related skin damage, yet photoprotection practices in elite rowers remain poorly investigated.

Methods: A cross-sectional survey was conducted among 78 competitive canoeists from Italy, Australia, Sweden, and Brazil. Participants completed an anonymous, self-administered questionnaire assessing sociodemographic and phenotypic characteristics, sun protection behaviors, skin cancer risk factors, and dermatological examination habits. Multivariate logistic regression models were used to identify predictors of photoprotection behaviors.

Results: While a majority of athletes reported occasional use of sunscreen, only 38.5% performed sunscreen reapplication during prolonged outdoor training. Unexpectedly, higher educational attainment was associated with a reduced likelihood of sunscreen use (OR = 0.07, 95% CI 0.01–0.41; $p = 0.003$). Lighter phototypes were positively associated with sunscreen use (OR = 17.62, 95% CI 2.16–143.80; $p = 0.007$). Sunglasses use was significantly associated with male gender (OR = 7.00, 95% CI 1.17–41.76; $p = 0.033$). No significant predictors were found for hat use or self-skin examination.

Conclusions: Olympic-level rowers exhibit suboptimal sun protection behaviors, with low rates of sunscreen reapplication and self-examination. Educational level alone may not predict appropriate photoprotection adherence in elite athletes. Targeted interventions are needed to promote comprehensive sun safety practices in this high-risk population.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC172 - EFFECTS OF AN AEROBIC TRAINING PROTOCOL ON MUSCLE STRENGTH, MUSCLE FLEXIBILITY, FUNCTIONAL AGILITY AND CARDIOVASCULAR ENDURANCE IN OLDER ADULTS: A LONGITUDINAL STUDY

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Purpose: Regular physical activity is widely recognized as a key strategy for maintaining and enhancing functional health in older

adults. This longitudinal study investigated the effects of an aerobic training protocol on functional fitness over two consecutive years.

Methods: Thirteen elderly women (70.10 ± 5.31 years; 1.57 ± 0.32 m; 60.20 ± 8.94 kg; 24.10 ± 2.46 kg/m²) participated in two six-week aerobic training protocols separated by a 10-month inactive period (2022 and 2023). These protocols consisted of two sessions (90 min for each session) per week. The functional fitness was assessed at baseline (T0), after first intervention (T1), after 10 months of follow up (T2) and after the second intervention (T3), using the Senior Fitness Test battery including chair stand (leg and endurance strength), arm curl (arm strength), sit and reach (back and hamstring flexibility), back scratch (shoulder flexibility), timed up and go (dynamic balance and walking ability) and two-minute step (aerobic endurance). The Shapiro–Wilk test was used to check data normal distribution. Differences over time (T0 vs T1, T2 and T3) were assessed with a repeated measures ANOVA using the time as the within-subject factor. When the main effect of time was significant, Bonferroni post-hoc test was used to identify differences between specific time points. The significant was set with $p < 0.05$.

Results: Lower limb strength was higher in T3 ($p < 0.001$) and T1 ($p = 0.029$) than T0. Upper limb strength improved in T3 compared with T0 ($p = 0.021$). Hamstring flexibility showed an increase in T1 compared to T0 ($p = 0.015$), while a decrease in T2 vs. T0 ($p = 0.034$) for the right leg and in T1 vs. T0 ($p = 0.005$) for left leg. Shoulder flexibility was higher in T3 than T0 for the right arm ($p = 0.031$) and left arm ($p = 0.013$). Functional agility increased in T1 ($p = 0.012$) compared with T0. Finally, cardiovascular endurance showed an increase in T3 ($p = 0.003$) and T1 ($p < 0.001$) compared with T0.

Conclusions: The aerobic training protocol has a significant impact on lower limb strength and cardiovascular endurance over the time. Improvements in upper limb strength, muscle flexibility, and functional agility were more evident after the second intervention, suggesting that continuity and extended duration of training period are key factors in producing meaningful functional outcomes in older adults.

OC173 - FEASIBILITY AND IMPACT OF A SUPERVISED EXERCISE PROGRAM IN PATIENTS UNDERGOING ACTIVE ONCOLOGIC TREATMENTS: DATA FROM A PROSPECTIVE COHORT STUDY

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Purpose: Exercise (EX) during cancer treatment is increasingly recognized for its ability to attenuate side effects, improve symptoms, and enhance quality of life (QoL), yet implementation in real-world settings remains limited. This study aimed to evaluate the feasibility and short-term outcomes of a structured EX program in patients receiving anticancer therapies.

Methods: A 12-week individualized EX protocol, including moderate-intensity aerobic (10–30 min/session) and resistance training (2–3

sets of 8–12 reps across six exercises), was offered at the University of Verona. The primary outcome was feasibility, assessed via recruitment, adherence, and retention. Secondary endpoints included changes in functional capacity (6-min walk test, 6MWT), muscle strength (handgrip strength test, HST), waist-hip ratio (WHR), and QoL (EORTC QLQ-C30). Statistical analysis used descriptive methods and paired t-tests.

Results: Out of 195 patients approached, 191 (98%) consented to participate (mean age 55 ± 11 years). Predominant cancer types were breast (36%) and gastrointestinal (30%); 49% had metastatic disease. During the program, 74% received chemotherapy and 11% received targeted therapy/radiotherapy/immunotherapy. Overall, 123 patients (65%) completed the intervention, with a median adherence to the EX sessions of 82%. Significant post-intervention improvements were observed for WHR (-3.5% , $p = 0.01$), 6MWT ($+29$ m, $p < 0.001$), and HST ($+1.4$ kg, $p < 0.01$). QoL scores improved across multiple domains—physical, emotional, social, and role functioning (all $p < 0.01$). Notable symptom reductions were shown for fatigue, nausea, pain, dyspnea, insomnia, appetite loss, and diarrhea (all $p < 0.05$). Financial burden and global health status also improved significantly. Subgroup analysis, on cancer type, stage, and treatment, revealed the patients' groups that may benefit more from the EX training.

Conclusion: A tailored and supervised EX program is feasible and beneficial for cancer patients during active treatment. The intervention led to measurable gains in physical fitness and almost all domains of QoL, supporting integration of EX into oncological care.

OC174 - EFFECTS OF 1- VS 2-WEEKLY PARTICIPATION IN A WORKPLACE PHYSICAL ACTIVITY PROGRAM ON PHYSICAL FITNESS COMPONENTS OF AN ADULT ACADEMIC COMMUNITY: DIFFERENCES IN SESSION TYPE AND FREQUENCY

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Purpose: Workplace physical activity programs (WPAPs) are increasingly acknowledged for their potential to enhance employee health. The university setting presents a favorable environment for implementing such programs. This study compared the effects of 1- vs 2-weekly participation of a 12-week combined circuit training and mobility program on physical fitness (PF) among university employees.

Methods: Fifty-four university employees (14 males and 40 females) aged 48.20 ± 16.65 years (body height: 165.51 ± 8.92 cm; body mass: 68.2 ± 12.5 kg) followed a 12-week training program with one group ($N = 28$) participating in two-weekly sessions, one circuit training and one mobility (CTM) the other group ($N = 26$) doing one weekly mobility session (MS). The CTM included eight stations with a work-rest ratio of 1:1 (30 s) repeated for 3 rounds, alternating aerobic and resistance exercises. The MS involved stretching and posture exercises, each lasting 12–20 repetitions, with 2–4 sets. Cardiorespiratory fitness (CRF), upper limb grip strength, upper mobility, core endurance, lower limb strength and balance were assessed before (T0) and after 12 weeks (T1).

Results: ANOVA analysis showed a significant effect of time (T0 vs T1, $p = 0.003$). Specifically, significant improvements were observed for handgrip (37.50 ± 12.09 vs 41.02 ± 12.00 kg, $p = 0.002$), two-minute step test (90.80 ± 20.10 vs 98.65 ± 19.17 reps, $p = 0.004$) and sit and reach (7.52 ± 8.17 vs 8.94 ± 7.60 cm, $p = 0.05$). Moreover, our data showed significant differences between groups for arm curl (CTM vs MS: 22.32 ± 0.66 vs 19.56 ± 0.69 reps, $p = 0.006$) and time up and go (CTM vs MS: 4.65 ± 0.10 vs 5.04 ± 0.10 s, $p = 0.001$). No significant time per group interaction was found.

Conclusions: Our program showed significant improvements over time in upper limbs strength, CRF and agility/dynamic balance. Moreover, the twice-weekly CTM showed better improvements for upper limb strength compared to the MS. Although overall improvements were observed in both groups, our findings suggest that although intervention was effective for both groups, session frequency and type may influence and enhance specific components of physical fitness.

OC175 - COMPARATIVE EFFECTS OF ISOMETRIC AND STANDARD MULTICOMPONENT TRAINING ON HEMODYNAMIC, PHYSICAL FITNESS, AND QUALITY OF LIFE IN CARDIOVASCULAR DISEASE: A 24-WEEK RANDOMIZED CONTROLLED TRIAL

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Purpose: Cardiovascular diseases (CVDs) remain a significant concern for global health, representing a considerable burden in terms of morbidity and mortality. Multicomponent training (MCT) protocols are designed to target various fitness domains, including cardiovascular endurance, muscular strength, flexibility, and balance. This study aimed to evaluate the effectiveness of MCT on hemodynamic parameters, physical and psychological parameters in individuals with stabilized CVDs, compared to an integrated multicomponent training protocol incorporating isometric exercises (IMCT).

Methods: Thirty-three subjects with CVDs (19M and 14F; age 69.5 ± 4.9 years) voluntarily participated in this 24-weeks randomized controlled study and were allocated into three groups: MCT group (6M, 6F; cardiorespiratory, resistance, flexibility and breathing exercises; 60', 2dwk⁻¹), IMCT group (7M, 5F; cardiorespiratory, isometric, flexibility and breathing exercises; 60', 2dwk⁻¹) or a wait-list control group (CG; 6M, 3F; no structured physical activity). Hemodynamic parameters were assessed through resting heart rate and peripheral blood pressure. Physical fitness was assessed using the 30" chair stand, timed up and go, handgrip strength, 2-min step, back scratch, and chair sit and reach tests. Psychological outcomes were evaluated using the Short Form-36 (SF-36) and Behavioural Regulation in Exercise Questionnaire (BREQ-3).

Results: After the intervention, both MCT and MCTI groups showed significant improvements in hemodynamic parameters (< 0.001), physical fitness ($p < 0.001$), Quality of Life and exercise motivation ($p < 0.05$) compared to CG. Between-group comparisons revealed significantly greater improvements in hemodynamic outcomes in the IMCT group compared to MCT ($p < 0.05$).

Conclusions: Findings showed that multicomponent training, with or without the integration of isometric exercises, effectively improved cardiovascular function, physical performance, quality of life, and exercise motivation in individuals with stabilized CVDs. However, the IMCT protocol yielded superior hemodynamic benefits, suggesting that the incorporation of isometric exercises may optimize exercise prescriptions for this population.

OC176 - MORE THAN MUSCLE: THE SPECIFIC ROLE OF LOWER LIMB MUSCLE MASS IN POSTURAL BALANCE CONTROL

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Purpose: Falls often arise from both intrinsic and extrinsic factors that compromise postural balance control. However, the specific physiological predictors of sway in healthy young adults remain unclear. This study aimed to assess if sway are influenced by reaction time, flexibility, and body composition, and to explore their utility in establishing reference data and fall prevention strategies.

Methods: Sixty-three healthy young adults (age: 24.30 ± 3.97 years; 173.8 ± 9.7 cm; weight: 73.9 ± 14.1 kg) were assessed using a stabilimeter platform under eyes-open (EO) and eyes-closed (EC) conditions. Postural sway metrics included ellipse surface area, path length, medio-lateral (X) and antero-posterior (Y) displacements, and mean velocity. Predictors included total and segmental muscle mass, fat percentage, BMI, body weight, reaction time, and flexibility (sit and reach). General Linear Models (GLMs) and Principal Component Analysis (PCA) were used.

Results: In EO, dominant leg mass had a significant multivariate effect (Wilks' Lambda = 0.669, $p = 0.002$) and non-dominant leg mass approached significance ($p = 0.050$). In EC, both had a significant multivariate effect (Wilks' Lambda = 0.777, $p = 0.036$; Wilks' Lambda = 0.719, $p = 0.008$). Univariate analyses showed that dominant leg mass predicted ellipse surface and X displacement ($p = 0.027$, $p = 0.012$); total muscle mass affected ellipse surface and both X and Y displacements ($p = 0.010$, $p = 0.011$, $p = 0.020$); trunk mass influenced ellipse surface ($p = 0.020$). The composite PCA muscle score, however, did not significantly predict sway. Reaction time and flexibility showed no significant effects.

Conclusions: These results highlight the importance of regional, rather than global, muscle mass in postural regulation. Lower limb masses appear to have distinct influences on CoP dynamics, particularly when visual input is suppressed. While total muscle mass also exhibited a significant univariate effect on sway parameters, the PCA summarizing muscularity did not retain predictive power, indicating that localized rather than global muscle characteristics may be more relevant for postural balance control. Conversely, reaction time and flexibility did not significantly affect postural stability in this sample, suggesting their limited utility as early markers of fall risk in this population. In conclusion, segmental muscle distribution may provide more meaningful insights into postural control mechanisms than traditional whole-body measures. These findings contribute to developing population-specific reference models for postural sway and may inform future postural balance training strategies targeting fall prevention.

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OC177 - STARTER AND NON-STARTER PLAYERS IN AN ITALIAN SERIE A SOCCER TEAM: RELIABILITY OF SESSION-RPE IN RELATION TO DIFFERENT TYPES OF TRAINING

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Purpose: The present study aimed to verify differences between starter (i.e., ≥ 60 min played in the previous official match) and non-starter players of a Serie A soccer team. In particular, they were compared in terms of training impulse/min (i.e., TRIMP/min) and rating of perceived effort (RPE), also considering different training sessions (i.e., pre-match, technical and tactical, conditioning with ball, small-sided game for metabolic load, and running-based conditioning session). Moreover, the relationship between session-RPE and TRIMP in each players subgroup and according to the type of training was analyzed.

Methods: Thirty-two players were monitored by an entire competitive season (August 2024–May 2025), submitting RPE scale (CR-10) and recording heart rate frequency during each training session to calculate the Bannister's TRIMP. Linear mixed effects models were applied according to the aims of the study.

Results: Starters and non-starters differed in RPE and in TRIMP/min for each type of training excepting for both pre-match sessions and technical and tactical workouts; and for condition session with ball only according with RPE values. For types of training session, TRIMP was different in both team subgroups excepting for small-sided game for metabolic load and technical and tactical workouts comparison. Conversely, s-RPE was different in all types of training session, excepting for pre-match sessions and small-sided game for metabolic load comparison in both subgroups; in addition, running-based conditioning and conditioning with ball sessions resulted quite similar in non-starter players. Finally, in each subgroup, correlations between session-RPE and TRIMP resulted large for small-sided game for metabolic load and conditioning sessions with ball, and for running-based conditioning only in starters; and moderate for the rest of types of training, excepting for starters' pre-match sessions which resulted scarce.

Conclusions: These findings suggest that internal training load differs between starters and non-starters, highlighting the need to specifically tailor training load among players with different current physical potential. Coherently, TRIMP varied determining further load perceptions between players' subgroups. Nevertheless, the high grade of TRIMP and s-RPE correlation demonstrate a satisfactory reliability of the use of session-RPE for almost all types of training session performed both by starter and non-starter players.

OC178 - COMPARISON OF KINEMATIC AND DYNAMIC PARAMETERS BETWEEN DIFFERENT LINEAR ENCODERS DURING BENCH PRESS EXERCISE

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Purpose: Velocity-based training is widely recognized as one of the most effective methods for evaluating and monitoring resistance training. The most commonly analyzed parameters are mean propulsive velocity, time, displacement, and power output. Specifically, mean propulsive velocity is frequently used to estimate fatigue levels and to help structure individualized training programs. The aim of this study is to assess the validity and reliability of different measurement tools, including the Chronojump and Vitruve linear encoders, by comparing them with the MuscleLab encoder.

Methods: One elite-level water polo athlete participated in the study. A progressive load bench press test was conducted on a Smith machine, with loads ranging from 20 to 80 kg in 20 kg increments. For each load, the athlete performed 3 trials $\times$ 4 sets, separated by optimal recovery, totalling 12 trials at maximal intended velocity per load. The encoders were attached to the barbell, keeping the cables perpendicular to the ground.

Results: Variables recorded included displacement, time, mean velocity, mean propulsive velocity, power, and force. Results showed significant differences ($p < 0.05$) in all measured parameters at 20, 40, and 60 kg, but not at 80 kg.

Conclusions: Chronojump and Vitruve appear less reliable at lighter loads with higher movement speeds.

OC179 - EFFECTS OF REGULAR RUNNING ON GAIT SMOOTHNESS: A JERK RATIO-BASED ANALYSIS

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Purpose: Running promotes sensorimotor integration and fine regulation of locomotor patterns, contributing to enhanced movement smoothness. Due to its dynamic and repetitive nature, running shares many biomechanical features with walking, but requires a higher degree of motor control, particularly in the management of forces and mediolateral balance. However, the impact of regular running on daily walking gait is still underexplored. The purpose of this study is to evaluate the effect of habitual running on gait fluidity by comparing trained runners and individuals who do not practise sports.

Methods: A total of 11 runners (≥ 3 years of experience, training ≥ 3 times/week) and 9 controls matched for age, sex, and BMI were recruited. All participants performed self-selected speed walking on a 10-m walkway, during which kinematic data were recorded using an eight-camera infrared stereophotogrammetric system. Gait smoothness was assessed at the level of the center of mass (COM) using the jerk ratio (JR), calculated for the mediolateral-vertical (ML/V) and anteroposterior-vertical (AP/V) components. Lower JR values indicate greater smoothness. Statistical analysis was conducted using an independent samples t-test ($p < 0.05$).

Results: A statistically significant difference was found in the JR ML/V parameter ($p = 0.017$), with lower values in the runner group compared to the control group. No statistical difference was found in the JR AP/V parameter.

Conclusions: These findings seem to suggest improved gait smoothness and neuromotor control in runners, particularly in managing mediolateral and vertical oscillations during walking. Regular running appears to promote neuromuscular adaptations that also benefit low-intensity motor tasks such as walking. JR ML/V emerges as a sensitive parameter for detecting differences in movement quality and may serve as a valuable indicator for monitoring dynamic coordination and the effectiveness of motor interventions in both clinical and athletic contexts.

Acknowledgments: (non obbligatorio).

References:

OC180 - INVESTIGATING THE DIFFERENCES IN THE REACTION TIME, STIFFNESS, AND NEUROMUSCULAR ACTIVATION BETWEEN YOUNG GYM USERS AND SPORTS PEOPLE

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Purpose: Differently from few years ago, the number of gym users is increasing having a negative effect on the number of people practicing other types of sports. Most of the gym activities are closed skill and this could decrease the processing speed capacity. Consequently, the objective was to investigate if a difference in reaction time task and stiffness (contact time of a drop jump test) exists between gym users and people who practiced a sport.

Methods: Young adults (18–26 years of age) were recruited. They had to be sportive (25 participants, 5 females; age: 22 years; height: 176 cm; weight: 72 kg) or gym users (33 participants, 9 females; age: 22 years; height: 170 cm; weight: 68 kg), physically healthy. After the informed consent signature, an informative questionnaire was proposed. Before the data collection, participants were evaluated in terms of anthropometric characteristics. Electrodes were set in the tibialis anterior (TA) and gastrocnemius lateralis (GL) to evaluate the electromyography (EMG). Participants performed the visual reaction time task and a drop jump test (to evaluate the stiffness through the contact time). Normality of the data distribution was tested with the Shapiro-Wilk test, α was set at 0.05. ANOVA and a Turkey's multiple comparison tests were adopted to study the differences between the two groups for the variables: reaction time and drop jump (stiffness). For the EMG data of the reaction time task, a Kruskal Wallis test and the Dunn post hoc were adopted. The significance level was set at $p \leq 0.05$.

Results: The reaction time of the two groups presented no statistical differences ($p > 0.999$, 95.00% CI of diff – 3.605 to 3.623). The mean reaction time for the gym users was of 0.5196 ± 0.088 s against 0.5104 ± 0.099 s of the sportive group. Similar results were for the drop jump ($p > 0.9999$, 95.00% CI of diff – 3.617 to 3.611) with gym users that did 0.2061 ± 0.03 s and sportive that did 0.2092 ± 0.03 s. No statistical differences ($p > 0.05$) were detected for the EMG data for the TA; %TA; GL; %GL; %GL/TA, and GL/TA.

Conclusions: The mean reaction time for the gym users was slightly higher compared with the sportive group, while the drop jump time was slightly lower. This trend makes us suppose that the activity could have an impact in the long time period. These differences are only indications highlighting the importance of further study this topic, especially between long-term practitioners. These findings could be also useful in terms of benefits of exercise for the prevention of falls in older adults. Its prevention is fundamental and it should start since young age.

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OC181 - IS THE PERFORMANCE DROP IN THE FATIGUED STATE ACCURATELY CAPTURED BY $\dot{V}O_{2\text{MAX}}$? A SEX-COMPARATIVE DURABILITY STUDY IN ENDURANCE ATHLETES

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Purpose: Despite being often uncorrelated with performance drops due to fatigue, fresh $\dot{V}O_{2\text{max}}$ in well-rested conditions still remains the gold standard for assessing cardiorespiratory fitness. Furthermore, sex differences in durability (i.e., time and onset of performance deterioration) remain unexplored despite well-known metabolic differences between sexes. This study aimed to investigate durability and potential sex differences in competitive triathletes following a fatiguing task performed at moderate-to-heavy intensity.

Methods: Triathletes performed maximal cardiopulmonary exercise tests on two randomly assigned instruments (cycle-ergometry, treadmill) in fresh conditions, and after a 40-min fatiguing protocol at their respiratory compensation point, with a recovery period of 3–5 days between tests. Testing on the second instrument was conducted one week after the completion of testing on the first. Breath-by-breath gas exchange ($\dot{V}O_2$, $\dot{V}CO_2$, VE), substrate oxidation, and performance (peak power/speed) were measured. ANOVA tested for sex, condition, and instrument effects.

Results: Twenty-seven sub-elite triathletes (16M, 11F) participated in the study and were matched by age (men: 33.6 ± 7.2 years, women: 35.8 ± 8.7 years, $p = 0.523$). Overall, performance significantly dropped (cycle-ergometer: – 6.4%; treadmill: – 5.2%, $p < 0.001$). Men showed larger drops (cycle-ergometer: – 9.3%; treadmill: – 8.9%, $p < 0.001$) than women, who only dropped on the cycle-ergometer (– 3.8%, $p = 0.04$). $\dot{V}O_{2\text{max}}$ did not capture the post-fatigue decrements, whereas $\dot{V}CO_{2\text{max}}$ decreased significantly only in men (cycle-ergometer: – 11.3%; treadmill: – 11.6%, $p = 0.01$). Moreover, sex differences emerged during the fatiguing protocol in which men oxidized more CHO both on treadmill, and cycle-ergometer (+ 24%, and + 29%, respectively, $p = 0.002$).

Conclusions: In the fatigued state, women exhibit greater durability than men. Performance drop was captured by reduced $\dot{V}CO_{2max}$, but not $\dot{V}O_{2max}$, implicating CO_2 handling/buffering capacity can limit athletes' physiological resilience. These findings highlight the importance of tailoring endurance training taking into account the key role of $\dot{V}CO_2$ in sustaining high-intensity performance under fatigue. Moreover, training strategies should integrate sex-specific characteristics in fatigue resistance and substrate utilization to refine training and competition strategies, enhancing athletes' durability in endurance performances.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC182 - PHYSIOLOGICAL INDICATORS DURING SUBMAXIMAL EXERCISE IN HYPOBARIC HYPOXIA: INSIGHTS FROM THE 6-MINUTE WALKING TEST

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Purpose: Few studies have investigated the relationship between oxyhemoglobin desaturation and performance in submaximal exercise while exposed at high altitude (Dünnwald et al., 2021). The six-minute walk test (6MWT), however, has been proven to be a valid tool for assessing functional capacity under such conditions (Gibson et al., 2015). This study aims to examine cardio-respiratory parameters and the walking distance by conducting 6MWT at high altitude.

Methods: A total of 10 healthy young adults (5 m and 5f, mean age of 26.4 y and BMI of 22.9 kg/m²) participated in a scientific expedition (15 days) up to the Pyramid Lab in the Himalayas (5050 m). They performed 6MWT in the fourth day after reaching Pyramid. Blood pressure and the Lack Louise Test (LLS) score were assessed before the test. SpO₂, heart rate (HR), symptoms and walking distance (WD) were recorded during the test and one minute post-exercise. SpO₂ and HR were measured by using a finger pulse oximeter (WristOx 2, Nonin Medical, USA).

Results: All participants showed normal blood pressure and none were affected by Acute Mountain Sickness. WD ranged from 500 to 630 m. SpO₂ decreased significantly from 82.8 to 78.3% during the test ($p = 0.002$), and increased to 83.9% during recovery. HR increased from 80.4 to 123.6 bpm during the test ($p < 0.001$), then dropped to 90.7 bpm post-test. Oxygen desaturation (ΔSpO_2) ranged from -8% to 0%. No significant correlations were found between distance and SpO₂ at the last test minute ($r = 0.09$, $p = 0.792$), ΔSpO_2 ($r = 0.04$, $p = 0.913$), HR at the last test minute ($r = 0.48$, $p = 0.223$), or ΔHR ($r = 0.51$, $p = 0.232$). However, positive and negative trends were observed between WD and post-test SpO₂ ($r = 0.65$, $p = 0.058$) and post-test HR ($r = -0.753$, $p = 0.051$), respectively.

Conclusions: Submaximal exercise in extreme high altitude results in greatly heterogeneous oxyhemoglobin desaturation responses. In this study, the cardio-respiratory parameters did not correlate with 6MWT distance covered. However, participants with better recovery capacity tended to achieve greater distances, suggesting that post-exercise recovery is associated to enhanced physical performance in expeditioners at high altitude.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

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OC183 - RESEARCH-ACTION AND TACTICAL GAMES MODEL FOR THE DEVELOPMENT OF TECHNICAL-TACTICAL SKILLS IN YOUNG FOOTBALLERS

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Background: In the football context, among the emerging models is the Tactical Games Model (TGM), which is characterised by its game-centred approach that integrates technical and tactical learning through practical and realistic contexts. Although the TGM is widely used in physical education to develop students' tactical and decision-making skills, its use in the training of young footballers is still limited.

Purpose: The aim of the study is to evaluate the effectiveness of an innovative methodological approach, the TGM, in enhancing the learning and development of key competences related to technical-tactical performance in young footballers.

Methods: A convenience sample of 40 young footballers aged between 11 and 13 years was involved in the study. The participants were divided into two distinct groups: the Experimental Group (EG) and the Control Group (CG). A methodological approach defined as action-research, a cyclical and reflexive model that integrates practical action with scientific analysis, with the aim of improving a specific situation through direct intervention, has been envisaged. The study involved the application of a scientifically validated test, the Game Performance Assessment Instrument (GPAI), administered in both the pre- and post-intervention phases. In the period between the pre- and post-test phase, two separate 9-month training protocols were implemented. The CG followed a traditional approach, while the EG was subjected to an innovative TGM-based methodology. Descriptive statistics and a T-test for independent samples were performed to analyse the differences between the groups.

Results: The EG benefited significantly from the TGM approach, with a significant increase in total scores, from a pre-test mean of 15.25 to a post-test mean of 22.45. Statistical analysis showed a significant difference between the groups, with a P-value = .00026, confirming the effectiveness of TGM for improving technical-tactical skills. The most marked improvements were observed in the components of decision making, support and tactical adaptation.

Conclusions: This study shows that TGM represents a promising methodology for the development of technical-tactical skills in young footballers. The adoption of innovative models such as TGM can provide athletes with valuable tools to address the complex challenges of the modern game.

OC184 - ACTN3 GENE POLYMORPHISM ANALYSIS IN PROFESSIONAL BASKETBALL PLAYERS: A STUDY ON GENETIC PREDISPOSITION TO PHYSICAL PERFORMANCE

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Purpose: Athletic performance and individual response to physical activity are influenced by a complex interplay between environmental and genetic factors. Among these, genetic predisposition plays a key role in determining endurance, strength, recovery capacity, and susceptibility to injury. Recent studies have identified several genetic polymorphisms in genes such as ACTN3, ACE, and PPARGC1A, that induce alterations in muscle fiber composition, oxygen utilization, and mitochondrial biogenesis, contributing to interindividual variability in physical performance. In this study, we investigated the frequency of genetic variants in the ACTN3 gene in elite athletes to explore the potential correlation with muscle performance characteristic.

Methods: For this study, a cohort of 45 basketball athletes were recruited and blood samples were collected. Genomic DNA was extracted using the Qiagen extraction kit and subsequently amplified by PCR with the Promega PCR Master Mix. Finally, the amplified DNA was sequenced using Next Generation Sequencing (NGS).

Results: Our results have identified the *c.1729C>T* (R577X) polymorphism in 19 athletes: 15 heterozygous and 4 homozygous. Moreover, we found additional variants: *c.1689A>G* in 14 athletes (11 heterozygous, 3 homozygous); *c.1679A>C* in 1 heterozygous athlete and *c.1889A>G* in 1 athlete. Finally, 14 athletes showed no detectable polymorphisms in the ACTN3 gene.

Conclusions: This study highlighted a heterogeneous genetic profile among professional basketball players. The prevalence of genotypes identified may suggest a genetic predisposition favoring power and speed performance. The development of a genetic screening panel could represent a valuable tool for sports physicians and coaches, enabling personalized training and performance optimization in elite athletes.

OC185 - FUNCTIONAL AND MOTOR ABILITIES CHANGES INDUCED BY AN ADAPTED TAEKWONDO-BASED INTERVENTION IN ELDERLY CARE HOME RESIDENTS: PRELIMINARY RESULTS

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Purpose: With the progressive aging of the population and the high prevalence of functional decline in long-term care settings, promoting physical activity in older adults has become a public health priority. Martial arts, such as taekwondo, are emerging as promising tools for adapted physical activity due to their multimodal nature. The purpose of this study was to explore the effects of an adapted taekwondo intervention on the functional capacity of elderly individuals living in a care home facility. Specifically, the study aimed to assess changes in muscular strength, flexibility, mobility, and joint range of motion following a six-month intervention.

Methods: The participants are care home residents. Participants were stratified by mobility status (ambulatory and non-ambulatory) and assessed using standard physical performance tests: the Senior Fitness Test battery, Handgrip Test, and Short Physical Performance Battery (SPPB) for ambulatory subjects, and a subset of the same tests plus joint mobility assessments for non-ambulatory subjects. The intervention included two weekly adapted taekwondo sessions for six months, supervised by certified instructors. Pre- and post-intervention data were analyzed with paired T-tests or Wilcoxon signed-rank tests, depending on normality assumptions.

Results: Nineteen care home residents (13 ambulatory and six non-ambulatory) aged ≥ 65 years participated in the program. Ambulatory participants showed statistically significant improvements in upper limb strength (Arm Curl test, $p < 0.05$ bilaterally) and in lower limb flexibility (Chair Sit and Reach, $p < 0.05$ left side). No significant improvements were detected in SPPB scores or lower limb strength. Among non-ambulatory participants, significant gains were observed in head mobility (flexion and left torsion, $p < 0.05$) and elbow extension ($p < 0.05$ bilaterally). Improvements in Arm Curl strength were more evident in the dominant limb, though not always statistically significant.

Conclusions: The results suggest that a structured adapted taekwondo interventions can induce measurable improvements in physical function, particularly in upper body strength and mobility, even among elderly individuals. This supports the feasibility and efficacy of implementing martial arts-based interventions in residential care settings as a good strategy for active aging.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OC186 - GLYCEMIC CONTROL AND MUSCULAR FITNESS IN ADULTS WITH TYPE 1 DIABETES: RTD AS A MARKER OF SUBCLINICAL NEUROPATHY

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Purpose: While physical exercise has been associated with improved glycemic outcomes, including increased time in range (TIR) and reduced glycosylated hemoglobin, the association between muscular fitness and glycemic control remains underexplored. This study aimed

to investigate whether distinct muscular fitness components are associated with glycemic control in type 1 diabetes (T1D).

Methods: HandGrip (HG) strength, knee extensor isometric peak torque (PeakT) and rate of torque development (RTD) were assessed in sixty-eight physically active adults with T1D (31 females, 37 males; age: 39.1 ± 14.5 years; BMI: 25.9 ± 4.5 kg/m²; disease duration: 19.5 ± 11.5 years; physical activity levels: 1615.3 ± 2649.8 MET-min/week). Specific power (SP) was retrieved from the ratio between the Sit-to-Stand test and skeletal muscle mass. Glycemic control was evaluated using continuous glucose monitoring (CGM) over the 14 days preceding the evaluation, including TIR (70–180 mg/dL), time above (TAR > 180 mg/dL) and below range (TBR < 70 mg/dL), coefficient of variation (CV), and glucose management indicator (GMI).

Results: Glycemic metrics results were: TIR = 67.2 ± 13.7 %; TBR = 1.6 ± 2.1 %; TAR = 22.0 ± 8.5 %; CV = 32.8 ± 5.1 %; GMI = 7.1 ± 0.5 %. HG was 31.8 ± 12.0 kgf, PeakT was 161.5 ± 50.7 Nm and RTD was 9.11 ± 3.87 Nm/kg/s. Pearson's correlation analysis revealed a significant positive correlation between TIR and RTD ($r = 0.367$, $p < 0.01$). TBR and TAR showed a significant and negative correlation with RTD (TBR: $r = -0.254$, $p = 0.04$; TAR: $r = -0.367$, $p < 0.01$). Furthermore, GMI showed a significant negative correlation with RTD ($r = -0.446$, $p < 0.01$). No significant correlations ($p > 0.05$) were found between glycemic variables and other muscular components of interest (HG, Peak T, SP).

Conclusions: Higher TIR was positively associated with RTD, while greater glycemic variability (TBR, TAR, GMI) showed negative associations. As RTD depends on motor unit recruitment and discharge rate, it may reflect neuromuscular function. The observed associations indicate that poor glycemic control may impair neuromuscular responsiveness even in the absence of overt neuropathy. Therefore, RTD may be used as a potential marker of subclinical diabetic neuropathy.

OC187 - PHYSICAL ACTIVITY AND PHYSICAL FUNCTIONING IN RELATION TO HEALTH-RELATED QUALITY OF LIFE: A PILOT STUDY IN PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY

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Purpose: Hypertrophic cardiomyopathy (HCM) is a cardiac disease characterized by abnormal thickening of the left ventricle, with no evidence of chamber dilation and no identifiable cause (Hensley et al., 2015). Primary symptoms include exercise intolerance, fatigue, angina, dyspnea, arrhythmias, syncope and/or sudden death. Consequently, patients often adopt a physically inactive lifestyle, which results in limited exercise capacity and negatively impacts their health-related quality of life (HRQOL; Weissler et al., 2021). This study has two main aims: (i) to evaluate the moderate to vigorous physical activity (MVPA), and (ii) to investigate whether MVPA and physical functioning are linked to HRQOL, in a sample of patients with HCM.

Methods: Twenty-four patients with HCM were recruited at the S.C. Cardiology Department of the Mauriziano Hospital (Turin). MVPA was assessed using the Global Physical Activity Questionnaire. Physical functioning was measured using the handgrip strength test (HST), the five-times sit-to-stand test (5-STs), and the cardiopulmonary exercise test (CPET; VO_{2max}). Physical fatigue and HRQOL were assessed using the subscale of the Multidimensional Fatigue Inventory and the Italian version of the Kansas City Cardiomyopathy Questionnaire, respectively. Data were treated with correlations and a hierarchical regression model.

Results: Patients' ages ranged from 28 to 65 years and 46% of them were women MVPA (IQR = 135 MET-min/week) was not practised by 75% of the sample. HRQOL was found to be significantly correlated with HST ($r = 0.430$; $p = 0.041$), 5-STs ($p = -0.732$; $p < 0.001$) and CPET ($r = 0.440$; $p = 0.036$). No statistically significant correlation was found between MVPA and HRQOL. After controlling for age, gender and physical fatigue, hierarchical regression revealed that the HST, 5-STs and CPET explained statistically significant variance in HRQOL ($\Delta R^2 = 0.265$; $R^2 = 0.751$; $p = 0.008$). The model identified age ($\beta = 0.329$) and 5-STs ($\beta = -0.576$) as statistically significant correlates of HRQOL.

Conclusions: The findings showed that patients with HCM did not engage sufficiently in MVPA. In addition, physical functioning, particularly leg strength (5-STs), positively impacted HRQOL. Patients with HCM should be encouraged to engage in MVPA and improve their physical functioning through personalized, supervised exercise programs, which have the potential to enhance HRQOL. Further studies should focus on the feasibility and efficacy of exercise for this specific population.

Acknowledgments: (non obbligatorio).

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OC188 - RELATIONSHIP BETWEEN BODY COMPOSITION AND SPORT PERFORMANCE IN WHEELCHAIR RUGBY

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Purpose: Wheelchair rugby (WR) is a Paralympic team sport reserved for individuals with disabilities affecting both upper and lower limbs, tetraplegia being the most common among players. Although WR's popularity is growing, several aspects of body composition (BC) and sport-specific performance still need to be investigated. This study aimed to evaluate the relationships between BC, strength, and sport-specific performance in WR athletes.

Methods: Sixteen WR male athletes volunteered for this study (age = 36.2 ± 7.47 yrs; stature = 171 ± 21.8 cm; weight = 64 ± 10.5 kg; WR participation = 9.44 ± 3.27 yrs). BC parameters at both whole-body (WB) and regional level including Bone Mineral Content (BMC), Lean Mass (LM), Fat Mass (FM) and FM percentage (%FM) were assessed by means of Dual-Energy X-ray Absorptiometry. Strength was assessed with the Maximal Pass test (MP) and sport-specific performance with the Sprint test (S), Agility test (A), and Acceleration test (ACC). Spearman's rho coefficient (rs) was

used for exploring correlation between variables. The level of significance was set at $p \leq 0.05$.

Results: At the WB level, a negative, statistically significant association was found between LM and S and A ($r_s = -0.591$; $p = 0.018$ and $r_s = -0.652$; $p = 0.006$, respectively), as well as a positive, statistically significant association between LM and MP ($r_s = 0.711$; $p = 0.002$). No statistically significant association was found between FM, BMC, FM%, and MP, S, A, and ACC ($p > 0.05$ for all variables). At the regional level, results showed a negative and statistically significant association between Arms LM and S, A, and ACC ($r_s = -0.562$; $p = 0.026$; $r_s = -0.603$; $p = 0.015$ and $r_s = -0.684$; $p = 0.003$ respectively) and a positive association between Arms LM and MP ($r_s = 0.782$; $p < 0.001$). Arms BMC negatively correlated with S and ACC ($r_s = -0.559$; $p = 0.027$ and $r_s = -0.680$; $p = 0.004$, respectively) and positively correlated with MP ($r_s = 0.637$; $p = 0.008$).

Conclusions: This study highlights the key role of BC in WR performance. Higher levels of Arms LM and BMC were associated with better results in sprinting, agility, acceleration, and passing ability, underscoring the importance of upper body development in optimizing performance in WR. These findings have practical implications for individualized training and classification processes. Future research should control for classification scores to more precisely identify the effect of BC.

OC189 - SUPPLEMENTATION WITH ENERVIT PURE-PRO POST WORKOUT IN HYROX ATHLETES: EFFECTS ON STRENGTH, POWER, AND RECOVERY

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Purpose: Hyrox is a rapidly growing sport that combines endurance running with high-intensity functional exercises. This modality alternates between running segments and muscular or cardiovascular workstations, demanding high metabolic efficiency and substantial recovery capacity. Proper nutritional supplementation is therefore essential to support performance and optimise recovery. This project aims to evaluate the effects of "ENERVIT PURE-PRO POST WORKOUT", a blend composed of maltodextrins, leucine, and beta-lactoglobulin (BLG-100) (Kajtel A et al., 2025). Maltodextrins provide readily available energy during and after exercise (Righetti S et al., 2024). Leucine, an essential amino acid, stimulates muscle protein synthesis, counteracts catabolism, and promotes anabolic adaptation (Kajtel A et al., 2025; Soares JDP, 2024.). BLG, a whey-derived protein rich in leucine, further enhances this effect by stimulating post-exercise insulinaemia, which supports muscle regeneration (Hartley C, 2022; Hughes A, 2023; Smedegaard SB, 2024).

Methods: The study design includes a preliminary case-study phase followed by a large-scale randomised controlled trial. A total of 24 competitive Hyrox athletes will be enrolled and randomly assigned to receive either the supplement or an isocaloric placebo in a double-blind fashion. The intervention will last 8 to 12 weeks, with the supplement taken within 30 min after each training session. All

participants will follow a standardised Hyrox training protocol. The protocol also includes targeted hematochemical and biochemical analyses, including inflammatory markers (e.g., IL-6, CRP), hormonal markers (e.g., cortisol, insulin, testosterone), indicators of muscle damage (e.g., CPK), and oxidative stress markers (e.g., SOD, CAT, GPX), in order to monitor the physiological effects of supplementation. Key outcome measures will include assessments of strength, power, muscular endurance, perceived wellness, delayed onset muscle soreness (DOMS), and body composition. Data will be collected before, during, and after supplementation, with follow-up analysis to assess the persistence of any effects.

Expected results: Anticipated outcomes include improved athletic performance, faster recovery times, and a protective effect on muscle tissue.

Conclusions: This rigorously designed study aims to highlight the value of advanced nutritional supplementation in the context of high-intensity functional sports.

OC190 - NEW METHODS AND PREDICTION MODELS FOR BODY COMPOSITION AND VOLUME IN YOUNGER ELITE BASKETBALL PLAYERS

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Purpose: Body composition involves analysing several insights from various viewpoints. The in vivo methods use laboratory analysis to quantify desired components by measurable parameters (1). The air displacement plethysmography (ADP) uses tissue density properties (2) to estimate body fat. However, subject variability affects the accuracy and precision of estimates, and sampling from a specific population may drive new panoramas (3). This study aimed to provide a new perspective for reducing biological variation in sports.

Methods: 30 elite young players (experience = 10.48 ± 3.22 years) were clustered into two age groups: U17 (53.37%) and U19. Body mass (BM), volume (BV, TEM = 0.35%) and thoracic gas volume have been measured by an ADP. Anthropometry and bio-electric conductivity (BIA) have been assessed by standardised methods (95% ICC = 0.82, 0.99). Since the general mathematical model (4), the highest body fat and fat-free mass density levels have been used as cut-off points in the new body composition model. The uncertainty of propagation has been computed. Pearson's product-moment coefficient measured linear correlation. The Kolmogorov-Smirnov test checked the residuals' distributions. The stepwise procedure selected the best regressors at a 5% type I error probability (both for entry and removal level). The White method accounted for error sphericity, whereas tests on residuals such as Cook distance, DFBETAS and DFFITS looked for outliers and leverage points. The VIF was detected for multicollinearity. To evaluate the goodness of fit, the adjusted-R², AIC and BIC, and Bland and Altman's limit of agreement have been implemented. Also, Lin's concordance correlation coefficient has been used.

Results: No significant differences appeared in body composition between categories. The widest body fat value was 0.21663, while the highest value of fat-free density was 1.113 kg/L. A new model payable for all players encompassed $BF = ((3.985 \times BV) - (3.58 \times BM)) \times 100$, with a low error propagation (3.4% of BM). The new methods estimated BV by anthropometry ($R^2 = 0.96$, RMSE = 2.9%) or BIA ($R^2 = 0.81$, RMSE = 4.56%), with a high degree of precision (97.8 and 86.8%) and accuracy (100 and 99.6%).

Conclusions: The proposed methods performed accurate and precise estimations, reducing costs for basketball research and clubs. To fill

the gaps between laboratories and the field is a challenge for sports sciences.

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OC191 - THE IMPACT OF PHYSICAL ACTIVITY ON QUALITY OF LIFE IN INDIVIDUALS WITH MULTIPLE SCLEROSIS

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Purpose: Multiple sclerosis (MS) is a chronic neurodegenerative disease of the CNS, marked by inflammation, demyelination, and axonal loss. It remains a leading cause of neurological disability in young adults despite therapeutic advances. This study aimed to evaluate the effects of a structured Adapted Physical Activity (APA) program on quality of life (QoL) in individuals with MS, focusing on functional changes and correlations with self-perceived QoL.

Methods: In collaboration with AISM Brescia, MOV, and FISM, the project covers a 10-month intervention (Sept 2024–June 2025); this abstract reports preliminary data from the first 4 months (T0–T1). Adults with MS attended biweekly, 50-min APA sessions tailored to individual abilities. Assessments included strength (Handgrip, Arm Curl Test (ACT), 30 s Sit-to-Stand (STS)), flexibility/mobility (Chair Sit and Reach (CSR), Back Scratch), and gait/balance with Inertial Measurement Unit (IMU) (6MWT, WALK + , TUG). Self-reported outcomes: SF-36, MSQOL-54, Modified Fatigue Impact Scale (MFIS), and International Fitness Scale (IFIS).

Results: Twenty-seven participants (mean age 62.2 ± 14.8 years; 63% female; mean EDSS 4.48 ± 2.28) included 44% with relapsing-remitting, 15% primary progressive, and 11% secondary progressive MS. Significant improvements were observed in ACT (right: $p = 0.0472$; left: $p = 0.0433$), STS ($p = 0.0446$), and CSR (right: $p = 0.0088$; left: $p = 0.0062$). Gait analysis with IMU revealed improvements in 6MWT ($p = 0.0009$) and TUG ($p = 0.0388$); no significant change in WALK+ ($p > 0.05$). QoL questionnaires showed no significant changes, though MSQOL-54 physical component trended upward ($p = 0.1309$). The gap between objective gains and perceived QoL highlights the complexity of subjective assessment in MS.

Conclusions: This interim analysis shows that a 4-month APA program improves strength, mobility, and gait in individuals with MS, although these changes are not yet mirrored by perceived QoL. The ongoing study will provide further insights at 10 months (June 2025), allowing evaluation of long-term effects and reinforcing the role of APA in neurorehabilitation.

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References: (non obbligatorio).

OC192 - THE EFFECTS OF ONLINE HOME-BASED PILATES COMBINED WITH DIET ON MUSCLE QUALITY INDEX IN INDIVIDUALS AFFECTED BY OBESITY/OVERWEIGHT

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Purpose: Overweight and obesity consist of an excess of body fat that may impair health, participation in physical activity, and increase the risk of non-communicable diseases. Recently, a systematic review and meta-analysis by Oliveira et al. (2024) demonstrated that Pilates brings muscular benefits in an elderly population not specifically focusing on individuals with overweight or obesity. Furthermore, Greco et al. (2024) highlighted how home-based online Pilates, when combined with the Mediterranean diet, may improve body composition in individual affected to overweight or obesity. Therefore this study evaluates the effects of 12 weeks of home-based online Pilates combined with a Mediterranean diet on Muscular Fitness in adults with overweight or obesity.

Methods: Thirty-nine participants (age: 50.1 ± 9.9 yrs; BMI: 32.5 ± 5.7 kg/m²) were recruited and randomly assigned into two groups: the Control Group (CG, $n = 21$) and the Pilates Group (PG, $n = 18$). Both groups adhered to a Mediterranean diet, but only the PG engaged in a supervised, home-based, online Pilates three times a week for 12 weeks. Body mass, height, BMI, body composition, maximal strength and endurance of the lower limbs, evaluated using an isometric dynamometer, lower limb muscle power assessed through the Sit To Stand Test (STS) were collected before (T0) and after the 12-week intervention (T3).

Results: Both groups showed a significant reduction in body mass, BMI kg/m² and body composition. However, only the PG maintained body cell mass (BCM; T0: 28.1 ± 5.5 kg; T1: 28.4 ± 5.5 kg) and skeletal muscle mass (SMM; T0: 23.7 ± 5.0 kg; T1: 24.1 ± 4.9 kg), while these decreased significantly ($p < 0.05$) in the CG: BCM (T0: 32.6 ± 8.2 kg; T1: 31.9 ± 8.5 kg), SMM (T0: 28.3 ± 6.7 kg; T1: 27.7 ± 6.8 kg).

Additionally, the PG showed significant improvements in lower limb muscle strength (Mean Fmax; T0: 341.7 ± 100.8 N; T1: 363.4 ± 91.8 N), endurance (Mean Endurance; T0: 297.4 ± 89.0 N; T1: 316.8 ± 75.4 N), and power (STS; T0: 23.5 ± 8.8 s; T1: 19.7 ± 4.1 s), (all $p < 0.05$), whereas no significant changes were observed in the CG.

Conclusions: Home-based online Pilates training, associated with a Mediterranean diet, is effective in preserving muscle mass and improving muscle function in overweight/obese adults.

References: Horenstein et al. Journal of Anxiety Disorders, 77, 102,340; Greco, et al. Nutrients 16(6):902; Oliveira, et al. Journal of Bodywork and Movement Therapies 39:615–34.

OC193 - THE EFFECTIVENESS OF COMBINING HIGH-INTENSITY INTERVAL TRAINING AND RESISTANCE TRAINING ON THE PHYSICAL FUNCTIONING AND FATIGUE IN PEOPLE WITH MULTIPLE SCLEROSIS

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Purpose: Multiple sclerosis (MS) is a chronic inflammatory condition affecting the myelin sheath of the central nervous system. MS is recognised as the leading cause of disability among young adults in developed countries (Reich et al., 2018). The benefits of exercise in reducing disease-related impairments and improving clinical outcomes in people with MS are widely known. Previous studies (including: Campbell et al., 2018) have highlighted that high intensity interval training (HIIT) is an efficient and well-tolerated training modality for people with MS. This study investigates the effectiveness of combining high-intensity interval training and resistance training on physical functioning (i.e., strength, mobility and cardiorespiratory fitness) and fatigue in people with MS, analyzing whether the impact of training differs between those with and without walking impairments.

Methods: A total of 35 people with MS (mean age of 51 ± 12 years; 74% of women; EDSS range 1.5–6.0) were included. Physical functioning was measured using the 5-Times Sit-to-Stand Test (5-STST), the 2-Minute Walk Test (2-MWT), and the 25-Foot Walk Test (25-FWT).

Fatigue was assessed using the Modified Fatigue Impact Scale (MFIS). Participants underwent a 12-week supervised exercise intervention comprising twice-weekly 60-minute sessions of HIIT and resistance training, based on individualised VO_2peak assessments. Data were treated with paired t-test and ANCOVAs.

Results: Following the intervention, there was an improvement in the 5-STST ($t = 2.00$; $p = .05$) and the 25-FWT ($t = 2.13$; $p = .04$). In contrast, there were no significant changes in the 2-MWT, the total MFIS and its subscales. After controlling for age and gender, participants without walking impairments ($n = 15$; $\text{EDSS} \leq 3.5$) showed greater improvement in the 2-MWT ($F = 4030$; $p = .05$) than those with walking impairments ($n = 20$; $\text{EDSS} > 3.5$). However, the effect of the intervention on people with and without walking impairments did not differ for the other variables.

Conclusions: These findings suggest that HIIT and resistance training are effective ways of improving physical functioning, particularly strength and walking ability, in people with MS, with no worsening of fatigue. Furthermore, people without walking impairments showed greater improvements in cardiorespiratory fitness. A lower disability level probably enables better management of prolonged walking tasks, such as the 2-MWT.

Acknowledgments: (non obbligatorio).

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OP001 - ACTIVE BREAKS AND COGNITIVE FUNCTION IN PRIMARY EDUCATION: A PILOT STUDY ON SHORT-MEDIUM TERM EFFECTS ON SELECTIVE AND SUSTAINED ATTENTION

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Purpose: A growing body of evidence demonstrates the positive relationship between physical activity and executive function in children. This study aimed to examine the time course of the effectiveness of active breaks (ABs) in enhancing attention levels among second-grade primary school children compared to traditional teaching methods over a three-month period.

Methods: Parents/guardians and teachers of both the experimental group (EG) and the control group (CG) completed a questionnaire assessing the psychometric characteristics of the sample. The EG participated in daily 10-minute active breaks for three months, while the CG followed regular teaching methods. Selective attention (SeA, at 30 seconds) and sustained attention (SuA, at 120 seconds) were assessed at baseline and monthly (T0, T1, T2, and T3).

Results: The EG consisted of 17 children (8.42 ± 0.39 years, 10 females), while the CG included 18 children (8.37 ± 0.42 years, 11 females). The EG generally exhibited higher psychometric scores, although teacher and parent perceptions varied in both groups. SeA levels improved significantly in both groups overtime, but EG demonstrated greater improvements, particularly three months after the introduction of active breaks ($p < 0.001$). A similar trend also for SuA ($p < 0.001$). A huge effect size shows larger increases during the third month for both SeA ($ES = 1.97$) and SuA ($ES = 1.46$) in favor of EG.

Conclusions: Active breaks positively influenced both SeA and SuA. Their effectiveness increased over time, suggesting that a minimum duration of three months is necessary to achieve significant benefits compared to traditional teaching methods in primary education.

OP002 - RESPIRATORY AND PERFORMANCE RESPONSES TO SIMULATED HIGH ALTITUDE IN TRAINED MEN AND WOMEN

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Purpose: Sex differences in physiological responses to High Altitude (HA) remain debated, with some evidence suggesting women may be disadvantaged due to respiratory limitations¹. This study aimed to

compare metabolic and respiratory responses to exercise at HA in trained men and women.

Methods: Twenty trained participants (10 M and 10 F, $\text{VO}_{2\text{max}}$: 58.3 ± 5.9 and 49.3 ± 4.2 ml/kg/min, respectively) performed a $\text{VO}_{2\text{max}}$ test at sea level (SL, FiO_2 : 20.9%) and simulated HA (4500 m, FiO_2 : 11.8%). Operational lung volumes and Diffusion Capacity (DLCO) were assessed at rest and during moderate (MOD), heavy (HEAV), and severe (SEV) exercise at both altitudes.

Results: At SL, F showed lower $\text{VO}_{2\text{max}}$ (-15.4%), V_{emax} (-31.2%), and maximal speed (V_{max} , -15.5%) than M (all $p < 0.01$), but comparable Exercise Induced Hypoxemia (EIH) prevalence was assessed (8 M vs 6 F). At HA, all parameters decreased similarly between sexes ($\text{VO}_{2\text{max}}$: -30.4 and -30.6% ; V_{max} : -29.0 and -29.5% ; V_{emax} : -7.0 and -6.4% ; SpO_2 : -25.9 and -26.9% for M and F, respectively). No differences in maximal stroke volume (SV), HR, and cardiac output (CO) were detected, and similar changes between SL and HA were seen (M: $+0.2\%$; -5.7% and -4.9% ; F: -5.4% , -5.3% and -10.6% for SV, HR and CO, respectively). F exhibited lower Inspiratory Capacity (IC), Inspiratory Reserve Volume (IRV), and DLCO across all intensities (SEX effect, all $p < 0.001$), though IC and IRV differences disappeared when normalized for Total Lung Capacity. DLCO remained lower in F even when adjusted for alveolar volume ($p = 0.03$), and decreased at HA in both sexes (FiO_2 effect, $p < 0.001$), plateauing faster in this condition ($\text{FiO}_2 \times \text{INT}$ effect, $p < 0.001$, HEAV $\neq$ SEV at SL but not at HA). The effectiveness of pulmonary vascular recruitment (DLCO/CO) was consistently lower in F (SEX effect, $p < 0.001$) but unaffected by altitude for both sexes.

Conclusions: Despite lower $\text{VO}_{2\text{max}}$ (ml/kg/min) at SL, women showed a comparable prevalence of EIH, and similar performance and $\text{VO}_{2\text{max}}$ declines at HA as men. These findings indicate that the lower metabolic demand in women did not confer an advantage under hypoxic conditions. Instead, the intrinsically lower lung diffusing capacity and DLCO/CO ratio may place them at a greater disadvantage at altitude. Future studies should match participants for $\text{VO}_{2\text{max}}$ relative to fat-free mass², to determine whether comparable metabolic demands impose greater exercise constraints on women in hypoxic environments.

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OP003 - WHOLE BODY VIBRATION ENHANCES NEUROGENESIS AND SYNAPTIC PLASTICITY THROUGH THE ACTIVATION OF THE SIRT1/PGC-1ALPHA/ERRALPHA AXIS

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Purpose: Several evidences have shown the beneficial effects of whole body vibration (WBV) on the central nervous system, promoting neurogenesis and hippocampal synaptic plasticity. Brain-derived neurotrophic factor (BDNF) and fibronectin type III domain-containing protein 5 (FNDC5) appear to play key roles, although the molecular mechanisms regulating their activation remain unclear. The sirtuin 1 (SIRT1)/peroxisome proliferator-activated receptor gamma

coactivator 1-alpha (PGC-1 α)/estrogen-related receptor alpha (ERR α) axis, known to promote gene expression in response to exercise and to regulate FNDC5, has been suggested as a potential mediator of these adaptations. However, its involvement in WBV-induced brain responses has never been explored. Therefore, our study aimed to investigate the involvement of the SIRT1/PGC-1 α /ERR α axis in WBV-induced neurogenesis and synaptic plasticity processes in a mouse model, to identify the molecular mechanisms responsible for brain adaptations.

Methods: 1-month-old male BALB/c mice ($n = 10$) underwent a WBV protocol characterized by 3 vibration series of 2 min 30 s, each with 2 min 30 s recovery, 3 days per week for 12 weeks. The vibratory training was performed using a vibratory platform with a frequency of 45 Hz, acceleration of 2 g and displacement of 1.5 mm. At the end of training, the animals were sacrificed, and the hippocampus was isolated for functional analysis, evaluating synaptic plasticity, and for morpho-molecular analysis, investigating the structure of the hippocampus and the expression of SIRT1, PGC-1 α , ERR α , BDNF and FNDC5. A group of mice of the same age ($n = 10$) was maintained under sedentary conditions and subjected to the same experimental procedures as the intervention group.

Results: The trained group was characterized by a significant improvement in hippocampal synaptic plasticity, indicative of enhanced learning and memory processes, as well as increased expression of the markers investigated, suggesting their involvement in central nervous system responses to WBV.

Conclusions: WBV can stimulate neurogenesis and synaptic plasticity through the modulation of the SIRT1/PGC-1 α /ERR α axis, an important regulator of neuronal adaptive processes. However, further studies are needed to clarify how different vibratory training protocols influence these mechanisms, with the aim of developing personalized WBV interventions that maximize the benefits for the central nervous system.

OP004 - MITOCHONDRIAL BIOCHEMICAL COUPLING EFFICIENCY REFLECTS PERIPHERAL LIMITS TO AEROBIC CAPACITY IN AGING MUSCLE

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Purpose: Aerobic exercise capacity (VO_2) relies heavily on the muscle's ability to efficiently generate ATP via oxidative phosphorylation. A key parameter in this process is the mitochondrial biochemical coupling efficiency, which represents the proportion of O_2 used for ATP synthesis rather than dissipated as proton leak, representing how effectively muscles convert O_2 into usable energy. In aging, VO_2 and mitochondrial function typically decline, but the extent to which mitochondrial biochemical coupling efficiency contributes to the limitation of VO_2 during exercise executed at severe intensity in older adults remains unclear. This study aimed to assess whether mitochondrial biochemical coupling efficiency is a key determinant of VO_2 during a severe-intensity single-leg knee-extensor exercise in healthy elderly individuals, a model that isolates peripheral muscle metabolism by reducing central cardiovascular constraints.

Methods: 10 active healthy elderly individuals performed constant-load (60 rpm) single-leg knee-extension at severe domain corresponding to the 85% of peak power output (assessed during an incremental test) to exhaustion. During the test, gas exchanges were

measured via a metabolic cart. After a week, a muscle biopsy sample from the vastus lateralis was taken from each participant, and mitochondrial respiration was assessed in permeabilized fibers via high-resolution respirometry. Mitochondrial biochemical coupling efficiency was calculated in relation to tissue wet weight.

Results: All participants reached task failure, defined as inability to sustain 60 rpm for more than 10 s after strong encouragement. The average time to exhaustion was 391 ± 194 s, at a workload of 58 ± 11 W. The $\text{VO}_{2\text{peak}}$ was 20.2 ± 5.2 mL/kg/min, with a respiratory quotient of 1.04 ± 0.09 . A strong positive correlation was found between mitochondrial biochemical coupling efficiency and $\text{VO}_{2\text{peak}}$ ($r = 0.85$, $p = 0.007$), indicating that higher oxidative efficiency was associated with greater aerobic performance.

Conclusions: We observed a strong positive association between mitochondrial biochemical coupling efficiency and VO_2 during localized muscle exercise executed at severe domain in older adults. These findings highlight the importance of mitochondrial quality, not just quantity, as a determinant of aerobic exercise capacity in aging muscle. Improving or preserving oxidative coupling efficiency may be a critical strategy to sustain exercise tolerance and functional performance with advancing age.

OP005 - EFFECTS OF AN EIGHT-MONTH SOCIAL DANCE PROGRAM ON MUSCULAR FITNESS AND OVERALL HEALTH IN OLDER ADULTS

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Purpose: Dance practice requires considerable cognitive, physical and emotional engagement and has been suggested as a useful type of physical exercise (PE) for healthy ageing. Dance may also be an alternative PE strategy to counteract age-related declines in muscular function, known to be involved in the risk of falls and the onset of disabilities in the elderly. Unlike performance-based or competitive dance, social dance, despite being easily accessible to older adults, is primarily a recreational activity. Therefore, the physical demands of social dance may not be sufficient to improve physical fitness and quality of life. This study aimed to evaluate the effects of an eight-month social dance program on muscular fitness components and overall health status in the elderly to highlight whether it may represent a valid PE in this population.

Methods: Older adults of both genders were assigned to a control group (CG, $n = 25$, age: 70.1 ± 7.3 years, BMI: 28.5 ± 3.6 kg/m²) and a dance group (DG, $n = 25$, age: 74.4 ± 6.5 years, BMI: 28.9 ± 3.9 kg/m²). The DG participated in an 8-month social dance program (two times/week), while the CG maintained its lifestyle routine and was not involved in any structured PE. Exercise intensity during the program was kept at low to moderate intensity. Body composition, muscular fitness, and overall health status were evaluated at baseline (T_0) and after 8 months of intervention (T_1). The 10-repetition chair stand test (CST) and the maximum isometric peak

torque (PeakT) of the dominant lower limb were used to evaluate muscular fitness. Overall health status.

Results: No significant main effects of time and time per group interactions were observed for skeletal muscle mass and fat mass between CG and DG ($p > 0.05$). Similarly, there were no significant effects of time and time per group interactions for CST ($p > 0.05$) and PeakT ($p > 0.05$). Significant differences ($p < 0.05$) were observed for EQ-VAS scores over time, with DG reporting a higher EQ-VAS score than CG at T_1 (76.0 ± 13.6 score vs 68.4 ± 19.4 score).

Conclusions: Although not detrimental, social dance did not elicit significant improvements in body composition and muscular fitness compared to the CG. Our findings suggest that, while social dance is easily accessible, it is not sufficient as a standalone intervention to enhance physical fitness in older adults. However, it appears to be effective in improving their overall self-reported health.

OP006 - EFFECTS OF TWO NUTRITIONAL STRATEGIES COMBINED WITH ADAPTED PHYSICAL ACTIVITY ON HEALTH-RELATED QUALITY OF LIFE IN CHRONIC KIDNEY DISEASE

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Purpose: Chronic kidney disease (CKD) is associated with multiple comorbidities, including uremic sarcopenia (US), which negatively affects patients’ health-related quality of life. Lifestyle interventions are the cornerstone of CKD management, especially in patients undergoing conservative therapy. Nutritional therapy and adapted physical activity (APA) represent effective non-pharmacological strategies to counteract the progression of CKD and its complications. Among dietary approaches, low-protein diets (LPD) (0.6–0.8 g/kg/day) with controlled intake of phosphorus, sodium, and potassium and adequate energy can help mitigate the metabolic imbalances that contribute to US. An alternative approach, the plant-dominated LPD (PLADO), with $\geq 50\%$ plant-based protein intake, may further slow the progression of CKD through modulation of the gut microbiota and reduction of uremic toxins. However, the combined effects of PLADO and APA on the prevention of US remain unclear. This pilot study analyses the impact of a 12-week online APA protocol combined with PLADO or LPD on muscle mass, physical capacity, and comorbidities in CKD patients.

Methods: 15 CKD patients undergoing conservative therapy, aged 59.8 ± 9.8 years, were randomized into 2 groups: A) Online APA protocol (3 sessions per week, lasting 1 h each) combined with PLADO; B) Online APA protocol combined with LPD. Physical capacity (6-Minute Walking Test), Muscle strength (Handgrip), body composition (Bioelectric Impedance Analysis-BIA), quadriceps femoris muscle thickness, and laboratory parameters (i.e. FORD, FORT) were evaluated at baseline (T_0) and after 12 weeks (T_1). SF-36 was administered to assess patients’ general.

Results: At T_1 Group A and Group B increased the distance in the 6-Minute Walking Test ($p = 0.001$; $p = 0.034$). Handgrip strength significantly improved in Group A for the left limb ($p = 0.014$), showing a positive trend in the right limb as well. In addition, there was a significant reduction in BMI in group A ($p = 0.022$). While quadriceps femoris muscle thickness increased significantly in group B ($p = 0.050$). No significant differences in FORD and FORT values

were observed in both groups. Positive trend was reported in general health perception in both groups, and the item health change increased significantly in Group A ($p = 0.050$).

Conclusions: Both PLADO and LPD, combined with APA, seems to positively affect muscle function and body composition in CKD patients. These results suggest that lifestyle interventions integrating tailored dietary protocols with structured physical exercise may enhance health-related quality of life in this population. However, larger randomized controlled trials with extended follow-up are needed to confirm these preliminary data and evaluate long-term effects.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

OP007 - ALTERED MUSCLE ACTIVITY BOTH IN ANTICIPATION AND IN REACTION TO KNEE LOADING DURING DROP JUMPS IN SUBJECTS WITH ACL RECONSTRUCTION

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Purpose: Anterior cruciate ligament rupture is a common and debilitating injury. Recent literature suggests that this injury leads to a reduction of quadriceps activation, potentially due to altered sensory feedback from internal knee structures [1]. Here we evaluate whether changes in muscle activity also occur before knee loading, assessing whether ACL injury causes alterations to movement planning.

Methods: Twenty-two participants who underwent anterior cruciate ligament reconstruction (age: 25.6 ± 7.1 years; BMI: 22.5 ± 2.3 kg/m²) performed three double leg drop jumps from a 30 cm box. Muscle activity was recorded from vastus lateralis and medialis, biceps femoris (BF), semitendinosus (ST), the gastrocnemii and tibialis anterior of both injured and non-injured legs. Root mean square (RMS) of the EMG envelopes was calculated 100 ms before and 100 ms after foot strike to assess anticipatory and feedback-driven reactive strategies respectively. Repetition-averaged RMS of individual muscles and repetition-averaged quadriceps to hamstring RMS ratio (Q:H) were computed. Comparison between injured and non-injured legs were performed using either paired t-test or Wilcoxon signed tests depending on data distribution.

Results: There were no significant differences between individual quadriceps, gastrocnemii and tibialis anterior muscles activity of injured and non-injured legs during the anticipatory and the reactive phase of landing. However, there was a significantly higher activity of both hamstring muscles (BF: $p = 0.03$, Effect Size = 0.54; ST: $p = 0.04$, ES = 0.56) in the injured than in the non-injured leg during the reactive phase.

In addition, Q:H of the injured leg was significantly lower than in the non-injured leg during both the anticipatory ($p = 0.02$, ES = -0.66) and the reactive phase ($p = 0.002$, ES = -0.66).

Conclusions: Our results indicate altered control strategies both in anticipation and in reaction to foot contact during jump-landing. Before knee loading the nervous system seems to control the quadriceps and the hamstring muscles inconsistently across subjects, with the goal of consistently reducing Q:H in the injured leg perhaps as a protective strategy [2]. Following ground contact the reduction of Q:H seems to be driven by an increased hamstring activity in the

injured leg, potentially mediated by sensory feedback due to knee loading.

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OP008 - THE MODULATORY EFFECTS OF VIRTUAL REALITY ON CORTICAL AND ATTENTIONAL DYNAMICS DURING CYCLING EXERCISE

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Purpose: The prefrontal cortex appears to be involved in the regulation of affective responses during physical exercise and influenced by exercise modality and setting. Therefore, the aim of this study was to investigate the functional activation of the prefrontal cortex and attentional focus (AF) across different exercise conditions.

Methods: 16 participants (age: 23.7 ± 5.3 years) completed a cycling protocol consisting of 5-min warm-up at 40 Watts, 10 min of self-paced (SP) exercise and a 4 km time trial (TT), with 15-min rest in between. Experimental sessions were performed with virtual reality (VR) immersion and without VR (noVR) in a randomized order. During the VR session, the real time performance was shown using ZWIFT App, which transfers real-world cycling into a virtual environment. Participants' maximum heart rate (HRmax) was calculated and heart rate (HR) was continuously recorded during exercises. Focus was measured using the Attentional Focus (AF) scale, administered every 2-min (during SP) and 500-m (during TT). Changes in oxygenation (O₂Hb) and deoxygenation (HHb) in prefrontal cortex were continuously monitored during exercise using functional near infrared spectroscopy (fNIRS). A 2×2 Repeated measures Analysis of Variance (ANOVA) was used to examine the effects of exercise settings (noVR, VR) and modalities (TT, SP) on prefrontal O₂Hb and HHb and AF.

Results: Based on %HRmax, SP was classified as moderate ($60 \pm 11\%$ HRmax) and TT as vigorous ($81 \pm 11\%$ HRmax). Significant ($p < 0.05$) differences were found in O₂Hb between exercise settings for TT (noVR = 2.42 ± 3.75 μ M; VR = 1.76 ± 1.56 μ M), and between exercise modalities for VR (TT = 1.76 ± 1.56 μ M; SP = 1.03 ± 0.80 μ M) and noVR (TT = 2.42 ± 3.75 μ M; SP = 2.28 ± 4.18 μ M). Differences were also found in HHb for VR (TT = 1.28 ± 1.12 μ M; SP = 0.77 ± 0.79 μ M) and noVR (TT = 1.76 ± 2.83 μ M; SP = 1.31 ± 2.42 μ M). AF scores were significantly different during VR sessions (SP: 32 ± 16 μ M; TT: 63 ± 17 μ M) compared to noVR (SP: 52 ± 21 μ M; TT: 41 ± 22 μ M).

Conclusions: The findings show that exercise modality and setting significantly influence AF and prefrontal cortex activation. Specifically VR conditions increased AF during TT and showed lower O₂Hb, indicating greater external focus and reduced cortical activation, while noVR revealed higher O₂Hb, reflecting greater internal attention. This study provides new evidence on the interplay between cortical responses and attentional processes as a function of exercise modality and setting.

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References: (non obbligatorio).

OP009 - WALKING SPEED AND MORTALITY IN CARDIAC PATIENTS WITH TYPE 2 DIABETES: A 25-YEAR FOLLOW-UP STUDY

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Purpose: To investigate the association between walking speed (WS) and mortality in cardiac patients with type 2 diabetes (T2D) undergoing a secondary prevention program.

Methods: This observational study analyzed data from 490 patients with T2D (mean age 67 ± 9 years) enrolled in the ITER registry (1998–2023). WS was assessed at baseline through the 1-km treadmill walking test (1 km-TWT) and used to stratify patients into tertiles (Slower, Medium, Faster). Cox proportional hazard models were applied to assess associations between WS and all-cause and cardiovascular mortality, adjusting for demographic and clinical variables. A sensitivity analysis excluded deaths within the first 3 years of follow-up.

Results: Over a median follow-up of 11 years, 205 patients died. Higher baseline WS was inversely associated with mortality. Compared to the Slower group, Medium (HR 0.46, 95% CI 0.33–0.62) and Faster (HR 0.59, 95% CI 0.41–0.80) walkers showed significantly lower all-cause mortality. Cardiovascular mortality was similarly reduced for Medium (HR 0.31, 95% CI 0.19–0.49) and Faster (HR 0.31, 95% CI 0.18–0.56) groups. Each 1 km/h increase in WS was associated with a 24% lower risk of all-cause mortality and a 42% lower risk of cardiovascular mortality. These associations were confirmed in the sensitivity analysis.

Conclusions: Walking speed, as measured by the 1 km-TWT, is a strong and independent predictor of mortality in cardiac patients with T2D. The test provides a simple and effective tool for evaluating functional status and guiding exercise-based interventions. These findings reinforce the role of physical activity promotion in long-term cardiovascular disease management and support the integration of functional assessments into secondary prevention strategies.

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OP010 - KINEMATICAL ANALYSIS OF 135° CHANGE-OF-DIRECTION TECHNIQUES IN BASKETBALL

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Purpose: Change of direction (COD) is a fundamental movement in team sports, particularly in basketball, where athletes must rapidly decelerate, reorient their bodies, and reaccelerate in response to

dynamic game situations. Among the biomechanical techniques used to perform COD, three primary patterns have been identified: the Side-Step, Crossover Cut, and Split-Step. Therefore, this study aimed to identify the COD techniques naturally adopted by basketball players during pre-planned 135° directional changes, and to compare the associated lower-limb kinematics and execution time using IMU-based motion analysis.

Methods: A total of 130 young basketball players (66 males, 64 females; aged 13–18) from Bàsquet Girona participated in the study. After a standardized 10-min warm-up, each player performed the V-cut test twice, consisting of a 25-m sprint with four pre-planned 135° CODs every 5 m, executed as quickly as possible on an indoor court. Kinematic data were collected using the MVN Biomech Link system (Xsens Technologies BV, Netherlands), comprising 17 IMUs operating at 60 Hz. Joint kinematics (hip, knee, ankle) and execution time for each COD were analyzed. Execution time was calculated between automatically identified initial and final frames. The frequency of each COD technique was expressed as a percentage of total CODs. Statistical Parametric Mapping (SPM{t}) was used to compare time-continuous joint kinematics across techniques, while Mann–Whitney U tests assessed differences in execution time. Statistical significance was set at $p < 0.05$.

Results: Two COD techniques emerged: Side-Step and Split-Step. Among 1,038 valid CODs, Side-Step was more frequent (72.1%) than Split-Step (27.9%). Side-Step also showed a significantly shorter execution time (median = 0.55 s; IQR = 0.13) compared to Split-Step (median = 0.67 s; IQR = 0.17) ($p < 0.001$). Kinematic analysis revealed that, in the pivot leg, Side-Step involved greater hip flexion, external rotation, and abduction during braking. Side-step also showed lower knee flexion, higher internal rotation, and greater knee abduction. At the ankle, Side-Step was characterized by higher dorsiflexion and adduction during the pivot and push-off phases.

Conclusions: Side-Step was the predominant COD technique, likely due to greater biomechanical efficiency, familiarity, or performance advantages, as reflected in its significantly shorter execution time. For 135° CODs, it may represent a time-efficient strategy. Nonetheless, the optimal technique depends on task demands, game context, and athlete-specific factors. In terms of kinematics, Split-Step showed reduced hip flexion and internal rotation during braking, which may increase ACL loading by shifting stress to the knee. However, its double-leg landing could help distribute forces more evenly compared to the unilateral loading seen in Side-Step.

P0001 - “RESISTERE”: UNDERSTANDING THE ATHLETES’ PSYCHOLOGICAL RESILIENCE IN SPORT

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Purpose: Psychological resilience plays an important role in improving athletes’ performance. Unfortunately, in the Italian sport context, a specific resilience scale is lacking. This study is aimed to examine the psychometric properties and to validate the Italian version of the *RESilience qualities In SporT (RESIST)* scale. RESIST scale addresses five dimensions of resilience consisting of adaptability (AP), positive personality (PP), self-confidence (SC), motivation (MT), and perceived social support (SS).

Methods: A total of 297 Italian athletes (68,35% males; Mage = 22.4, SD = 4.24 y.o.) from various types and levels of sport participated to the study. The sample included 142 athletes from team sports and 155 from individual sports. Athletes competed at amateur (26.6%), professional (9.8%), regional (39.7%), national (21.2%), and

international (2.7%) levels. Athletes filled out a questionnaire containing the RESIST scale and Athlete Burnout Questionnaire (ABQ), World Health Organization Quality of Life -BREF (WHOQOL-BREF) and Self-Confidence Inventory (SCI). One month later, the RESIST scale was re-administered to 212 of the original participating athletes for test–retest. Data analyses were performed using *Jamovi*.

Results: Confirmatory Factor Analyses supported the original five-factor model of the RESIST (CFI = 0.944, TLI = 0.932, RMSEA = 0.06). All factor loadings were found to be statistically significant and ranged from 0.37 to 0.80. The internal consistency for all the subscales is adequate (Cronbach's α , AP = 0.751; PP = 0.798; SC = 0.866; MT = 0.791; SS = 0.719). Test–retest correlations showed good temporal consistency across the two assessment points (Pearson's r AP = 0.707; PP = 0.690; SC = 0.719; MT = 0.603; SS = 0.635). Finally, the RESIST scale resulted to be related to the other key psychological variables in the expected directions. Specifically, RESIST subscales were negatively and significantly correlated with ABQ (r range from -0.172 to -0.581) whereas they showed significant positive correlations with SCI (r range from 0.362 to 0.634) and WHOQOL-BREF (r range from 0.252 to 0.596).

Conclusions: The Italian version of the RESIST scale is a valid and reliable instrument. This context-specific assessment tool might make an important contribution to scientific progress in sport psychology research.

P0002 - A TAILORED 3-MONTH EXERCISE PROGRAM DURING CHEMOTHERAPY IN PATIENTS WITH ADVANCED PANCREATIC CANCER: FEASIBILITY AND BENEFITS

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Purpose: Advanced pancreatic cancer has a substantial negative impact on both the physical and psychological health of patients, significantly diminishing their quality of life (QoL). While the benefits of exercise are well-documented across many cancer populations, there is a lack of targeted research in those with advanced pancreatic cancer. This study seeks to explore the feasibility and potential benefits of implementing an exercise program in this specific group of patients.

Methods: Patients with locally advanced or metastatic pancreatic cancer undergoing chemotherapy were recruited at the University of Verona to take part in a 3-month structured exercise program. The intervention included twice-weekly, individualized sessions combining aerobic and resistance training at a moderate intensity. The primary outcome—feasibility—was evaluated through metrics such as recruitment rate, session attendance, adherence to the program, dropout rate, tolerability, and safety. Secondary outcomes focused on physical fitness parameters, including cardiorespiratory endurance, muscular strength, flexibility, body composition, and quality of life (QoL), the latter assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire

(EORTC QLQ-C30). Descriptive statistics and Student's t -tests were used for data analysis.

Results: A total of 29 patients were enrolled, corresponding to a recruitment rate of 82%. Seventeen patients completed the 3-month exercise program, resulting in a 40% dropout rate, primarily due to disease progression. The median attendance rate was 79%, with 75% adherence to the prescribed exercises and 100% tolerability of the exercise intensity. Two mild adverse events—nausea and dizziness—were reported. Following the intervention, significant improvements were observed in several physical parameters: upper limb flexibility increased by 32% ($p = 0.05$), moderate-intensity physical activity rose by 120% ($p < 0.01$), total physical activity increased by 70% ($p = 0.01$), body weight by 2% ($p = 0.02$), and body mass index by 2% ($p = 0.02$). Regarding quality of life (QoL), emotional functioning improved by 11% ($p = 0.04$), social functioning by 25% ($p = 0.01$), and appetite loss was completely resolved (-100% , $p < 0.01$). No other statistically significant changes were observed.

Conclusions: A 3-month supervised exercise program was well tolerated by patients with advanced pancreatic cancer undergoing chemotherapy and led to meaningful improvements in specific physical fitness parameters and quality of life domains. However, the reasons behind the dropout rate, i.e., the disease progression, highlight the need for more personalized and adaptable exercise interventions that account for the unique clinical challenges faced by this patient population.

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References: (non obbligatorio).

P0003 - THE EFFECTS OF POST-HYPNOTIC SUGGESTION ON MUSCULAR PERFORMANCE: AN EMG STUDY ON THE FOREARM DURING A STATIC HANDGRIP ENDURANCE TEST

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Purpose: We investigated the effects of a single hypnosis session, terminated with a precise posthypnotic suggestion, on muscle strength, endurance, and myoelectric activity.

Methods: Thirty participants (M = 17, F = 13) were divided into a Control (CO) and a Hypnosis group (HY). Handgrip strength and endurance were tested in three pre- and post-training phases: i) holding the handgrip as strongly as possible for 5 seconds (i.e. a measure of muscle strength); ii) after a 1-minute passive pause, holding the handgrip as strongly and as long as possible (i.e. a measure of muscle endurance); iii) after a further 1-minute pause, the first trial was repeated. All these procedures were repeated after a 30-minute rest period during which the CO could use the time freely, the HY was subjected to the hypnosis session. During the experimental procedures, surface EMG was applied to the forearm muscles to assess neuromuscular fatigue.

Results: Regardless of a stronger improvement between pre- and post-processing in the HY, we found no interaction effect between the groups. This suggests that a single post-hypnotic suggestion is not sufficient to significantly increase the force exerted over time (i.e., impulse), and that the observed HY improvement may be influenced by highly susceptible participants. Furthermore, despite this difference, we found no change in forearm muscle activation. Our results show that a single hypnosis session negligibly altered muscular performance.

Conclusions: These findings contribute to the debate on the topic of hypnosis and fatigue but require further investigation, given the observed tendency of the hypnosis group to delay fatigue.

P0004 - OPTIMIZATION OF SHOOTING TECHNIQUE IN BASKETBALL: THE IMPACT OF THE “SHOOTING MACHINE” ON YOUNG TALENTS

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Purpose: Shooting is one of the most decisive skills in modern basketball, particularly at the youth level, where proper technical development significantly influences long-term athletic progression. Its effective execution involves biomechanical, coordinative, and cognitive components. Recently, technological advancements in sports training have created new opportunities to enhance practice quality and efficiency. Among these, the shooting machine—an automated device that returns the ball to the shooter—facilitates high-repetition practice under controlled conditions. Nevertheless, limited research exists on its objective impact on young athletes' technical performance.

Methods: This experimental study investigated the effectiveness of the shooting machine in optimizing the jump shot technique in six male athletes (aged 13–14) from the Under-14 elite team of Vis 2008 Ferrara. All participants had at least three years of competitive experience. We assessed shooting performance in two situations (after receiving a pass and after dribbling with a stop), both with and without the shooting machine. We collected data at two time points: baseline (T0) and after 40 days of training (T40), during which athletes completed three 20-min sessions per week using the machine. A side-positioned iPhone 11 (5 m from the action) recorded videos at 60 fps, analysed with the Tracker app. We evaluated three biomechanical parameters: elevation at ball release, flight time, and maximum trajectory height.

Results: At T0, shots with the machine showed higher averages across all parameters compared to those without. For instance, the average elevation after receiving a pass was 22.33 cm with the machine versus 15.83 cm without. By T40, we observed general improvements in both conditions. Elevation after reception without the machine increased from 15.83 cm to 20.83 cm. Notably, shots with the machine displayed a decrease in parabola height, while those without showed an increase—suggesting a possible standardization effect induced by the tool.

Conclusions: Consistent use of the shooting machine effectively improved elevation and flight time in youth basketball players, reinforcing the value of controlled, high-repetition training in technical skill acquisition. However, variations in trajectory may indicate a reduction in movement spontaneity due to tool-induced standardization. Study limitations include the small sample size, short intervention period, and use of non-professional motion analysis

tools. Future research with larger cohorts and advanced technologies is recommended to further assess the machine's role in youth skill development.

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P0005 - EFFECTS OF AN 8 WEEKS FUNCTIONAL TRAINING PROGRAM ON AGILITY, STRENGTH AND BALANCE IN HEALTHY ADULTS

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Purpose: Functional training has been widely proposed in fitness and wellness programs in order to increase body strength, neuromuscular control, core stability and improve quality of life. Several types of training involved different tools (like unstable surfaces, sling surfaces and elastic bands, for example) and exercises (static and dynamic with variable load) in respect of movement integration and whole body myofascial chains principles. The aim of present work is to investigate the effects of a specific functional training program on agility, strength and balance in healthy adults.

Methods: Twenty eight healthy adults (21 males and 7 females) volunteered in the study. They were recruited from Young Line Gym Center (Imola, BO) and divided in 2 groups: functional training group (FUN n: 13, mean age $32,7 \pm 7,3$) and isotonic training group (ISO n: 15, mean age $29,9 \pm 6,3$). Both groups trained 2 times a week for 8 weeks (60' each session) with difference in conditioning program: FUN followed a specific functional training progression (circuit training with increased level of intensity) focused on 8 exercises using different tools, while ISO performed a traditional training using isotonic machines (with increasing in external load). FUN and ISO were evaluated pre and post training using Illinois Agility Test (IAT), Standing Long Jump (SLJ), Curl Up Test (CU), Push Up test (PU) and 1 leg standing balance test for both feet (R BAL and L BAL).

Results: FUN group demonstrated significant improvements in the PU ($p = 0.04$), CU ($p = 0.001$), IAT ($p = 0.01$), SLJ ($p = 0.008$), and R BAL ($p = 0.006$). The ISO group showed significant improvements only in PU ($p = 0.001$) and CU ($p = 0.03$). Overall, the functional training group exhibited greater percentage improvements across most performance metrics. A significant effect was found for training factor ($p = 0.01$), while interaction group x training evidence significance for L BAL and SLJ only ($p < 0.05$).

Conclusions: Functional training led to greater improvements in agility, core endurance, balance, and overall physical performance compared to traditional isotonic training. These findings highlight the effectiveness of functional training as a comprehensive and efficient approach to enhancing movement skills and physical fitness in healthy adults, as it promotes the integrated development of both conditional and coordinative abilities.

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P0006 - THE BODY EFFICIENCY INDEX (BEI): A NOVEL INDICATOR FOR TALENT IDENTIFICATION IN RUGBY

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Purpose: This study evaluated the effectiveness of the Body Efficiency Index (BEI), a novel morpho-functional index designed to (i) discriminate between elite and sub-elite rugby players, and (ii) remain stable across chronological age and birth quartile in youth athletes, thereby reducing maturational bias in talent identification processes.

Methods: A cross-sectional sample of 135 male rugby athletes (11.7–36.0 years) was assessed using standardized anthropometric and ultrasound-based methods to compute fat-free mass (FFM), body fat percentage (%BF), fat-free mass index (FFMI). Then, the BEI was estimated using the formula $FFMI/\%BF$. Logistic regression and ROC curve analyses were applied to evaluate the discriminative power of BEI between elite (Serie A Elite) and sub-elite (Serie C) players ($n = 68$; mean age = 26.4 ± 4.87). Developmental neutrality was assessed in junior athletes ($n = 67$; mean age = 14.6 ± 1.93 ; range = 11.7–18.5) using linear mixed-effects models and Kruskal–Wallis tests, examining associations of BEI with age, years of training, and birth quartile (Relative Age Effect—RAE).

Results: BEI effectively distinguished elite from sub-elite players (AUC = 0.854; sensitivity = 97.5%), and demonstrated potential as a practical index for identifying rugby players with higher performance profiles. In youth athletes, BEI showed no significant association with age ($p = 0.202$) and no differences across birth quartiles (Kruskal–Wallis $\chi^2 = 4.32$, $p = 0.229$), and showed a significant correlation with years of rugby training ($p = 0.007$). Unlike conventional indices (e.g., BMI, FFM, FFMI), BEI demonstrated resistance to maturational confounding and greater sensitivity to sport-specific adaptation.

Conclusions: BEI represents a methodological advance in profiling body composition for the identification of elite players, integrating active and passive structural components into a single, maturation-independent metric. Its developmental neutrality and operational simplicity support its application within multidimensional, equitable, and data-driven talent identification frameworks.

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P0007 - EFFECT OF SPECIFIC MOVEMENT TRAINING ON INJURY PREVENTION IN FEMALE VOLLEYBALL PLAYERS

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Purpose: Injuries in volleyball players are usually related to acute stress and overuse movements due to sport's specific demands. The repetition of jumping actions, quick changes of directions and overhead movements impacts mainly upper and lower extremity and occurs differently in male or female players in relation to age and level of competition. In order to reduce the possibility of

musculoskeletal trauma, several sport conditioning programs have been purposed to prevent injuries and improve the movement's quality. The aim of present work is to evaluate the effects of a specific training program on injury prevention in female volleyball players.

Methods: Twenty two healthy female volleyball players were involved in current work. They were recruited from Libertas Volley Forlì team (Emilia Romagna regional league) and divided in 2 groups: intervention group (IG— $n = 11$, age range 15–28 years) and control group (CG— $n = 11$, age range 15–17 years).

They were submitted to a specific training program for 16 weeks in addition to sport conditioning. In particular, IG received an individualized corrective program focused on joint mobility, core stability and specific strength, while CG executed a general core stability and balance training program (2 sessions per week for 16 weeks). Both group were evaluated pre and post training using Functional Movement Screen® (FMS) assessment system.

Results: IG showed a significant improvement in FMS scores from 14.63 ± 1.80 to 16.63 ± 1.74 (+ 2 points, $p < 0.05$), while CG showed a minimal increase from 15 ± 1.34 to

15.09 ± 1.30 (+ 0.09 points, $p > 0.05$). The improvement in the intervention group was statistically significant at the 98% confidence level. Injury risk profiles improved more markedly in IG: the number of athletes with FMS scores considered at higher injury risk (< 14) decreased from 5 to 1, whereas in the CG the reduction was only from 5 to 4.

Conclusions: An integrated training program combining core stability and individualized corrective exercises is more effective in improving FMS scores than core stability alone. Although a direct causal relationship between FMS scores improvement and reduced injury rates cannot be definitively established within the study time-frame, these findings support the use of FMS as a valuable assessment and potential injury prevention tool in volleyball.

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P0008 - ANALYSIS OF INJURIES IN MALE SOCCER PLAYERS: STUDY ON SAN MARINO LEAGUE

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Purpose: Football is the most widely practiced and followed sport worldwide, yet it also presents one of the highest injury rates, especially at the amateur level where preventive and rehabilitative resources are often limited. While numerous studies have addressed injuries in professional football, there remains a gap in understanding the specific risk factors and injury patterns in non-elite contexts, such as in the Republic of San Marino. The aim of present work is to retrospectively analyze the injury profile in that country.

Methods: This retrospective study investigated injury incidence and patterns among amateur football players in San Marino. Data were collected through an online questionnaire targeting male players involved in the local football league. The collected responses (50

players, mean age 29.5 ± 11.9 years, height 183 ± 17 cm, weight $79 \text{ kg} \pm 24 \text{ kg}$) were analyzed and compared with existing literature on professional and amateur football injuries. Risk factors were assessed based on intrinsic (e.g., age, fitness level, previous injuries) and extrinsic (e.g., training volume, pitch surface, season timing) categories.

Results: The findings evidence a high prevalence of injuries among amateur players, with muscular strains (32,6%), knee and ankle ligament sprains (28,2%), and overuse injuries (26,2%) being the most common. Lower extremities are the main involved area of the body (83%) and moderate severity represents the most frequent type of injury (55,3%). Notably, the study confirmed a higher rate of injury recurrence due to insufficient rehabilitation protocols and suboptimal training loads (29,7%). Fatigue, poor physical conditioning, and the quality of playing surfaces were also found to be significant contributors to injury risk. A lower training-to-competition time ratio (TTE/CTE) correlated with increased injury incidence.

Conclusions: Injury prevention in amateur football requires more structured and context-specific interventions, especially in small-scale realities like San Marino. Emphasizing structured pre-season conditioning, consistent application of neuromuscular and proprioceptive exercises, and improving training quality and surface conditions can substantially reduce the incidence and recurrence of injuries. These findings underscore the need for tailored injury prevention programs even in amateur sports settings.

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P0009 - THE RELATIONSHIP BETWEEN ANKLE JOINT RANGE OF MOTION AND POSTURAL CONTROL IN KOSHIDO-BUDO ATHLETES: A PILOT STUDY

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Purpose: In combat sports, maintaining good postural control can lead to enhanced performance [1]. Loss of balance and its recovery are permanent moments during a fight [1]. Indeed, combat athletes undergo training focused on improving dynamic balance [1]. Koshido-Budo is a modern martial discipline that focuses on achieving mental and physical balance, aiming for the harmonious and conscious development of athletes. Recently, a relationship between ankle mobility and jumping performance has been discovered, demonstrating the influence of ankle Range of Motion (ROM) on sports performance, especially in Dorsiflexion movement [2]. Nevertheless, ankle movement has not yet been studied with postural control, and in a combat sport, it could find particular relevance. Therefore, this study aims to evaluate whether postural control is related to ankle Range of Motion in Koshido-Budo athletes, a modern type of combat sport.

Methods: Thirteen Koshido-Budo athletes were recruited (Age: 24.6 ± 7.67 years; height: 171 ± 8.83 cm; weight: 70.2 ± 13.7 kg). Ankle joint mobility was assessed using the Beyond Inertial system (Motustech), focusing on dorsiflexion and plantarflexion movements. Postural control was evaluated through a posturographic pressure platform (freeMed; sensor Medica; Guidonia Montecelio, Rome, Italy) and the related software (Freestep). The parameter studied was the sway ellipse surface. The Shapiro–Wilk analysis was conducted to assess data normality. Spearman’s R analysis was utilized to evaluate the correlations between parameters after determining that the data distributions were not normal.

Results: A statistically significant correlation was found between foot ROM and the sway ellipse surface. Specifically, the Dorsiflexion ROM of the left foot had a good correlation with the sway ellipse surface ($r = 0.654$, $p = 0.018$). No significant correlation was found between the Plantarflexion ROM ($r = 0.555$, $p = 0.053$) and the right foot.

Conclusions: These preliminary results suggest that dorsiflexion mobility, particularly of the left ankle, may influence postural control in Koshido-Budo athletes. Although further research with large samples is needed, this preliminary study provides insight into a new line of investigation among combat sport athletes with potential relevance to performance enhancement and injury prevention.

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P0010 - INVESTIGATING MUSCLE SYNERGIES AND SELF-ORGANISATION IN PARACANOE: A PILOT STUDY

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Purpose: Paddling technique significantly impacts kayaking performance and relies on coordinated, adaptable body movements (Garnier et al. 2023). According to the ecological-dynamic approach, athletes optimize their performance through self-organizing processes, giving rise to synergies such as muscle synergies that reduce degrees of freedom (Latash, 2020). A key aspect of this adaptability is degeneration employing varied structures for the same outcomes (Button et al. 2021). Studying synergies helps understand neuromuscular control. Muscle synergies in paracanoe athletes remain largely unexplored. This study investigates muscle synergies in paracanoe athletes, emphasizing the role of degeneracy in adaptive performance.

Methods: Three paracanoe athletes (two KL3, one KL1; two males, one female; average age 31 ± 10.5 years) performed two 30-s maximal sprints on a kayak ergometer. Surface electromyography (sEMG) was utilized to monitor activity from six muscles bilaterally: biceps brachii (BB), triceps brachii (TB), pectoralis (PECT), middle deltoid (MD), upper trapezius (UT), and latissimus dorsi (LD). EMG signals were processed (filtered, rectified, and normalized) based on

each paddling cycle. Muscle synergies were identified using Non-Negative Matrix Factorization, analyzing muscle contributions and activation timing. Similar modules were grouped via k-means clustering, and Cosine Similarity (CS) evaluated inter-athlete consistency.

Results: Three modules per athlete were extracted and classified into three clusters, indicating that the central nervous system facilitates paddling through three modular structures. Clusters were similar among athletes (CS > 0.80). Cluster 1 was active during the pulling phase (10–30% of the cycle), involving bilateral activation of the UT and MD, along with the right BB, stabilizing scapula and balancing elbow movement. Cluster 2 encompassed the left LD, BB, right PECT, and left TB, active during the input phase and traction of the opposite limb (40–60% of the cycle). Cluster 3 (0–20% and 90–100% cycle) activated right LD, right TB, and left PECT, with TB moderating elbow flexion and LD enabling shoulder extension and rotation.

Conclusions: The similarity in activation patterns suggests shared self-organization principles despite individual differences. These preliminary findings could help develop more targeted training programs, although further studies with larger samples are needed to confirm these conclusions.

P0011 - SELF-REPORTED VS. OBJECTIVE PHYSICAL ACTIVITY LEVELS IN PATIENTS WITH MASLD: A COMPARATIVE STUDY USING IPAQ SHORT FORM AND ACCELEROMETRY

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Purpose: Metabolic dysfunction–Associated Steatotic Liver Disease (MASLD) is a multifactorial liver disorder characterized by pathological hepatic accumulation of triglycerides in hepatocytes, in the absence of significant alcohol consumption. Formerly known as non-alcoholic fatty liver disease (NAFLD), MASLD represents a more precise and incorporates specific diagnostic criteria associated with metabolic impairments, including obesity, insulin resistance, dyslipidemia, and hypertension. Patients with MASLD are frequently sedentary and exhibit low levels of physical activity (PA). To accurately assess PA levels in this population, this study aims to compare the International Physical Activity Questionnaire-Short Form (IPAQ-SF) with objective measurements using accelerometry.

Methods: Patients reported their PA using the IPAQ during a face-to-face interview and wore an Actigraph GT9-X accelerometer for 1 week. Readings were classified into moderate, vigorous, and moderate-vigorous PA, as well as sedentary behavior (SB). Valid wear time was defined as ≥ 10 h/day for ≥ 3 days. A paired t-test was used for the analysis.

Results: The study included thirty-three adults with MASLD (13 men; mean age 51 ± 11 years). Two participants were excluded due to insufficient wear time. Our results suggest significant differences ($p < 0.05$) when comparing ActiGraph® and IPAQ data: moderate PA (IPAQ: 573.3 vs. Actigraph: 1187.6 weekly minutes); vigorous PA (IPAQ: 185.8 vs. Actigraph: 0 weekly minutes), moderate-vigorous PA (IPAQ: 759 vs. Actigraph: 1187.6 weekly minutes); and SB (IPAQ: 4.0 vs. Actigraph: 9.3 daily hours).

Conclusions: The participants in the study demonstrated an underestimation of moderate-intensity PA and SB when self-reported via the IPAQ questionnaire, while overestimating vigorous-intensity PA. These findings highlight the challenges associated with the accurate perception and classification of PA intensity. Although objective assessment using accelerometry revealed overall sufficient levels of PA, participants were found to be highly sedentary. This discrepancy

confirms that sedentary behavior represents an independent risk factor for metabolic health, separate from the total amount of physical activity performed.

Although the number of participants in the study was limited, we believe that, whenever possible, using a more objective measurement tool such as the Actigraph would be more appropriate for assessing PA levels in this population.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0012 - A NOVEL WEB-BASED APPLICATION TO GUIDE AND MONITOR IN-HOME WALKING TRAINING OF FRAIL ELDERLY PATIENTS: DESIGN, DEVELOPMENT AND ALFA-TESTING PHASE

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Purpose: Frailty forces people into reduced mobility and a high risk of morbidity and mortality, especially among the elderly. Exercise is considered one of the main strategies used to counteract frailty-related physical impairment in older patients, but several barriers to participation, including the need to transport frail patients to hospitals or gym facilities, reduce their overall applicability and effectiveness. The aims of this research project, funded by the Italian Ministry of Research, include the design, creation and testing of a web-based smartphone application to guide and monitor the home-based training of frail patients.

Methods: We implemented into the app an exercise-based intervention to be carried out at home. Each training session, to be repeated twice per day, is composed of 8 min walking (with a 1:1 walk:rest ratio pattern) at a slow speed, which is increased weekly to adequate the stimulus.

Results: The ARTIDE web-based application was created using modern programming languages and was compatible with a robotic counterpart, with a minimal user-friendly experience. Very simple graphics with large fonts for visually impaired people were designed and developed so that patients only had to open the app and push a “play” button. Thereafter, a prerecorded voice guides the patient to stand up and start walking following a preset metronome-guided rhythm. After one minute, the rhythm stops, and the patients are instructed to sit and rest for the subsequent minute. This pattern is repeated 8 times. At the end, the patient is asked to rate his/her perceived exertion by selecting one color smiles (green—low effort; yellow—medium; red—high). When a yellow or red option was selected, four boxes with the most common symptoms emerged (dyspnea, leg cramps, fatigue, other). The “other” option opens an additional box to type in any words. The progression of exercise is remotely controlled by the trainers, which can regulate the walking speed each week. The ease of use has been preliminarily tested by several people, who fully appreciate the application.

Conclusions: A simple application designed for patients' or caregivers' smartphones can precisely guide in-home walking training for frail patients. The possibility of remote-checking the execution and rate of perceived exertion can help in monitoring patients' adherence and effort. Patients' and caregivers' acceptance and satisfaction are being tested during a randomized controlled trial.

P0013 - THE IMPACT OF DAILY CRUTCHES USE AND AMPUTATION LEVEL ON MATCH PERFORMANCE OF AMPUTEE FOOTBALL PLAYERS AT THE INTERNATIONAL LEVEL

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Purpose: Amputee football (AF) is a high-intensity, adapted team sport for individuals with limb amputations. Players use crutches without prostheses, requiring high levels of fitness, strength, technical skill, and coordination. Although its popularity is growing, the scientific literature on AF remains limited, particularly regarding performance-related variables. The aim of this study was to examine whether kinematic performance indicators vary according to daily use of crutches (DUC) and level of amputation (LA).

Methods: Twenty-six players volunteered for this study (age = 32.7 ± 8.5 yrs; stature = 175 ± 5.3 cm; weight = 70.9 ± 13.9 kg; AF participation = 9.6 ± 5.0 yrs). All participants were divided based on DUC (Users = 10; Non-users = 16) and according to LA (Above-Knee [AK] = 11; Below-Knee [BK] = 15). A total of 11 matches from the Champions League held in Sassuolo, Italy, in September 2024 were analyzed, obtaining 86 tracking data files. Match performance data, including Average Speed (AS), Maximum Speed (MS), Distance covered per minute (DM), Peak Acceleration (PA), and Peak Deceleration (PD) were collected using an 18 Hz GPS device. The Shapiro–Wilk test assessed data normality. Independent samples T-Test and Mann–Whitney U test were used to compare groups, with significance set at $p \leq 0.05$.

Results: Regarding DUC, the results showed significant differences between the two groups. Players who use crutches every day exhibited significantly greater AS and DM ($p = 0.028$; $p = 0.029$, respectively) and tended to have higher PA (Users = 3.26 ± 0.56 m/s²; Non-users = 3.08 ± 0.35 m/s²). No significant differences were found between the groups for MS and PD ($p > 0.05$). As far LA is concerned, only MS showed a significant difference, with players with BK amputation achieving higher MS compared to those with AK amputation ($p = 0.023$). PA showed a tendency toward higher values among players with BK amputation ($AK = 3.04 \pm 0.38$ m/s²; $BK = 3.23$).

Conclusions: These results suggest that DUC and LA influence match performance in this adapted sport, especially for AS, DM, and MS, highlighting the importance for practitioners to consider these factors when designing tailored training programs, alongside physiological and technical aspects. This study contributes to a deeper understanding of the characteristics of AF players. Further investigation, e.g. integrating GPS-based kinematic data with notational analysis will offer a more comprehensive view of AF.

P0014 - ACTIVE BREAKS AND WELL-BEING AT SECONDARY SCHOOL IN CAMPANIA REGION: PROJECT DESIGN, METHODOLOGY AND PRELIMINARY RESULTS

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Purpose: The Active Breaks (ABs), short bouts of PA (5–15 min), during and between lessons have been proposed as strategy to counteract sedentary behaviors, to improve attention and concentration and to reduce anxiety and stress (1,2). Therefore, the aims of present study are to evaluate the effects of ABs on physical fitness, concentration and psycho-relational aspects in a cohort of students attending secondary school in Campania region.

Methods: A group of students ($n = 640$; $n = 288$ boys and $n = 352$ girls; age: 14.3 ± 0.9 yrs) attending secondary school from four institutes in Campania region were recruited. In each institute the students were divided into two groups: intervention group (IG; $n = 80$) and control group (CG; $n = 80$). IG performed two 10-min bouts of ABs during the lessons for four months while the CG continued regular school activities. ABs consisted of mobilisation, stretching, strengthening, coordination and balance exercises that were reproduced with videos including music using the interactive whiteboard. Before (T0) and after intervention period (T1), all participants filled a questionnaire in order to evaluate: sport participation, adherence to the Mediterranean diet (MD, KIDMED questionnaire), emotional/relational behavioural (ERB) aspects (SDQ questionnaire); and a test to evaluate the attention and concentration performance (CP, d2-R test). Moreover, the anthropometric parameters (height, body weight and BMI) and some physical fitness component such as handgrip strength, flexibility (sit and reach test), legs power (standing broad jump), speed and agility (10x 5m shuttle run) were evaluated.

Results: The preliminary results showed that at T0, the percentage of overweight/obese, according with WHO cut-off, were 42.2% in the cohort of volunteers students; 56.3% of the responders declared to do sport; Adherence to MD was low, medium or high in 41.5%, 48.7% and 9.7% of participants, respectively. ERB aspects were considered normal, borderline and abnormal in 67.9%, 15.9% and 16.2% of participants, respectively, while more than half of them (68.2%) showed low/very low CP levels.

Conclusions: Our preliminary results show a picture of the wellness, sport practice, and behaviour grade in a representative cohort of school-students living in Campania region. We confirm the prevalence of overweight/obesity associated with poor adherence to MD and regular sports practice, as well as the presence of problematic related to psycho-cognitive-relational aspects.

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P0015- COGNITIVE APPROACH VS ECOLOGICAL DYNAMIC APPROACH IN BRAZILIAN JIU JITSU: EFFECTS ON RATE OF FORCE DEVELOPMENT, MOTOR REACTIVITY, AND PERCEIVED STRESS

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Background: Brazilian Jiu Jitsu is a situational and combat sport discipline in which explosive strength and motor reactivity are developed, key aspects of physical exercise for performance. Over the years, the ecological-dynamic approach has been used more frequently than the cognitive approach, due to the positive outcomes observed. However, these outcomes are based solely on experience and are not supported by scientific studies related to physical education and associated teaching-learning methods.

Purpose: The aim is to compare the potential effectiveness of the two training methods in Brazilian Jiu Jitsu by analysing the following parameters: Rate of Force Development (RFD), motor reactivity, and perception of psychophysical distress.

Methods: The sample consists of 60 athletes, equally divided into an experimental group applying the ecological-dynamic approach through the heuristic learning method, and a control group applying the cognitive approach with a specific prescriptive protocol. Both groups trained four times per week for two months. For pre- and post-intervention assessments, the following tests were used: the Isometric Mid-Thigh Pull (standing) with a force plate for RFD; the Reactive Agility Test using BlazePods for motor reactivity; and ad hoc qualitative-quantitative questionnaires for the perception of distress. Repeated measures ANOVA was used for the statistical analysis.

Results: The results revealed a significant group-by-time interaction concerning Rate of Force Development ($F(1,58) = 6.89$, $p = 0.011$), with a greater improvement in the experimental group (+ 15.2%) compared to the traditional group (+ 6.3%). Reactivity also showed a significant interaction ($F(1,58) = 7.34$, $p = 0.009$), with reaction times reduced by 12.8% in the experimental group versus 5.4% in the control group. Finally, perceived distress showed a significant decrease only in the experimental group ($t(29) = 3.22$, $p = 0.003$).

Conclusions: The evidence supports the integration of the ecological-dynamic approach as an alternative strategy to the cognitive approach in training programmes to promote more effective and conscious motor and psychophysical adaptations.

P0016-EVALUATING OFFENSIVE PLAY PATTERNS IN HIGH-PERFORMANCE WOMEN'S 3 × 3 BASKETBALL

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Purpose: This study aimed to analyze performance indicators during offensive phases in elite women's 3 × 3 basketball, focusing on actions from the beginning of the attack to its conclusion.

Methods: A total of 298 offensive sequences from four matches in the 2023 FIBA 3 × 3 Women's World Cup final phase were analyzed using Lince Win software. Variables were categorized according to the initiation, development, and completion of each offensive play.

Results: Key findings include: (a) running shots were the most frequent and effective form of finishing; (b) limited use of passing and collective play, with 1-on-1 situations being predominant; (c) the presence of a highly skilled offensive player significantly influenced team performance; (d) fast transitions from defense to offense were more successful than static plays from the top of the key.

Conclusions: In conclusion, offensive efficiency increased with passing, and successful teams employed more complex tactics such as ball screens. However, defensive rebounds were not decisive, while the ability to generate immediate scoring opportunities after regaining possession proved crucial for success.

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P0017 - EFFECTS OF A 6-MONTH STRUCTURED EXERCISE PROGRAM ON BODY COMPOSITION, PHYSICAL FITNESS, AND QUALITY OF LIFE IN PATIENTS WITH CANCER

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Purpose: Cancer and its treatments can significantly alter body composition, often leading to muscle loss or fat gain, which negatively affects prognosis and quality of life. Exercise has emerged as a supportive intervention to counteract these changes. This study aimed to assess the impact of a 6-month structured exercise program on physical fitness, and quality of life in patients with cancer.

Methods: Patients with solid tumors treated at the University Hospital of Verona were enrolled in a 6-month exercise program involving two supervised sessions per week, combining aerobic and resistance training. The first 3 months included moderate-intensity continuous aerobic exercise, with treadmill or cycle ergometer, progressing from 10–15 to 30 min and bodyweight/elastic band strength exercises. The second trimester progressed to high-intensity interval training and machine-based strength exercises. Feasibility was assessed through attendance to sessions, body composition via bio-electrical impedance (TANITA RD-545), physical fitness through the 6-min walk test, handgrip strength, 30-s chair stand, back scratch, and sit-and-reach tests and quality of life using the EORTC QLQ C-30. Assessments were conducted at baseline, 3, and 6 months. Data were analyzed with descriptive statistics and repeated measures ANOVA.

Results: Twenty-five patients completed the intervention. Breast and pancreatic cancers were most common cancer sites, 52% had advanced/metastatic disease and were receiving chemotherapy or hormone therapy. Median attendance was 69% in the first trimester and 77% in the second and no adverse events occurred. While no significant changes in fat mass and muscle mass were detected, waist circumference significantly decreased after 6 months (-3% , $p = 0.008$). Subgroup analysis showed weight reduction in patients with hormone-responsive tumors and weight gain in those at higher risk of weight loss after the intervention. Significant improvements were also observed in cardiorespiratory fitness ($+11\%$, $p < 0.001$) and lower limb strength ($+25\%$, $p < 0.001$). Increase in emotional and social functioning and reduced insomnia levels were found.

Conclusions: Although no significant changes occurred to body composition, a structured 6-month exercise program was associated

with meaningful improvements in physical fitness and quality of life in patients with cancer.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0018 - EFFECTIVENESS OF ADAPTED PHYSICAL ACTIVITY IN REDUCING PAIN IN SUBJECTS WITH PRIMARY DYSMENORRHEA: A PILOT STUDY

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Purpose: Primary dysmenorrhea (PD) is a common gynecological condition affecting women of reproductive age, characterized by menstrual pain in the absence of pelvic pathology. It often impacts daily functioning, academic performance, and psychological well-being. Although first-line treatments include nonsteroidal anti-inflammatory drugs and hormonal contraceptives, many women seek non-pharmacological approaches. This pilot study aimed to assess the effectiveness of a supervised adapted physical activity (APA) program in reducing menstrual pain and improving perceived quality of life in young women with PD.

Methods: Young women with PD participated in an 11-week supervised online APA program, consisting of three 60-min. sessions per week. Women were asked to complete a questionnaire at baseline and after completing the program. The questionnaire collected information on age at menarche, menstrual cycle regularity, menstrual flow, use of pharmacological or hormonal therapy, and pain symptoms assessed using the Visual Analog Scale (VAS). Additionally, menstrual-related factors and symptoms were evaluated using the Menstrual Distress Questionnaire (MEDI-Q), and quality of life (QoL) was assessed with the Short Form Health Survey (SF-36).

Results: Four women with moderate to severe PD were initially recruited for the APA program; however, one woman dropped out during the intervention. The final sample was three participants, aged between 19 and 23 years. Post-intervention, the average pain level measured on the VAS decreased from 7 to 5 points. QoL as assessed by the SF-36 showed overall improvements, particularly in terms of reduced physical pain in the post-intervention phase. One subject also reported a decrease in menstrual distress based on the MEDI-Q, while others showed mixed results.

Conclusions: APA appears to be a promising, accessible, and non-pharmacological strategy to reduce menstrual pain and improve general well-being in women with PD. The reduction in pain and improved scores in overall quality of life support its potential. The variability in menstrual-specific symptom responses suggests the need for further research with larger sample sizes and controlled designs to confirm the effects and explore long-term outcomes.

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P0019 - TRUNK MORPHOLOGICAL ASYMMETRIES IN YOUTH TENNIS PLAYERS: PRELIMINARY RESULTS

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Purpose: The study of body symmetry is of interest in sports as it useful for performance evaluations, training optimization, and injury prevention. Some sports, such as tennis, unilateral gestures can induce to body asymmetries. In particular, depending on upper limb dominance, asymmetries in the morphology of the upper limbs, shoulder girdle, and trunk may be detected due to repetitive movement patterns. Hence, the aim of this study was to assess trunk morphology, through a 3D scanning method, in youth tennis players. The hypothesis is that right-handed tennis players may present a counterclockwise rotation of the trunk and a lower inclination of the shoulder girdle to the right.

Methods: Twenty-one youth right-handed tennis players were recruited. To evaluate trunk morphology a non-invasive, three-dimensional optoelectronic detection system using the Light Detection and Ranging (LIDAR) technology (Spine 3D; Sensor Medica) was used. Each participant was placed in orthostatic position barefoot and with the back bare-chested in front of the device and at 1 m from it. The device, by infrared cameras using Time-of-Flight (ToF) depth technology was able to develop a 3D scan of the trunk by identifying the following landmarks: prominent vertebra (VP), right and left shoulder (SR and SL), right and left lumbar dimple (DR and DL). Based on these landmarks, the software calculates different parameters on each plane. For this study, we considered: shoulder obliquity (i.e., the distance between the horizontal axis passing through SL and the horizontal axis passing through SR); shoulder tilt (i.e., the lateral deviation between SL and SR and the horizontal axis); shoulder torsion (i.e., the rotation of the shoulder girdle); trunk inclination (i.e., the angle formed between the straight line passing through VP and DM and the vertical plane along the sagittal section), and trunk imbalance.

Results: On the frontal plane, we found a shoulder obliquity (4.1 mm), a shoulder tilt (1.09°), and a trunk inclination (3.86°), and trunk imbalance (6.8 mm) on the right side. On the horizontal plane, we detected a counterclockwise shoulder torsion (12.7°).

Conclusions: As hypothesized, these findings suggest a consistency in the direction of asymmetry based on upper limb dominance in tennis. However, this preliminary results need further research to better demonstrate the relationship between body asymmetries and tennis practice.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0020 - DIFFERENT MUSCLE ACTIVATION PATTERNS IN PLANK EXERCISE: A COMPARATIVE ELECTROMYOGRAPHIC ANALYSIS BETWEEN TRAINED AND UNTRAINED INDIVIDUALS

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Purpose: Core strengthening is fundamental to athletic performance, spinal stability, and injury prevention. The plank exercise is one of the most traditional and widely used exercises in fitness facilities for core enhancement. The literature presents limited evidence comparing the muscle activation patterns between trained and untrained individuals during plank execution. The present study analysed muscle activation variability during plank exercise using surface electromyography (EMG), comparing trained and untrained subjects to assess exercise appropriateness across different fitness levels.

Methods: Thirty subjects were recruited and divided as follows: 15 trained males (mean age: 23.24 ± 1.52 years) with at least 3 years of resistance training experience, and 15 untrained males (mean age: 22.94 ± 1.38 years) with less than 6 months of structured exercise experience. Subjects had no musculoskeletal injuries in the past 6 months or chronic pathologies of the locomotor system. Prior to the surface EMG analysis, maximal voluntary isometric contraction (MVC) tests were performed for each muscle group analysed, including the abdominal muscles, gluteal muscles, multifidus, and erector spinae. The electrodes have been positioned as indicated by Hermens et al. [1]. For each subject and experimental condition, the rmsEMG values were normalized relative to those obtained during the MVC tests (NrmsEMG). The level of NrmsEMG for each muscle reflects the percentage of maximal activation and offers an indication of the relative involvement of each muscle during each analysed movement. The NrmsEMG was then used for the analysis.

Results: Multivariate analysis of variance (MANOVA) showed higher EMG activation of the multifidus and erector spinae muscles in the untrained group than in the trained group ($F(1,28) = 5.440$, $p = 0.027$; and $F(1,28) = 5.699$, $p = 0.024$, respectively). No significant differences were observed in other muscle groups.

Conclusions: Greater activation of the multifidus and erector spinae muscles in the untrained group may indicate excessive lumbar loading during plank execution, suggesting that this exercise requires adequate neuromuscular control and movement competency before implementation. These findings support the recommendation that plank exercise should be introduced only after individuals have developed sufficient movement proficiency and core stability awareness. Implementation in the initial phases of training programs may predispose novice exercisers to lumbar spine overload and should be avoided until proper movement patterns and core controls are established.

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P0021 - EFFECT OF JUDO PROGRAM ON HEALTH-RELATED PHYSICAL FITNESS: A PROSPECTIVE LONGITUDINAL STUDY

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Purpose: Judo is a combat sport that can be used to improve health-related physical fitness. Although some evidence has demonstrated improvements in health-related fitness parameters, the time course and level-dependent adaptation remain to be determined in recreational Judo practitioners. Thus, we aimed to analyze the effects of Judo training on physical fitness among different levels of recreational Judo athletes.

Methods: This is a prospective longitudinal study. A total of 24 male Judo athletes (height 173 ± 6.8 cm, body mass 79.5 ± 16 kg, body mass index 26.6 ± 5.3 , age 27.7 ± 8.2 years old, 9.9 ± 8.8 years of experience) were enrolled, who trained between two and three days per week. The participants were exposed to the traditional Judo training. We applied the isometric handgrip test from both the right and left sides (strength), 60-s curl-up and push-up tests (abdominal and upper limb muscle endurance, respectively), the sit-and-reach test (flexibility), and the Astrand-Rhyming step test (cardiorespiratory fitness) at baseline, after two months, and after four months. Data were analyzed by comparing the levels (up to blue belt, 6; to purple belt, 8; and brown and black belt, 10) and moments using a two-way (level and time) ANOVA with repeated measures. A Bonferroni test was used as a post-hoc test.

Results: The 60 s push-up, handgrip strength, and flexibility tests remained unchanged. The 60 s curl-up test results were similar between the baseline (43 ± 8 reps) and 2-month post-baseline (43 ± 11 reps) periods, but increased at the 4-month post-baseline (46 ± 10 reps, $p = 0.049$). The maximum oxygen consumption at 4-month post (36.2 ± 3.3 ml/kg/min) was higher than at baseline (32.0 ± 4.9 ml/kg/min, $p < 0.001$) and at 2-month post (33.8 ± 4.7 ml/kg/min, $p = 0.013$), without differences between baseline and 2-month post ($p = 0.124$).

Conclusions: Therefore, while the initial two months of Judo training may not reflect immediate physiological changes, the sustained engagement in the sport over a four-month period resulted in meaningful improvements in abdominal muscle endurance and cardiorespiratory fitness, highlighting the long-term benefits of consistent training in combat sports.

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P0022 - PERACTING: AN INNOVATIVE RHYTHMIC STICK-BASED EXERCISE TO IMPROVE GRIP STRENGTH IN OLDER ADULTS

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Purpose: This study aimed to evaluate the effects of a rhythmic motor activity involving the use of sticks with music (Peracting) on hand grip strength in elderly individuals. The goal was to assess potential improvements following a three-month intervention.

Methods: 60 elderly participants (76.4 ± 6.5 Years) 10 men and 50 women, were divided in two groups: the Peracting group ($n = 30$), which engaged in rhythmic stick-based motor activities set to music, and a Control group ($n = 30$), which performed general gymnastics. Both groups participated in bi-weekly sessions (50 min each) over a three-month period. Hand grip strength was measured at baseline and post-intervention for both the right and left hands.

Results: Descriptive statistics are presented as means, and percentage changes ($\Delta\%$) were calculated using the formula: $((\text{Post-Mean} - \text{Pre-Mean})/\text{Pre-Mean}) \times 100$. Statistical significance was set at $p < 0.05$. In the Peracting group, a significant improvement in grip strength was observed: Right hand: increased from 25.2 ± 8.1 to 26.4 ± 8.5 kg/f

($\Delta + 4.5\%$, $p < 0.001$); Left hand: increased from 23.9 ± 7.5 to 24.6 ± 7.7 kg/f ($\Delta + 2.8\%$, $p = 0.007$). The Control group showed no statistically significant changes in hand grip strength for either hand.

Conclusions: The rhythmic motor activity involving sticks synchronized with music (Peracting) proved effective in enhancing hand grip strength among elderly participants. Compared to general gymnastics, this engaging and accessible intervention demonstrated superior benefits, suggesting its potential value in preventing upper limb functional decline in the aging population.

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P0023 - COMPARING MOTOR DEVELOPMENT BETWEEN BOYS AND GIRLS IN A FOREST KINDERGARTEN

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Purpose: Motor development in preschoolers is strongly influenced by educational context and physical activity. The childcare environment and practices have a clear impact on a child's activity levels, also that the natural outdoor environment offers a wide range of motor and cognitive stimuli that spontaneously adapt to the child's abilities. However, several studies have shown that gender differences in motor skills favoring boys are already evident in the preschool years. The purpose of this research is to compare the motor competence of boys and girls attending a forest kindergarten.

Methods: A total of 22 kindergarten children aged between 3 and 5 years from Trentino, Italy, participated in this study (12 females and 10 males). All participants were assessed using the ABC test, which evaluates fundamental motor skills through subtests: static and dynamic balance, as well as ball throwing and standing long jump.

Results: No significant differences were observed between females and males across all subtest scores. In the static balance test, female participants achieved a mean score of 6.07 ± 5.66 s on the right leg and 14.07 ± 15.62 s on the left leg; Boys: 1.39 ± 0.07 s on the right leg and 2.785 ± 2.21 s on the left leg. In the heel-to-toe walking balance test, females achieved a mean of 9.5 ± 2.12 steps, while males averaged 8.47 ± 4.91 steps. In the ball throw test, females reached an average distance of 132.95 ± 22.56 cm, compared to 114.5 ± 31.82 cm for males. In the standing long jump, females recorded a mean distance of 70.51 ± 24.77 cm, whereas males achieved an average of 75.52 ± 9.16 cm.

Conclusions: The results of this study suggest that the forest environment promotes motor stimulation equally for both boys and girls. Therefore, the forest school represents a favorable setting, not only by providing outdoor opportunities with well-documented benefits but also by helping to level the differences in opportunities and types of movement between males and females.

This suggests a more equal motor development between genders, potentially linked to the educational approach adopted in this context.

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P0024 - ACUTE EFFECTS OF STATIC STRETCHING AND FOAM ROLLING OF CALF AND HAMSTRING MUSCLES ON DOMINANT LEG BALANCE

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Purpose: Balance ability is crucial for all prevention, and it depends on vision, vestibular, and proprioception input [1, 2]. As calf and hamstring muscles are linked via the superficial back line [3], this study hypothesizes that static stretching (SS) or foam rolling (FR) intervention of the calf may affect balance similarly to the same interventions for the hamstring.

Methods: 40 healthy subjects were divided into 4 groups of 10 participants each, as follows: SS of the calf (SSC); SS of the hamstring (SSH); FR of the calf (FRC); FR of the hamstring (FRH). Each group performed 3 sets of 1 min at a self-reported discomfort level of 7/10 with 30 s of rest among sets. Balance of the dominant leg was measured before (T0) and 5 min after the last set (T1) for 10 s using a posturographic platform.

Results: Significant differences were found in sway path length (SPL), sway ellipse surface (SES), and sway mean speed (SMS) among the interventions. At T1, the FRC group showed higher

performance in SPL ($p = 0.007$) and SMS ($p = 0.007$) compared to the FRH group. Similarly, also the SSC group showed higher performance in SPL ($p = 0.023$) and SMS ($p = 0.022$) compared to the FRH group. Finally, the FRC group showed better results in SES ($p = 0.034$) compared to SSH.

Conclusions: These results suggest that both SS and FR of the calf could improve balance more than the same interventions for the hamstring. And this could be explained by the functional link between the calf and hamstring.

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P0025 - BEYOND THE FIRST IMPRESSION: IS IVR NOVELTY EFFECT DRIVING EXERCISE ENGAGEMENT?

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Purpose: When individuals are exposed for the first time to video games, their excitement may lead to overlooking physical strain. Thus, the novelty effect may play a significant role in their engagement, particularly when it concerns immersive games¹. This study aimed to evaluate whether the novelty effect of immersive Virtual Reality (iVR) influenced exercise engagement.

Methods: Ten habitual video gamers (aged = 24.1 years, 1 female), with no experience in iVR participated in this study. The experiment included two sessions, a novelty (N) and a familiarized (F) session. In both sessions, participants wore a heart rate (HR) monitor (Polar H7) and used a Head-Mounted Display (Meta Quest 3). During the N session, we explained how to use Meta Quest 3, and how to move and interact within virtual environments. Then participants tried two different exergames. One game was an early access version (SW1) and lacked many features (i.e. low immersivity) compared to the other (SW2). The second session, F, took place around 24 hours later and followed the same structure as the N session, except for the familiarization part. Engagement was assessed by measuring exercise intensity (i.e., HR) throughout the sessions². HR data was split into two halves (1st and 2nd), means and standard deviations (SDs) were computed. A three-way ANOVA was run to assess interactions and

main effects of HR means and SDs within sessions (N and F), software (SW1 and SW2) and exergame phase.

Results: The 3-way ANOVA of HR means revealed no significant familiarization x software ($F(1, 72) 1.935, p = 0.169$), software x exergame phase ($F(1, 72) 0.090, p = 0.764$), nor between familiarization x exergame phase ($F(1, 72) 0.001, p = 0.972$) interactions. No main effects of familiarization ($F(1, 72) 0.033, p = 0.856$), software ($F(1, 72) 0.942, p = 0.335$) and exergame phase ($F(1, 72) 1.266, p = 0.264$) were found. However, SDs analysis resulted in a significant SW x phase interaction ($F(1, 72) 7.052, p = 0.010$) and a main effect of SW ($F(1, 72) 4.173, p = 0.045$). Follow-up showed that SW2 had higher variability ($\Delta SD = 2.59, p < 0.001$) and it increased over time ($p < 0.01$).

Conclusions: Novelty effect did not seem to drive physical activity engagement during the first use of an iVR exergame. Software immersivity nor exergame exposure (1st vs 2nd part) affected engagement. However, increased HR SDs for the higher immersivity game may be related to a diverse response to people’s engagement. Future research is required to solve this question.

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P0026 - SCOLIOSIS AND SPONDYLOSIS IN RHYTHMIC GYMNASTS

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Purpose: Rhythmic gymnastics is a complete discipline. However, research has shown that repetitiveness of gestures, a prerequisite for the perfection of some movements that make up the competition exercises, puts gymnasts, particularly high-level ones, at risk of stress-related injuries, especially in the spinal column.

Methods: The study is based on bibliographic research of texts and scientific articles dealing with research related to subjects practicing rhythmic gymnastics competitively.

Results: One study looked at 100 girls practicing rhythmic gymnastics and as many who were not involved in the sport. The tests included one’s medical history, height and weight, growth and maturation information, diet, along with duration and intensity of training. An incidence of scoliosis was found 10 times more in rhythmic gymnasts (12%) compared to their peers (1.1%). The evaluation of practice sessions showed that the gymnasts, approximately 75% of the time, utilize only and exclusively their dominant hand to ensure better control in the use of the apparatus. Furthermore, the technical elements of rhythmic gymnastics involve continuous asymmetrical overloading of the spine, pelvis and lower limbs. A prospective study of seven elite gymnasts was undertaken in which they documented spinal pain and injuries. The athletes were members of the U.S. National Rhythmic Gymnastics Team, with an average seven years of experience and 16 years of age. At the end of the study, five out of the seven gymnasts displayed injuries in the lumbar region, ranging from muscle strains to bone fractures (spondylosis).

Conclusions: Muscle strengthening in all areas of the body and good stretching are unquestionably effective, in both preventing osteo-articular diseases and in preventing injuries. It is particularly essential to include preventive functional exercises that strengthen the core in training sessions.

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P0027 - BIOFEEDBACK-BASED PROPRIOCEPTIVE TRAINING TO IMPROVE UPPER BODY SENSORIMOTOR CONTROL IN DRAGON LADIES

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Purpose: Breast cancer (BC)-related sequelae drastically impact the psychophysical functioning and quality of life of affected women. Adapted physical activity (APA) has proved to effectively counteract these impairments in a non-medicalized framework. In particular, dragon boat is able to promote body functionality, social interaction, and quality of life in BC survivors. In this context, the present longitudinal study investigated the benefits of an integrated biofeedback-based sensorimotor training intervention on upper body functionality in a team of dragon ladies.

Methods: Twelve dragon ladies were recruited from a Tuscan association providing social support and multidisciplinary re-education for oncological subjects and underwent quantitative and qualitative evaluations (i.e., upper body active ROM, Sit up and Sit and reach test, SDG test, and a structured survey comprising SF-12, NRS, and Distress thermometer) at baseline and after ending the adapted sensorimotor training intervention. The 8-week protocol was conceived as integrated dry workout sessions led by an APA kinesiologist and applied a novel sensorized proprioceptive device, such as a Libra board.

Results: Post-protocol evaluation revealed a significant improvement in bilateral upper limb mobility, core endurance, and trunk stability along with a distress decrease and quality of life enhancement.

Conclusions: Our findings suggest that integrating biofeedback-based workout sessions can effectively promote upper body functionality in BC survivors practicing dragon boating. Furthermore, our innovative approach could help spread methodological hints able to boost exercise adherence in this target population, thus counteracting cancer recurrence while promoting overall well-being.

P0028 - ATTENTIONAL FOCUS AND OBESITY: EFFECTS ON BODY COMPOSITION AND PHYSICAL FITNESS

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Purpose: The way an individual focuses their attention during physical activity can influence motor learning and performance. Evidence suggests that patients with various health conditions may benefit from adopting different attentional focus strategies to improve their health outcomes. This study aims to examine the dose–response effect of a 10-week exercise training program, based on different types of attentional focus, on body composition and physical fitness in outpatients with obesity.

Methods: Sixty patients (51.6 ± 8.2 years; 37.3 ± 4.6 kg/m²; 82% female) were recruited at IRCCS Istituto Auxologico Italiano and randomly assigned to one of three groups: External Focus (EF, n = 20), Internal Focus (IF, n = 20), or No Focus (NF, n = 20). All participants followed the same resistance-based program (3 times/week), with the only difference being the instructional cues directing their attention externally or internally. Fat mass percentage (FM%), waist circumference (WC), static balance (M-BESS), handgrip strength test (HST), and sit-to-stand test (5STS) were assessed at baseline (T0) and after 10 weeks (T10).

Results: A significant time $\times$ group interaction was observed for WC, HST, 5STS, and M-BESS. A main effect of time was found for FM%, WC, HST, 5STS, and M-BESS outcomes. Additionally, a main effect of group was observed for HST, 5STS, and M-BESS. The EF group exhibited greater improvements than both IF and NF across all outcomes ($p < 0.05$). Conversely, the IF group showed a significant improvement only in the M-BESS parameter compared to NF.

Conclusions: Practitioners and trainers may consider to adopt specific attentional focus instructions when designing exercise programs for individuals with obesity to promote positive outcomes in both body composition and physical fitness.

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P0029 - MUSCLE SYNERGIES IN THE JUMP FLOAT SERVE IN WOMEN'S VOLLEYBALL: A PRELIMINARY STUDY

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Purpose: The *jump float* serve is the most commonly used serving technique in women's volleyball. Despite its widespread use, the spatiotemporal coordination of upper limb muscles remains poorly investigated, particularly in relation to its implications for training and performance. Therefore, the aim of this preliminary study is to describe the coordinative strategies of the movement through the analysis of the muscle synergies involved. It is hypothesized that a similar motor output corresponds to a shared coordination strategy among athletes.

Methods: Ten regional-level competitive female volleyball players participated in the study. Electromyographic activity was recorded from 11 muscles of the ipsilateral shoulder (infraspinatus, anterior deltoid, middle deltoid, posterior deltoid, pectoralis major, biceps brachii, triceps brachii, latissimus dorsi, transverse trapezius, ascending trapezius, descending trapezius) during the execution of the movement at maximal intensity. The movement was divided into distinct temporal phases, identified using a triaxial accelerometer (G-Sensor) placed at the distal end of the dominant upper limb. Non-negative matrix factorization (NMF) was used to extract the composition of motor modules and their temporal activation patterns, followed by a K-means clustering analysis to group them based on similarity. The optimal number of clusters was defined using the silhouette value, while the similarity between motor modules across athletes was assessed using cosine similarity (CS) analysis.

Results: The results of the analysis highlight the existence of two distinct modules in terms of muscular contributions underlying the identified synergies, which were strongly shared among the athletes. However, the temporal activation of these synergies, although shared across athletes, showed greater variability, as indicated by the lower cosine similarity values.

Conclusions: The results suggest that the *jump float* serve may be based on two muscle synergies shared among the athletes. It should be noted that the small sample size limits the generalizability of the findings to the entire volleyball population. Future studies should aim to increase the sample size and define the practical implications of this type of analysis for training practices.

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P0030 - CORRELATION BETWEEN MOTOR COORDINATION AND ACADEMIC ACHIEVEMENT IN PRIMARY SCHOOL CHILDREN

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Purpose: It is known that physical activity (PA) improves not only physical fitness but also cognitive functions in children (1, 2). Moreover, the level of PA and the associations with its effectiveness can depend on different factors, such as the setting in which they live

(3). This study aimed to explore the correlation between motor coordination performance and academic achievement in children of a primary school in a peripheral neighborhood of a city.

Methods: A number of 58 children attending the first and second grade of a primary school in a peripheral neighborhood of Palermo city were recruited. Motor coordination was assessed using the Test of Gross Motor Development-3 (TGMD-3) for gross motor skills and the Grooved Pegboard Test (GPT) for fine motor skills. For the TGMD-3, the sum of ball skills (SBS), locomotor skills (SLS), and the total sum (TOT) were taken into consideration. For the GPT, we administered the baseline test with right and left hand (GPT RT and GPT LT), the test associated with the finger tapping test with right and left hand (GPT-FTT RT and GPT-FTT LT), the test associated with the counting test with right and left hand (GPT-CT RT and GPT-CT LT). Furthermore, the school grades obtained by each child in Italian (ITA), mathematics (MAT), and English (ENG) were taken into consideration for learning outcomes.

Results: A positive correlation between ITA and GPT-CT RT ($p = 0.012$) and a negative correlation between ITA and SLS ($p = 0.002$) and TOT ($p = 0.036$) were found. We detected a negative correlations between: GPT RT and SLS ($p = 0.015$), SBS ($p = 0.006$), and TOT ($p = 0.003$); between GPT-FTT RT and SBS ($p = 0.031$) and TOT ($p = 0.038$); between GPT-CT RT and SLS ($p = 0.009$), SBS ($p = 0.025$), and TOT ($p = 0.007$); between GPT LT and SBS ($p = 0.028$) and TOT ($p = 0.031$); GPT-CT LT and SLS ($p = 0.035$), SBS ($p = 0.043$), and TOT ($p = 0.023$).

Conclusions: These results showed negative correlations between gross and fine motor skills, as well as between gross motor coordination performance and academic achievement. These findings suggest that in a peripheral neighborhood of a city in South Italy, where the possibility of accessing sports activities may be more difficult due to the lack of economic resources of families, gross motor skills are lower and, in fact, are negatively correlated with academic achievement.

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P0031 - INFLUENCE OF START CONDITIONS ON MUSCLE SYNERGIES IN KARATE MAWASHI GERI KICK: AN ECOLOGICAL-DYNAMICS APPROACH TO NEUROMUSCULAR CONTROL

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Purpose: The mawashi geri is a primary kicking technique used in kumite competitions. This kick demands complex neuromuscular coordination with multiple muscles working synchronously to produce accurate impact. In the ecological-dynamics framework, motor control is an emergent, self-organized process arising from continuous interactions among organismic, task, and environmental constraints. Thus, different initial movement conditions could act as task-specific constraints that alter the neuromuscular organization and consequently lead to distinct muscle synergy patterns. This study aimed to investigate whether these varied initial conditions in the mawashi geri influence the emergence of distinct muscle synergies.

Methods: Five healthy participants (age 23 ± 1.7 years and karate practice 11.6 ± 4.2 years) performed three mawashi geri using the back leg from a static fighting stance and three preceded by the characteristic rhythmic bouncing footwork. Eight sEMG sensors were placed on the following muscles: biceps femoris (BF), semitendinosus (ST), gastrocnemius lateralis (GL), gastrocnemius medialis (GM), rectus femoris (RF), vastus lateralis (VL), vastus medialis (VM), and tibialis anterior (TA). A camera was used to define the kicking cycle from toe-off to foot impact with the target. Muscle synergies were extracted using Non-Negative Matrix Factorization and grouped through k-means clustering. Cosine Similarity (CS) was employed to evaluate intra-cluster similarity.

Results: Two motor modules were extracted for both mawashi geri start conditions in all participants, grouping into two clusters. Cluster 1 primarily included RF, VL, VM, and TA muscles, peaking from 70 to 100% of the kick cycle. Cluster 2 comprised GM, BF, ST, and GL muscles, with peak activation from the start to 70% of the kick cycle. Muscle synergies remained highly consistent across participants and start conditions, with high intra-cluster CS values for muscle weights and activation timing.

Conclusions: The findings would suggest that the central nervous system might simplify movement execution during the mawashi geri through two consistent muscle synergies, irrespective of the initial start condition. The high similarity observed in both muscle contribution and temporal activation patterns between static and dynamic starts indicates that different initial conditions do not impose sufficient task constraints to induce distinct synergy structures.

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P0032 - EFFECTS OF A PASSIVE BACK EXOSKELETON ON PHYSICAL FUNCTION IN HEALTHY ADULTS: A PILOT STUDY

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Purpose: musculoskeletal disorders are the most reported health issue among workers, particularly in physically demanding sectors. Low back pain is a common issue among workers, with most individuals expected to experience symptoms throughout their working lives. Work-related low back pain has been linked to factors such as lifting and carrying heavy loads, and maintaining awkward postures involving trunk flexion and rotation (Griffith et al., 2012). Recently, there has been growing interest in using exoskeletons in the workplace. Designed to aid with manual handling of loads and holding awkward postures, these devices seem to reduce physical strain and the risk of musculoskeletal injuries (Toxiri et al., 2019). This pilot

study aims to assess the effects of a passive back-support exoskeleton on physical function and specific tasks in a sample of healthy adults.

Methods: nine subjects (aged 26 ± 3 years, 11% of women) participated. A passive exoskeleton Laevo V2.56 (Laevo, Delft, The Netherlands) was used. A series of tests was administered to assess leg strength (5-times sit-to-stand test), cardiorespiratory fitness (3-minute YMCA step test), flexibility (toes reach test), and simulated work tasks (lifting and carrying load, holding a forward-bent posture). The perceived task difficulty/discomfort was evaluated using a VAS scale for each functional test. All the tests were conducted under two experimental conditions: with and without the exoskeleton. The Wilcoxon signed-rank test was used to analyze the differences between these conditions, with significance set at $p < 0.05$.

Results: performance in the toes reach test decreased wearing the exoskeleton (-34% , $p = 0.04$) as the VAS score during the task of holding a forward-bent posture (-45% ; $p = 0.02$). No statistically significant differences were found for any of the other study outcomes.

Conclusions: our preliminary results showed that using the exoskeleton reduced flexibility during torso flexion, without affecting lower limb strength during the sit-to-stand transition and without increasing the energy expenditure. Furthermore, the exoskeleton was found to effectively reduce the perceived difficulty/discomfort associated with static postures, particularly when holding a forward-bent posture. We hypothesize this may be due to the reduced loading on the lumbar muscles, specifically during trunk flexion.

Acknowledgments: (non obligatory).

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P0033 - KINEMATIC ANALYSIS OF STAG LEAP IN RHYTHMIC GYMNASTICS: AN ECOLOGICAL-DYNAMIC PERSPECTIVE

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Purpose: Jumps are a fundamental component of rhythmic gymnastics competition exercises. They are considered as complex tasks as they require explosive strength, speed, flexibility and motor coordination. It is important to study the biomechanical characteristics of jumps to improve performance. Therefore, the aim of this study is to analyze, from an ecological-dynamic perspective, the kinematics of the stag leap in rhythmic gymnastics performed with two run-up techniques: the chassè and the pre-jump.

Methods: The study sample included six competitive gymnasts with an average age of 16.6 years (± 1.9). The integrated multifactorial optoelectronic system was used for the acquisitions, consisting of six BTS Smart-DX video cameras, seven BTS-6000 force platforms, fifteen passive markers applied to the athletes' bodies according to the

Simple Helen-Hayes protocol and two BTS-Vixta support video cameras.

Results: The results of the independent samples t-test show that the difference between the jumps performed with the two run-up techniques is not statistically significant ($p > 0.05$).

Conclusions: Since in this study there are no statistically significant differences between stag leap performed with chassè and with pre-jump, it could be hypothesized that both techniques can be used to perform the jump since they do not alter the performance, consistently with the principles of variation and variability of the ecological-dynamics. This could represent a suggestion for coaches who could include both approach techniques in jump training so that athletes can experiment with different movement variations to adapt more effectively in the competition context.

Despite the small sample of the study that does not allow to draw conclusions representative of the population of gymnasts, this study can represent a starting point to open the reflection on these issues in rhythmic gymnastics, aiming at improving performances.

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References: (non obbligatorio).

P0034 - A MULTI-COMPONENT TRAINING PROGRAM IMPROVES MOTOR, BUT NOT FUNCTIONAL RESPIRATORY, PARAMETERS IN PARKINSON'S DISEASE PATIENTS: A PILOT STUDY

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Purpose: Parkinson's disease (PD) can affect both motor and respiratory functions, which together reduce physical efficiency and quality of life. Different forms of physical exercise have shown favourable outcomes in improving motor or respiratory functions in PD; however, it is unclear whether a multi-component training program (McTP) (i.e. a program that includes cardiovascular, strength, balance, coordination, flexibility and proprioception), designed to provide benefits across multiple domains, may impact both functions concomitantly.

Methods: A group of 10 PD patients (age: 75.1 ± 7.1 years; 1 female; Hoehn & Yahr: 2) was assessed before and after a 3-month bi-weekly McTP with respiratory (spirometric evaluation, 12-s forced inspiration and expiration, and maximal inspirations) and motor tests (6-Minute Walking Test (6MWT), Timed Up & Go Test (TUG), and Short Physical Performance Battery (SPPB)). Wilcoxon signed-rank and two-tailed Paired Sample Student's t-test were used to compare the pre- and post-intervention results. Additionally, between 6MWT and PFTs, Pearson correlation analysis pre- and post-intervention was performed.

Results: No statistically significant differences ($p > 0.05$) in the respiratory parameters and TUG were found between pre- and post-intervention. Instead, the training protocol significantly improved 6MWT ($p < 0.01$) and SPPB measures ($p < 0.05$). Pearson correlation between 6MWT and peak inspiratory flow reached statistical significance after the McTP ($p < 0.05$).

Conclusions: Our results highlight the potential benefits of McTP in improving motor function in PD patients. However, when respiratory parameters are the primary focus of rehabilitation, specific training protocols may be necessary.

P0035 - ELECTROMYOGRAPHIC ANALYSIS OF BACK MUSCLE ACTIVATION DURING LAT PULL-DOWN EXERCISE: EFFECTS OF GRIP VARIATIONS AND FOREARM ORIENTATION

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Purpose: Dorsal musculature training is fundamental for athletic performance and prevention of musculoskeletal injuries. The lat pulldown machine is one of the most versatile pieces of equipment for back strengthening, allowing variations in grip and load. However, the literature presents significant gaps in the understanding of the relationship between execution modalities and specific muscle activation. Previous studies have partially analysed exercise variants, neglecting fundamental biomechanical aspects such as forearm orientation and trunk inclination [1]. The present study analysed muscle activation during different grip variants (pronated, supinated, and neutral) and forearm orientations of the lat pulldown machine using surface electromyography (EMG).

Methods: Eighteen male subjects were recruited (mean age: 24.19 ± 3.77 years) with at least 3 years of resistance training experience, without musculoskeletal injuries in the past 6 months, or chronic pathologies of the locomotor system. Prior to the surface EMG analysis, maximal voluntary contraction (MVC) tests were performed for each muscle group analysed, specifically the latissimus dorsi, posterior deltoid, brachial biceps, middle and lower trapezium, and infraspinatus. The electrodes were positioned as described by Seniam et al. [2]. The Root Mean Square (RMS) was then calculated, and the activation percentage of each muscle was calculated as the ratio between RMS and MVC.

Results: Multivariate analysis of variance (MANOVA) showed no significant difference in EMG muscle activation across the different lat pulldown exercises (all $p > 0.050$). The significant difference found was in posterior deltoid EMG activation during the inclined wide pronated grip compared with the wide pronated grip ($p = 0.011$) and wide neutral grip ($p = 0.017$).

Conclusion: The lack of significant differences in muscle activation across the various grip types indicated an inability to provide definitive guidelines regarding the most effective grip for maximising latissimus dorsi stimulation. Despite having a similar training experience, the subjects exhibited considerable variability in muscle activation during each exercise. The choice of grip and exercise to enhance target muscle stimulation should be individualised based on each athlete's specific characteristics and cannot be generalised.

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P0036 - SUSTAINING EUROPEAN ELITE ATHLETES' CAREER RETIREMENT TRANSITION AND MENTAL HEALTH: THE MAJOR SPORTS ORGANIZATIONS' PERSPECTIVE

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Purpose: The transition from elite sports to post-athletic life presents a complex array of psychological, financial, career, and social challenges, requiring tailored support services to mitigate these difficulties. Hence, the present study aimed to map the policies, programs, and practices surrounding the career transitions, mental health, and support services for elite athletes within European (EU) sporting contexts under the Erasmus+ funded Project "PORTAL".

Methods: Project partners from 6 EU countries (Croatia, France, Italy, North Macedonia, Romania, Spain) developed a tailored 34-items semi-structured electronic questionnaire to be administered to EU major sports organizations. Dependent variables included typology (e.g., career transitions, mental health, other support), modality, funding, and perceived challenges of service delivery to elite athletes. Descriptive statistics was applied.

Results: Respondents (National Olympic Committees $n = 16$, National Sport Institute $n = 1$) highlighted several issues in ensuring athletes adequate support and a fragmented approach in services implementation and delivery. When available, services are offered mostly to medallist athletes in international competitions of both Individual and Team sports (71%). For mental health support, access to external professionals (34%), awareness training (20%), and in-house psychologists (17%) resulted the most common services across countries. However, only 29% of organizations conduct formal needs assessment, with lack of funding (41%) and of multi-method assessment approaches affecting service continuity and quality. Only 35% of countries currently provide career transition services, mostly in the form of educational workshops (29%) and career counselling (19%). Regarding additional support services provision, nutrition (21%), financial (19%), social (19%), and travel/logistics (19%) support resulted the most cited, meeting practical needs related to athletes' performance and well-being through internal organizational support networks (40%) and coach/staff referrals (33.3%).

Conclusions: Results reflect previous literature in this field, with the absence of regulatory frameworks for career assistance and temporary initiatives/activities or informal support as the common practice. Multi-faceted programs combining several types of services, and comprehensive, athlete-centred systems are needed to effectively support athletes' mental health and career transitions.

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P0037 - A BEHAVIORAL INTERVENTION FOR THE ADOPTION OF A HEALTHIER LIFESTYLE IN PEOPLE WITH DIABETES MELLITUS: THE PRELIMINARY DATA OF DIA01 STUDY

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Purpose: DIA01 is a multidisciplinary study promoting a healthy lifestyle to prevent and treat type 2 diabetes (DM2), supporting social and healthcare systems for DM2 patients. This study aims to assess physical activity (PA), sitting time (ST), health status, anthropometrics and blood pressure measurements, eating habits, lifestyle change desire, quality of life, and functional abilities. We also explore barriers and willingness to start PA, first at C.U.R.I.A.Mo, then at *Palestre della Salute*.

Methods: From January to March 2025, volunteer adults who accessed the Diabetes Clinics of Perugia were involved in this study with these inclusion criteria: 25–80 years old with DM2 for at least 3 months; ability to walk independently; $18.5 < \text{BMI (kg/m}^2\text{)} < 40$. The exclusion criteria were cardiovascular, central nervous system, and musculoskeletal diseases contraindicating PA; no informed consent. Body weight (BW), height, BMI, CV, eating habit (14-item Mediterranean diet assessment tool), perceived quality of life (EuroQol-5D and SF-36 questionnaires), barriers to PA, PA level, and ST (IPAQ questionnaire) were evaluated.

Results: 15 adults (80% men), mean age 61.53 ± 9.59 years, were enrolled. The average BW and height were 92.30 ± 23.65 kg and 174.70 ± 9.36 cm, respectively; the of health status reported a mean score of $72.67/100 \pm 15.45$. The adherence to the Med diet was low?. SF questionnaire dimensions values were: Physical activity 86.79 ± 18.03 ; Physical role: 78.33 ± 38.80 ; Emotional role: 82.22 ± 33.01 ; Vitality: 61.00 ± 21.56 ; Mental health: 75.47 ± 18.57 ; Social activities: 75.00 ± 25.00 ; Pain: 83.17 ± 23.76 . IPAQ values showed a total weekly PA of $666.33 (\pm 784.7)$ minutes, and a total daily ST of $263.33 (\pm 196.02)$ minutes. Participants who answered the lifestyle change questionnaire reported no current physical activity and no plans to start in the next six months.

Conclusions: Preliminary data from the DIA study show that subjects often underestimate their sitting time and overestimate the volume of their PA levels. The next phases of the study will include meetings focused on movement and healthy eating education, as well as supervised physical exercise sessions monitored with accelerometers and actigraphs. This approach helps assess the current situation and encourages patients with DM2 to engage in regular PA, including spontaneous activities supported by *Palestre delle Salute*.

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P0038 - THE PREDICTIVE ROLE OF DROP JUMP BIOMECHANICS IN INITIAL SPRINT ACCELERATION AMONG MALE SPRINTERS: A PILOT STUDY

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Purpose: The sprint start and the initial acceleration phase are critical components of overall sprint performance, particularly for short distances such as 10 m. Identifying biomechanical predictors of acceleration can inform training strategies aimed at improving neuromuscular efficiency and explosive power. This pilot study explores the relationship between vertical jump metrics and 10-m sprint times in competitive sprinters.

Methods: Eight male competitive sprinters underwent a battery of biomechanical tests, including the Squat Jump (SJ), Drop Jump (DJ), and Countermovement Jump (CMJ). Key variables collected included jump height, flight time, contact time, take-off velocity, power output, and the Reactive Strength Index (RSI). Personal Best (PB) over 100 m and 10-m sprint times were also recorded. Pearson correlation analysis were performed to assess the association between jump metrics and performance. A multiple linear regression model was also developed to predict 10-m sprint times based on biomechanical variables.

Results: Among all jump tests, the DJ emerged as the most significant predictor of sprint performance. Specifically, DJ jump height ($r = -0.71$; $p = 0.024$), flight time ($r = -0.71$; $p = 0.024$), and RSI ($r = -0.72$; $p = 0.021$) were strongly and negatively correlated with Personal Best times over 100 m, indicating that enhanced explosive and reactive strength is associated with faster sprint performances. In contrast, variables from the SJ and CMJ showed weaker correlations. The regression model, based on combined biomechanical variables, demonstrated moderate predictive power for 10-m sprint times, with a low mean squared error and a meaningful.

Conclusions: Vertical jump assessment, particularly the DJ, has proven to be a reliable indicator of short-distance sprint performance. Among the evaluated metrics, reactive strength indicators such as the Reactive Strength Index (RSI) and jump height showed strong associations with enhanced acceleration capacity. These findings highlight the value of reactive strength assessments, especially through the DJ, for evaluating neuromuscular qualities relevant to sprinting. Therefore, training interventions aimed at improving reactive and explosive strength may represent an effective strategy for enhancing initial sprint acceleration.

P0039 - EFFECTS OF 12-WEEK COMBINED RESISTANCE AND AEROBIC TRAINING ON BODY COMPOSITION AND FUNCTIONAL CAPACITY IN MIDDLE-AGED ADULTS

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Purpose: This study investigated the effects of a 12-week combined resistance and aerobic training programme on body composition, muscle strength, and aerobic capacity in sedentary middle-aged adults. Additionally, it evaluated whether changes in phase angle, a non-invasive marker of cellular health, were associated with improvements in functional outcomes.

Methods: Sixty-four sedentary adults (32 males and 32 females; age 51.3 ± 6.2 years) were enrolled in a 12-week, supervised combined training intervention. Sessions were held 3 times per week and comprised resistance and aerobic components with progressively increasing volume and intensity. Assessments of body composition (fat mass, fat-free mass, phase angle), handgrip strength, and aerobic capacity (estimated $\dot{V}O_2\text{max}$) were performed at baseline, 6, and 12 weeks. Pearson's correlations and regression analyses were used to explore associations between changes in body composition and functional measures.

Results: The combined training resulted in significant reductions in body mass (-2.3 ± 0.9 kg) and fat mass (-3.6 ± 1.1 kg), alongside increases in fat-free mass ($+1.8 \pm 0.7$ kg) and phase angle ($+0.6 \pm 0.2^\circ$, $p < 0.001$). Handgrip strength improved by $+4.2 \pm 1.3$ kg in males and $+3.1 \pm 1.1$ kg in females ($p < 0.001$), while estimated $\dot{V}O_2\text{max}$ rose by $+4.6 \pm 1.5$ ml/kg/min. Changes in phase angle were strongly positively correlated with improvements in handgrip strength ($r = 0.68$) and $\dot{V}O_2\text{max}$ ($r = 0.57$). Regression models identified phase angle and fat-free mass as independent predictors.

Conclusions: A 12-week combined resistance and aerobic training programme effectively improved body composition, muscle strength, and aerobic capacity in sedentary middle-aged adults. Furthermore, increases in phase angle were strongly associated with functional improvements, suggesting it may serve as a valuable biomarker to track the effects of multicomponent training.

P0040- COMBINED EFFECTS OF FATIGUE AND EXTREME ENVIRONMENTAL CONDITION ON NEUROMUSCULAR FUNCTION

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Purpose: The effects of fatigue on neuromuscular function (NMF) under normoxic conditions are well documented. However, less is known about how these responses are altered under extreme environmental conditions such as hypoxia. This study aimed to examine

the impact of a fatiguing task on NMF in hypoxic versus normoxic conditions. It was hypothesized that NMF would decline following the fatiguing task, with more pronounced impairments observed in hypoxia.

Methods: Eight high-altitude experienced mountaineers were recruited. Maximal voluntary isometric contraction (MViC), voluntary activation (VMA%, central component), and potentiated twitch force (Qtw.pot, peripheral component) were assessed using the interpolated twitch (IT) technique in the lower limb in normoxia (FiO₂% = 20.9) and hypoxia (FiO₂% = 11.8). Torque for MViC and Qtw.pot was calculated and normalized to the limb cross-sectional area. The maximal Rate of Force Development (RFDMAX), early RFD (RFD0–100) and late RFD (RFD100–200) were measured for each MViC. MViC + IT protocol was repeated at rest and within 30 s after a fatiguing task, which consisted in a time-to-exhaustion (TTE) cycling task performed at 80% of the maximal exercise capacity.

Results: The two-way ANOVA shows the effect of fatigue on MViC ($p = 0.001$, $F = 43.71$), Qtw.pot. ($p = 0.002$, $F = 25.40$) and VMA% ($p = 0.016$, $F = 11.13$). RFDMAX results lower in hypoxia compared with normoxia ($p = 0.043$, $F = 6.12$). An interaction between Fatigue and Condition was found for RFD0–100 ($p = 0.040$, $F = 6.30$). No significant results were found for RFD100–200.

Conclusions: Contrary to our initial hypothesis, the results indicate that hypoxia does not induce greater deterioration in NMF. However, when examining the RFD, the effect of hypoxia become evident through a prolonged early phase of force production, which delays reaching maximal strength. This finding suggests that fatigue under extreme environmental conditions primarily affects neural drive rather than the contractile capacity of the muscle.

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References: (non obbligatorio).

P0041 - STRENGTH ASSESSMENT IN PEOPLE WITH PARKINSON DISEASE: BILATERAL DEFICIT

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Purpose: Parkinson's disease (PD) is a neurodegenerative disorder that is frequently encountered and is distinguished by the early degeneration of dopaminergic neurons. A common characteristic of Parkinson's disease (PD) is a weakness deficit, which can negatively impact motor control, cause balance issues, and raise the risk of falls. It is crucial to assess these modifications through precise biomechanical evaluations in light of these factors. The objective of this investigation was to evaluate the strength deficits in the lower limbs (unilateral and bilateral tests) and the upper limbs (unilateral handgrip strength tests).

Methods: Ten subjects with PD (7 men and 3 women; age = 65.6 ± 10.2 years; height = 167.1 ± 8.5 cm; weight = 71.7 ± 8.4 kg; BMI = 25.7 ± 3.3) voluntarily took part in this study. In both unilateral and bilateral conditions, maximal voluntary isometric contraction (MVIC) tests of the lower limbs were conducted during leg extension. Force-time profiles were recorded to analyse the rate of torque development (RTD) and peak force throughout the 0–200 ms time window. Unilateral handgrip strength tests were implemented; the peak force was assessed for analysis. The experimental procedures, which included four sessions of MVIC leg extension and handgrip strength, were

introduced to the participants over the course of two weeks. After the most recent familiarization session, the assessment was administered at least 48 hours later.

Results: No statistically significant differences were observed in MVIC or RTD between the lower limbs during unilateral execution ($p > 0.05$). Nevertheless, the dominant (DL) and non-dominant limb (N-DL) exhibited marked differences in RTD during bilateral execution ($p < 0.05$), whereas the MVIC were not significant ($p > 0.05$). No significant differences were observed in either MVIC or RTD when unilateral and bilateral execution were compared ($p > 0.05$). In contrast, the N-DL demonstrated significantly lower values for both MVIC and RTD during bilateral execution ($p < 0.05$). DL and N-DL did not exhibit any significant differences in the hand grip strength test ($p > 0.05$).

Conclusions: These results suggest that bilateral isometric leg extension is a more sensitive modality than unilateral execution for the detection of strength imbalances between the DL and N-DL in individuals with PD.

P0042 - POSTURAL SWAY USING DIFFERENT TYPES OF EXTERNAL ATTENTIONAL FOCI

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Purpose: The advantage of an external attentional focus for improving motor learning and performance has consistently been demonstrated. However, an external focus can be obtained by different communication ways¹. In this sense, the aim of this study was to investigate the effect of adopting different attentional external foci (analogy vs. metaphor) on static balance performance.

Methods: Seventeen moderately-active university students were tested for static balance (postural sway with eyes closed for 30 s) on a firm surface under three different conditions in a randomized order: i) using an internal focus (i.e., “stand still and focus on how your foot supports your weight—from the heel, across the arch, to the tip of your toes”); ii) using a metaphor as external focus (i.e., “stand still as if you were a stone or a statue”); iii) using an analogy as external focus (i.e., “imagine being on top of the mountain and you don't have to fall down”). Postural sway was assessed by Microgate GYKO inertial sensor system².

Results: Sway area, convex hull area, antero-posterior length, mean distance, root mean square distance and mean velocity of the center of mass trajectory in the ground surface were lower in both the analogy and metaphor external focus than in the internal focus ($p < 0.05$). Furthermore, no significant differences were revealed between analogy and metaphor in any of the parameters ($p > 0.05$).

Conclusions: This study confirms the superiority of an external over an internal focus for static balance performance³. However, the way in which the external focus is communicated by the practitioner (using a metaphor or an analogy) did not differently affect static balance performance. Our findings may help practitioners to identify the most appropriate way for communicating and using instructions on different attentional foci when the main purpose is postural control.

Acknowledgments: (non obbligatorio).

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P0043 - EFFECT AND IMPACT OF EXERCISE PROGRAM CONDUCTED BY KINESIOLOGIST WITHIN A COMMUNITY-BASED ONCOLOGY PROGRAM TO INDUCE CHANGE IN BREAST CANCER WOMEN'S LIFESTYLE AND PHYSICAL ACTIVITY

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Purpose: Cancer is the second cause of death worldwide, but the survival rate is enhanced every year. The scientific community is now aware of the role of physical activity (PA) for cancer patients as it is essential to improve PA, enhance quality of life, and reduce the risk of relapse. The study aims to evaluate the role of kinesiologists within the National Health System (NHS) in implementing exercise training for cancer survivors in their daily lives.

Methods: Overall, 26 women with breast cancer received up to two months of exercise training in small groups supervised by a kinesiologist. Women were evaluated before and after the end of the protocol by the kinesiologist and orthopedic through the following assessments: 6-min walking distance (6MWD), five times sit to stand (5xsts), Handgrip Test (HGT) and Single Leg Stance test (SLS) for 10 s, were proposed to every subject at the baseline and the end of the protocol. The exercise program consisted of 60-min sessions twice a week. Each session included mobility (10 min); strength exercises for the upper and lower body with rubber bands and squats (interval training up to 30 min); exercises for core stability (15 min) and for balance (5 min). At the end of the program, the kinesiologist proposed that the patient continue adapted physical activity outside the NHS, under the supervision of a kinesiologist. After that, within one year, by the end of the program, every subject has been contacted for a follow-up about their active habits.

Results: At the end of the program, 6MWD improved around 60 m ($p < 0.001$) and errors in SLS were reduced by 1.07 to the baseline ($p < 0.006$). HGT improved by 2.11 kg ($p < 0.037$) and 5xsts was reduced by 1.12 s ($p < 0.001$). The adherence rate, based on the total number of sessions and patient attendance, was 87%. Moreover, 88%

of the women described the program as excellent. While at the baseline, only 30% were physically active, the follow-up showed that 65% of the patients continued to engage in PA with a kinesiologist or in walking groups; 31% stopped due to health problems, and only 4% stopped exercising because of a lack of time.

Conclusions: PA is necessary for cancer survivors to improve their quality of life and change their lifestyle, thus reducing the risk of relapse. Our results show that exercise programs conducted by kinesiologists, recognized within the NHS, are effective in teaching breast cancer women the impact of physical activity into their lives.

P0044 - FIGHTING COGNITIVE DECLINE: A MULTICOMPONENT PHYSICAL ACTIVITY PROTOCOL FOR OLDER ADULTS

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Purpose: Although moderate-to-vigorous physical activity (PA) is known to attenuate age-related cognitive decline, the effects of structured Fit-Fighting (F-F) and psychomotor ludic activities (PLA) protocols in older adults with cognitive deterioration remain under-explored. This study aimed to assess the impact of a six-month multicomponent PA program on cognitive function and physical fitness in older adults with mild-to-severe cognitive decline.

Methods: Twenty older adults were randomized into an experimental group (EG; $n = 10$) or control group (CG; $n = 10$). Prior to any intervention, all participants completed baseline assessments (T0), including the Mini-Mental State Examination (MMSE), image recognition test, Timed Up and Go (TUG), Short Physical Performance Battery (SPPB), and handgrip strength. The EG then underwent a two-month familiarization phase consisting of four weekly sessions (two F-F and two PLA) to acquire familiarity with the exercises. Following this phase, the EG continued with a three-month intervention (two F-F and two PLA sessions weekly), while the CG maintained their usual routines. Both groups were reassessed immediately after the intervention (T1) and again after a one-month follow-up without structured activity (T2).

Results: At T1, the EG demonstrated significant improvements in MMSE and image recognition, with partial retention at T2. TUG performance improved in the EG, indicating enhanced mobility, while CG outcomes remained unchanged. SPPB gait speed showed a trend toward improvement in the EG. Chair-rise times decreased significantly in the EG at both T1 and T2, reflecting improved lower-body strength. Handgrip strength on the dominant side increased significantly in the EG at T1 and remained stable at T2; no changes were observed in the CG.

Conclusions: A multicomponent PA protocol combining F-F and PLA modalities led to short-term improvements in cognition and physical function in older adults with cognitive decline. These findings support its potential to preserve autonomy and delay deterioration. Further large-scale trials are needed.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0045 - EFFECTS OF TAOPATCH®-ENHANCED HEARING AIDS ON BALANCE CONTROL IN OLDER ADULTS WITH HEARING LOSS

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Purpose: Hearing loss (hypoacusis), particularly prevalent in the elderly, is not only a communication disorder but also a factor contributing to postural instability and increased fall risk. The functional link between auditory and vestibular systems suggests that compromised hearing may negatively affect balance control. Taopatch® is a nanotechnology-based neuromodulation device that emits near- and far-infrared light when activated by body heat and sunlight. Prior research has shown its potential in improving postural control. This study explores the effects of integrating Taopatch® technology into hearing aids to assess potential improvements in balance among individuals with hearing loss.

Methods: Forty adults diagnosed with hearing loss (mean age: 77.28 ± 15.58 years; 19 males, 21 females) were recruited through Audioclinik, a hearing aid provider. Each subject underwent stabilometric evaluation under two conditions: 1. Using standard hearing aids; 2. Using hearing aids integrated with Taopatch® technology. Postural stability was assessed using a SensorMedica stabilometric platform. Parameters including sway path length, mean velocity, mean acceleration, and support surface area were recorded and compared using paired t-tests.

Results: The results revealed a statistically significant improvement in postural stability when participants used hearing aids integrated with Taopatch® technology compared to standard devices. The sway path length was reduced, indicating decreased amplitude of body oscillation. Both mean velocity and acceleration of sway showed a notable decline, suggesting more controlled and efficient postural adjustments. Additionally, an increase in the support surface area was observed during static analysis, with an average increase of 14.9% in the right foot and 12.4% in the left foot. These findings indicate an overall enhancement in postural control, with participants demonstrating a more stable stance and improved balance.

Conclusions: The integration of Taopatch® nanotechnology into hearing aids appears to offer significant benefits in terms of postural stability for individuals with hearing loss. The observed improvements in sway parameters and foot support surface suggest better neuromuscular control and reduced balance-related risks. This combined technological approach may represent a promising strategy for fall prevention and quality of life enhancement in populations affected by auditory deficits. Further studies are recommended to investigate the long-term impact and potential clinical applications of this intervention.

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P0046 - FROM SURVIVAL TO PODIUM: THE IMPACT OF MOTIVATION AND SPORT RESILIENCE ON HEALTH AMONG REFUGEE OLYMPICS TEAM IN PARIS 2024

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Purpose: Athletes from refugee backgrounds competing in the 2024 Paris Olympics encounter significant obstacles, including psychological and physiological domains. This research examines the connections between psychological resilience, motivation, and health-related well-being among these refugee Olympians. The study investigates how these psychological elements affect both physical and mental health outcomes in high-performing refugee athletes.

Methods: A total of 31 athletes from the 2024 Refugee Olympic Team, representing 10 different nationalities (32.3% female; Mage = 27.6, SD = 5.10 y.o.), and participating in various sports, took part in the study. Participants completed four instruments: the English version of the *RESilience qualities In SporT (RESIST) Scale* (sport-specific resilience; including adaptability –AP, positive personality –PP, self-confidence –SC, motivation –MT, and perceived social support –PSS); the Sport Motivation Scale-II (SMS-II; assessing intrinsic motivation –IM, external motivation –EM); the CD-RISC-10 (general resilience); and the SF-36 (health-related quality of life).

Results: CD-RISC-10 scores showed a significant positive correlation with intrinsic motivation ($r = 0.398$, $p < 0.05$), indicating that higher general resilience is associated with greater intrinsic motivation. Intrinsic motivation was also positively related to physical functioning ($r = 0.530$, $p = 0.002$) and negatively associated with emotional limitations ($r = .798$, $p < .001$), as measured by the SF-36.

Pearson correlation analyses were conducted. For general resilience, the highest correlation was observed between the RESIST total score and the role emotional problems of the SF-36 ($r = 0.678$, $p < 0.001$). A strong positive correlation was found between CD-RISC-10 and the RESIST total score, with the highest association detected between CD-RISC-10 and the RESIST SC ($r = 0.933$, $p < 0.001$), supporting convergent validity. Within the sport-specific domain, a moderate yet significant correlation emerged between external motivation and the RESIST PSS ($r = 0.477$, $p < .001$), indicating the role of social factors in resilience among athletes.

Conclusions: This study emphasizes the psychological and physical challenges confronted by refugee athletes, highlighting the urgent need for the International Olympic Committee to enhance support mechanisms. The findings highlight psychological and structural support mechanisms that address the psychological resilience of refugee high-level athletes.

P0047 - READINESS INDEX, A SUITABLE TOOL FOR ASSESSING THE ATHLETES' CONDITION ON MATCH DAYS: DATA FROM ITALIAN SERIE A RUGBY PLAYERS

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Purpose: Here we assessed the readiness of senior male rugby players on match days (MDs) exploring four specific dimensions (fatigue upon waking, FW; mood, Mo; sleep quality, SQ; and muscle soreness, MS) in correlation with GPS tracking data.

Methods: 28 senior male rugby players (age: 26.3 ± 4.6 years), from Rugby Parabiago 1948 team, were assessed during 9 matches in the Italian Serie A rugby tournament. Match demands were evaluated by GPS-based Catapult One (10Hz) device. Volume and intensity (1) match data included total distance covered (TD and TD-min⁻¹), distance covered at speeds over 18 km·h⁻¹ (SD and SD-min⁻¹), the number of acceleration efforts over 3 m·s⁻² (nAE and nAE-min⁻¹). The Performance Index (PI, value 0 to 1), defined as the ratio between specific intensity and the athlete's personal best, was calculated (2). All dimension indexes (e.g., FW index, Mo index, etc.) were calculated as "MD score/seasonal athlete's personal best score" and allowed to determine the subjective athlete's dimensional Readiness Index (dRI, value 0 to 1) as their weighted average. Data metrics were split into the first (H1) and second halves (H2). Only athletes who played at least 80% of the match were considered. In addition, every MD morning the athletes answered to defined questions about FW, Mo, SQ and MS, using a 5-point Likert scale. Pearson's correlation was used to measure the correlation coefficient between GPS data and FW, Mo, SQ and MS.

Results: MD GPS data had a medium correlation with FW, Mo, SQ and MS. In particular, GPS data in H1 were positively correlated with low MS and low FW. Furthermore, Mo showed a medium negative correlation with nAE-min⁻¹. The PI showed a moderate correlation with all four dimensions, and particularly with their total score and MS. Additionally, significant differences were found between the dimension scores and both volume and intensity data ($p < 0.05$). The average dRI of all athletes was evaluated as 0.85 ± 0.11 .

Conclusions: The athletes with dRI > 0.8 performed better. The proposed readiness calculation appears as a suitable tool for assessing fatigue on MDs. Nevertheless, further considerations regarding the aggregation and robustness of such composite indexes need to be evaluated in future studies (3).

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P0048 - DAILY FLUCTUATIONS IN BDNF AND COGNITIVE PERFORMANCE: EFFECTS OF ACUTE PHYSICAL ACTIVITY

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Purpose: Cognitive functions are essential to everyday life, representing the core mental capacities required to perform any activity. Recent studies have shown that improved cognitive performance correlates with increased BDNF (brain-derived neurotrophic factor) levels, which can be enhanced following an acute bout of physical activity. However, daily variations of BDNF serum and plasma are not fully understood, and their correlation with daily variations in cognitive performance has not been previously explored. This study explores correlations between daily BDNF fluctuations and cognitive performance, aiming to integrate exercise as a targeted tool to boost cognition during the workday. It also examines whether a single bout of exercise can raise BDNF levels and enhance cognitive function.

Methods: Fourteen healthy, physically active adults (7 male and 7 female) participated in the study. The intervention was conducted over two separate days, spaced two weeks apart. Participants' lifestyle habits were standardised during the 24 h preceding each intervention day. Blood samples were collected at five time points throughout the workday: 09:00 (T1), 11:00 (T2), 13:00 (T3), 15:00 (T4), and 17:00 (T5) to assess potential diurnal variation in BDNF. Cognitive performance was evaluated using the Psychomotor Vigilance Test (PVT), the Flanker task, and the Digit Span Backwards test at T1, T3, and T5. On the second intervention day, the protocol was identical, with the addition of a fifteen-minute single bout of high-intensity physical activity at a specific time during the day.

Results: Preliminary data show a decline, from T1 to T5, in the ratio between memory span and total time of the Digit Span Backwards. In the Flanker task, a slight decrease in mean response time from T1 to T5 suggests a progressive improvement in response speed. However, the conflict cost shows a slight increase from T1 to T5, which may indicate a small decrease in the ability to resolve cognitive conflict. In the PVT, both Mean and Median RT show a decreasing trend from T1 to T5 across all day values, especially noticeable at higher delays, suggesting improved sustained attention and faster responses over time.

Conclusions: Preliminary cognitive performance results are presented here. Complete analyses, including BDNF data and their potential correlations with cognitive outcomes and exercise intervention, will be completed soon.

P0049 - CAN THE SIGHT OF THE LOAD INFLUENCE VELOCITY PERCEPTION AND VELOCITY LOSS PERCEPTION?

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Purpose: Velocity-based training (VBT) is a method used to prescribe and monitor resistance training. In VBT, the velocity of the first repetition is used to modulate training intensity, while training volume is adjusted using the percentage of velocity loss (%VL). Considering the high cost of velocity-monitoring devices used to prescribe VBT¹, recently, researchers have investigated individuals' ability to correctly perceive barbell velocity (PV)¹ and Velocity Loss (PVL)², finding them to be valid and reliable parameters^{1,2}. To investigate the accuracy of PV and PVL, in previous studies loads were hidden during the tests¹. Therefore, the present study aims to investigate whether seeing the load, a condition more similar to real-world training, can increase the accuracy of PV and PVL.

Methods: Twelve resistance-trained volunteers (8 M, 4 F; age 22.1 ± 1.5 y) completed six testing sessions on the back squat. The first four sessions familiarized participants with PV and PVL. The final two sessions were performed under blind (BC) and non-blind (NBC) load conditions. During testing, participants performed five sets: three with moderate (55%, 60%, 65% 1RM) and two with heavy (75%, 85% 1RM) loads, combined with three velocity loss thresholds: 10%, 20%, and 30% for lighter loads, and 10% and 20% for heavier loads. PV and PVL accuracy were assessed using the Delta Score (Ds) and Vscore. Ds was calculated as the difference between perceived (Vp) and measured (Vr) velocity: $Ds = Vp - Vr$. Vscore was defined as the difference between repetitions performed (Np) and those required to reach the VL threshold (Nr): $Vscore = Np - Nr$. Due to the results of normality test, Paired sample t-test was used to analyze differences in Ds, while the Wilcoxon test was used for Vscore, both between BS and NBS. Moreover, the Bland–Altman plot was used to analyze the limit of agreement in Ds.

Results: The paired sample t-test revealed no significant differences between BC and NBC for PV ($t(59)$, $v = 1.043$, $p > 0.05$). Likewise, the Wilcoxon signed-rank test showed no significant differences between BC and NBC for PVL ($z = -0.641$, $p > 0.05$, $r = 0.08$).

Conclusions: No significant differences between BC and NBC were found for either PV and PVL. The present results suggest that the sight of loads did not influence the accuracy of PV and PVL. Based on this, we hypothesize that PV and PVL could be used as parameters in real training settings where loads generally are not covered.

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P0050 - GENDER DIFFERENCES IN TERMINAL ACTIONS IN SITTING VOLLEYBALL: A MATCH ANALYSIS OF THE 2022 SARAJEVO WORLD CHAMPIONSHIP

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Purpose: Sitting Volleyball (SV) features specific adaptations compared to traditional volleyball, including the seated playing position and the possibility of blocking serves. Few studies have applied match analysis (MA) to SV, particularly regarding gender differences in the technical skills that conclude rallies (terminal actions). This study aimed to identify gender-based differences in terminal actions, focusing on the technical skills (i.e., as serve, attack, block, or opponent's error) that directly result in a point.

Methods: Video recordings from 24 matches (12 female, 12 male) played during the 2022 Sarajevo World Championship were analyzed, including a total of 3,502 actions. The percentage frequencies of terminal actions by gender were reported using contingency tables. Pearson's Chi-Square test (χ^2) was applied to assess associations between variables, and effect size was calculated using Cramer's V (small = 0.10, medium = 0.30, large = 0.50). When statistically significant associations between independent variables were found, post hoc tests with Bonferroni correction were performed to identify significant differences between subgroup pairs. Statistical significance was set at $p \leq 0.05$.

Results: In both genders, attacks were the most effective skills for scoring points, followed by opponent errors, while serves and blocks contributed a smaller proportion of the total points. Despite this

similarity, a significant gender difference was observed: females scored a higher percentage of points from serves compared to males ($p = 0.001$), whereas males scored a higher percentage of points through attacks ($p = 0.004$).

Conclusions: The results indicate that females score a higher proportion of points from serves, likely reflecting superior serving skills, whereas males exhibit stronger reception abilities. Additionally, males' greater physical capacity to generate higher ball speeds contributes to enhanced attack effectiveness. Despite the evolution of Sitting Volleyball over recent decades, technical errors remain frequent and pivotal in determining match outcomes. Coaches should prioritize minimizing these errors to achieve more consistent performance. Future research should focus on better characterizing these errors by distinguishing between technical faults and rule violations, thereby providing coaches with clearer guidance for targeted training interventions.

P0051 - EMPLOYEES' ATTITUDES TOWARD ACTIVE BREAKS IN A LARGE PUBLIC HEALTHCARE ORGANIZATION IN ITALY: PRELIMINARY RESULTS FROM A SURVEY

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Purpose: Sedentary behavior (SB) and work-related stress remain major occupational health issues in Europe. A promising strategy to reduce SB and promote workers' wellbeing is Active Breaks (ABs), defined as short bouts of light-to-moderate physical activity during working hours. In this context, the present study has the aim to explore the preliminary data from a survey assessing attitudes toward ABs within the "Azienda USL della Romagna" (public healthcare organizations in Italy). The results of this survey could help to better understand the most effective strategies for implementing ABs in public healthcare workplaces in Italy.

Methods: A cross-sectional observational study was conducted through an ad hoc survey distributed via institutional channels. The questionnaire included sections on socio-demographic and occupational characteristics, awareness and current practices regarding ABs, and attitudes toward ABs, assessed using Likert-scale items. For the analysis of preliminary data, descriptive statistics were performed.

Results: A total of 1,474 employees participated. The sample consisted of 63% healthcare professionals, 12% technical staff, and 25% administrative workers, with 79% female and 21% male participants aged 22 to 68 years. Regarding prior knowledge of ABs, 79% had never heard of them, while 21% were familiar. Concerning SB, 79% agreed it reduces attention, 73% believed it lowers productivity, and 94% acknowledged associated physical health issues. Attitudes toward ABs were positive: 86% saw ABs as appropriate, 84% did not consider them a waste of time, and 81% felt they would not disturb others. Additionally, 83% expected improved attention, 80% increased productivity, and 93% anticipated better physical well-being after ABs. Socially and organizationally, 81% would join colleagues on ABs, 87% believed managers should promote them, and 80% felt encouraged ABs would increase their sense of value at work. As these are preliminary results, more structured statistical analyses will be conducted in the future to better understand workers' attitudes towards ABs.

Conclusions: These early findings suggest a positive attitude toward ABs among healthcare workers in an Italian large public organization.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0052 - PERFORMANCE AND BODY COMPOSITION EVALUATION DURING 1 YEAR OF YOUNG ELITE FOOTBALL PLAYERS IN MALTA NATIONAL TEAM

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Purpose: The attention and care of youth sectors have been growing in recent years; on the other hand, especially in the younger age groups, it is important to ensure adequate support for the physiological development of the boys; there are no standardized evaluation protocols; in our work, we report the work carried out with the Maltese national team, which supervises young footballers throughout the year, even if they play and train with their club teams.

Methods: Sprint test was performed on artificial turf using three timing gates. A target marker was positioned 3 m beyond the final timing gate. The best performance was recorded for each distance. The 30–15 Intermittent Fitness Test was conducted on artificial turf following the official protocol outlined on the test's website. Countermovement jump height, CMJ modified reactive strength index, and multi-rebound performance were assessed using force plates. The best of the two trials was recorded. For the Triple Hop Test for distance, participants executed a rapid countermovement followed by three consecutive forward hops, landing on both feet after the final jump. The jump distance was measured from the starting line to the heel of the closest foot upon landing. Bioimpedance analysis was performed with BIA101 Anniversary (Akern Srl, Florence, Italy), and an Ultrasound device (BX2000, IntelaMetrix, Brentwood, CA, USA) to determine the thickness of subcutaneous fat.

Results: sprint performance (10m: U15: 1.91 ± 0.09 s, U16: 1.88 ± 0.10 s, U17: 1.84 ± 0.09 s, U18: 1.84 ± 0.09 s; 30m: U15: 4.58 ± 0.23 s, U16: 4.45 ± 0.20 s, U17: 4.31 ± 0.17 s, U18: 4.33 ± 0.16 s), endurance using the 30–15 Intermittent Fitness Test (VIFT: U15: 19.56 ± 0.93 km/h, U16: 19.96 ± 0.81 km/h, U17: 19.87 ± 1.10 km/h, U18: 19.78 ± 0.86 km/h), CMJ modified reactive strength index (U15: 0.51 ± 0.08 m/s, U16: 0.51 ± 0.09 m/s, U17: 0.56 ± 0.07 m/s, U18: 0.62 ± 0.11 m/s), CMJ jump height (U15: 32.40 ± 4.73 cm, U16: 33.66 ± 4.09 cm, U17: 35.79 ± 4.04 cm, U18: 36.90 ± 5.01 cm), multi-rebound reactive strength index (U15: 1.96 ± 0.38 cm/ms, U16: 1.99 ± 0.30 cm/ms, U17: 2.29 ± 0.33 cm/ms, U18: 2.20 ± 0.37 cm/ms), triple hop test for distance (average distance: U15: 5.79 ± 0.69 m, U16: 6.06 ± 0.48 m, U17: 6.43 ± 0.37 m, U18: 6.56 ± 0.56 m), Levi Mass Index (U15: 2.28 ± 0.53 kg/m², U16: 2.60 ± 0.50 kg/m², U17: 2.76 ± 0.48 kg/m², U18: 3.04 ± 0.47 kg/m²), and phase angle (U15: $6.59 \pm 0.72^\circ$, U16: $7.04 \pm 0.76^\circ$, U17: $7.39 \pm 0.73^\circ$, U18: $7.77 \pm 0.63^\circ$).

Conclusions: Results revealed a consistent improvement in speed, reactive strength, and lean mass with increasing age, reflecting the combined effects of natural physical development and training adaptations. It is concluded that football training can support the physiological growth of young people, particularly due to the combination of support from national teams and club teams. These

findings provide benchmarks for talent identification and offer insights into the progression of physical development.

Acknowledgments: Malta Football Association

References: (non obbligatorio).

P0053 - INTERVENTIONS BASED ON DANCE ELEMENTS AND THE USE OF MUSIC TO IMPROVE BALANCE AND POSTURAL CONTROL IN CHILDREN WITH HEARING DISABILITIES. RCT CARRIED OUT IN A SPECIAL SCHOOL IN ROMANIA

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Purpose: Postural instability is one of the most frequent problems in children with hearing disabilities, due to the close anatomical connection between the cochlea and the vestibular apparatus. This condition not only affects the motor level, but also the psychological and social level. Numerous studies show that these children score lower on balance tests than normal hearing peers. From this perspective, dance emerges as an activity capable of combining rhythmic stimulation, motor coordination and postural adaptation.

Methods: This randomised controlled trial (RCT) involved 30 pupils aged between 7 and 10 years, attending the Liceul pentru Deficienti de Auz in Cluj-Napoca, Romania. The participants were divided into an experimental group (n = 17), which underwent a twice-weekly dance intervention for 10 weeks, and a control group (n = 13), which continued with normal school motor activities. The evaluation took place in two phases (T0-T1), using a Balance Board to measure posturographic parameters (Ellipse Surface, C.O.P. Distance, Average Speed) in static conditions, and the Pediatric Reach Test to analyse dynamic balance in four directions.

Results: The results showed clinically relevant improvements in the experimental group, particularly in the more complex tests such as monopodal stance and eyes closed. The deltas of reduction in Ellipse Surface and C.O.P. Distance values suggest greater stability and motor control. In the Pediatric Reach Test, the experimental group showed progress in all directions, with an average posterior increase of + 7.2 cm (vs. + 2.2 cm in the control group), which was statistically significant (p = 0.015). However, the between-group analysis showed no significant differences (p > 0.05), while confirming a favourable trend in the experimental group (Cohen's d > 0.4 in the most challenging tests).

Conclusions: Despite the limitations related to sample size and developmental age, the data obtained indicate that the inclusion of dance elements in motor teaching may represent an effective, inclusive and promising strategy for improving balance in children with hearing disabilities.

P0054 - ITALIAN VERSION OF THE HEALTH-RELATED FITNESS KNOWLEDGE TEST: PRELIMINARY RESULTS OF VALIDATION PROCESS

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Purpose: Health-Related Fitness Knowledge (HRFK) is essential for PE teachers to promote active lifestyles, but no validated tool exists in Italian context. This study translated and adapted the HRFK Test (Santiago & Morrow, 2018) to the Italian context and defined a cut-off score to distinguish experts from beginners.

Methods: Using forward-backward translation, the HRFK test was culturally adapted and piloted with 38 Kinesiology and Sport Science students to ensure clarity and relevance. Welch's t-test was conducted to assess the construct validity of the test by using data from 92 pre-service PE teachers (experts) and 51 sport-oriented high school students (beginners). Additionally, ROC analysis was performed to identify the optimal cut-off score for discriminating experts and beginners.

Results: Welch's t-test revealed a statistically significant difference between groups ($t(139) = 7.93$, $p < .001$), with a mean difference of 6.28 (95% CI [4.71, 7.84]) and a large effect size (Cohen's $d = 1.29$). The ROC analysis showed good discrimination (AUC = 0.829; 95% CI: 0.764–0.895; $p < 0.001$). The optimal cut-off was 21 points (88.2% sensitivity, 68.5% specificity).

Conclusions: The Italian HRFK Test is valid and useful for evaluating HRFK, supporting targeted training and enhancing PE quality in schools.

Acknowledgments: (non obbligatorio).

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P0055 - A BASED WHOLE BODY VIBRATION TRAINING PROTOCOL FOR OSTEOPOROSIS: A REVIEW

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Purpose: The vibrating platform is a machine that emits micro-vertical sussultatory vibrations acting mainly on the musculoskeletal system. Since the second half of the twentieth century, its application began to be studied, initially for astronauts, then from the 1980s also in physical therapy thanks to its beneficial effects such as: bone regrowth, increase in the contractile force of the muscle groups involved, and increases the speed of blood flow. The object of the review was to propose a training protocol based on whole body vibration (WBV) to intervene in people with osteoporosis.

Methods: A review of the literature was carried out searching the main articles on PubMed published on the topic WBV and

osteoporosis. The protocols adopted in the articles were analysed and a protocol was extrapolated.

Results: The WBV training protocol could be based using frequencies from 12.5 to 30 Hz. It is advisable to start with lower frequencies and gradually increase them. The number of sessions could be 3 times a week with a duration between 5 to 10 min. The minimum period to obtain bone mineral density benefits seems to be 12 months. The most commonly used position is the isometric squat, although its variants (such as the deep squat and the power squat) can also be used, as well as other positions such as push-ups, the lunge (right or left) or positions that allow the correct stimulation of the calves, biceps, triceps, adductors, shoulders and pectorals. Stand up is not recommended.

Conclusions: WBV training has positive effects in the treatment of bone decay characterising osteoporosis. Limitations of the research are the different protocols adopted in different periods. Furthermore, no databases other than Pubmed were analysed. This review wants to propose an intervention proposal but further researches, directly on the field, are required. For the future, it is hoped that longitudinal studies will be carried out to understand how long the benefits of the vibrating platform are maintained over time and, above all, how age influences this response.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0056 - TENDON STRUCTURAL CHANGES ONE YEAR AFTER THE INTERRUPTION OF ORAL SUPPLEMENTATION WITH CHONDROVITA FIT IN ROLLER SKATERS

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Purpose: Collagen hydrolysate is a nutritional supplement shown to improve joint comfort and function; moreover enhances proteoglycan synthesis in human chondrocytes. A previous study demonstrated increased thickness in selected lower limb tendons in elite speed skaters after 90 days of supplementation with Chondrovita Fit®, a collagen hydrolysate-based formulation. However, little is known about the persistence of these structural adaptations after supplementation is discontinued. This study aimed to investigate tendon structural changes one year after the cessation of Chondrovita Fit® supplementation in the same cohort of athletes.

Methods: A longitudinal, repeated-measures design was adopted, enrolling 25 elite skaters (11 males, 14 females; mean age 20.6 ± 3.6 years). Participants consumed Chondrovita Fit® before and after each training session for 90 consecutive days. Data were collected at T0 (baseline, pre-supplementation), T1 (3 months post-T0, during supplementation), and T2 (1 year post-supplementation). Anteroposterior (AP) tendon thickness was assessed using ultrasound at five anatomical sites: pre-insertional quadriceps tendon, proximal patellar tendon, proximal tibial tendon, submalleolar section of the long peroneal tendon, and the critical zone of the Achilles tendon. To evaluate treatment effects, a linear mixed-effects model was employed with tendon type and time points as fixed effects, subject as a random effect, and tendon thickness as the dependent variable.

Results: Tendon thickness were different in anatomical sites; thickness values also significantly varied across time points. A significant

tendon-by-time interaction effect indicated that the magnitude of thickness change differed among tendons (all $p < 0.001$). From T0 to T1, significant increases in thickness were observed in all tendons: tibial (+ 50.1%), quadriceps (+ 12.7%), long peroneal (+ 9.5%), Achilles (+ 5.2%), and patellar (+ 3.1%). At T2, most tendons maintained a substantial proportion of the initial gains: quadriceps (+ 15.1%), tibial (+ 11.9%), Achilles (+ 5.1%), and patellar (+ 0.7%). A decrease was observed only in the long peroneal tendon (−18.2%).

Conclusions: 90 days of oral supplementation with Chondrovita Fit® significantly increases tendon thickness in elite figure skaters. The majority of structural improvements were sustained even one year after discontinuation, suggesting a potential long-term benefit for performance enhancement and injury prevention.

P0057 - INFLUENCE OF TIBIOTARSAL JOINT EXCURSION ON ACHILLES TENDON ELASTIC POTENTIAL UTILIZATION IN VERTICAL JUMPING ACTIONS

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Purpose: The present study aims to investigate the influence of the tibiotalar joint on SSC efficiency, including exploring the differences between highly mobile and minimally mobile subjects

Methods: The sample used includes 27 subjects, who were measured dorsiflexion with Leg Motion and elastic capacity was assessed through the difference in jump height between Squat Jump and Countermovement Jump. Correlation analysis, linear regression and t-test were conducted to evaluate relationships between the variables.

Results: No significant correlation emerged between ankle mobility and elastic contribution ($p = .186$). Comparison between the high and low mobility groups also showed no significant differences.

Conclusions: Ankle dorsiflexion does not appear to be a significant predictor of the ability to use the SSC in vertical jump. Future studies in larger, controlled samples are needed to further investigate these relationships.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0058 - THE EFFECT OF WHOLE-BODY VIBRATION ON STATIC AND DYNAMIC BALANCE IN INDIVIDUALS WITH VISUAL IMPAIRMENTS

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Purpose: Visual impairment (VI) leads to the development of abnormal sensory and motor interactions, resulting in postures and gait patterns that promote instability, reduce balance and an increased

risk of falls. The whole-body vibration (WBV) is a training method that have positive effects on balance in various populations. The aim of this study was to investigate the acute effects of WBV on static balance (SB) and dynamic balance (DB) in individuals with VI, to assess whether this type of training can lead to improvements in postural control within this population.

Methods: Ten individuals with VI participated in this study (age = 37.1 ± 11.2 years, BMI = 26.06 ± 3.27 kg/m²). The intervention included two training sessions, one with WBV, and one NO_WBV, spaced 2 to 7 days apart. Participants performed 2 sets of 12 repetitions of isometric squats at a 120° knee angle under different vibration frequencies and amplitudes (randomly assigned). Balance was assessed via body sway on a force platform during static and dynamic bipodal stances, open eyes (OE) or closed eyes (CE), at baseline (T0), post-sets (T1–T2), and 10-min post (T3).

A 2×4 mixed factorial repeated measures analysis of variance (ANOVA), with two conditions (WBV and NO_WBV) and four time points with repeated measures on the second factor, was conducted to evaluate the effect of WBV on SB and DB. The level of statistical significance was set at $p \leq 0.05$.

Results: Regarding dynamic balance, the results showed a statistically significant time effect for the anteroposterior variable, measured in both the OE and CE tests. In the OE test, the Bonferroni-corrected post hoc analysis showed a statistically significant difference in the variable considered between T1 and T2 ($p = 0.025$), while in the CE test, in the variable examined between T0 and T3 ($p = 0.001$). Results also showed a statistically significant condition-by-time interaction effect for the mediolateral variable, measured only in the OE test between T1 and T2 ($p = 0.037$) in the WBV condition.

Conclusions: The results of this preliminary study demonstrated that WBV training can lead to acute improvements in DB in individuals with VI. These findings suggest that WBV may be considered a valuable training method for enhancing balance, particularly DB, in people with visual deficits.

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P0059 - ADHERENCE AND RETENTION RATES IN A PROGRESSIVE AEROBIC EXERCISE PROTOCOL USING TREADMILL AND BICYCLE ERGOMETER IN WOMEN WITH OBESITY

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Purpose: Weight reduction remains a key strategy in the management of obesity and in the prevention of type 2 diabetes mellitus (T2D). While structured physical activity, particularly aerobic exercise, is an essential component of these interventions, the long-term success of such programs depends heavily on participants' adherence and retention. The aim of this study was to evaluate the adherence and retention rates among women with obesity participating in a progressive aerobic exercise protocol utilizing treadmill and bicycle ergometer sessions.

Methods: This study was embedded within a 2:1 randomized cross-over-controlled trial. A total of 23 women aged 25–45 years with obesity (BMI > 30 kg/m²) were enrolled and participated in three consecutive waves of an aerobic exercise intervention. Each participant was expected to complete 36 exercise sessions. Adherence was defined as the percentage of completed sessions out of the total expected sessions. Retention was defined as the proportion of participants who completed the entire intervention protocol.

Results: The mean age of the participants was 36.0 ± 5.5 years. The average adherence rate was 90.6% (95% CI: 86.3–95.0), while the overall retention rate reached 82.6% (95% CI: 61.2–95.1).

Conclusions: Despite being recruited from a specialized obesity clinic and selected based on their initial willingness to participate, adherence and retention rates were lower than anticipated. One of the likely contributing factors was the geographical distance between participants' homes and the intervention site. These findings highlight the importance of considering logistical barriers when designing and implementing exercise programs for individuals with obesity.

P0060 - A 10-WEEK ACTIVE BREAKS PROGRAM PROPOSAL TO IMPROVE PHYSICAL ACTIVITY LEVELS, PHYSICAL FITNESS AND REDUCE SEDENTARY BEHAVIOURS IN THE ADULT ACADEMIC EMPLOYEES

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Purpose: University employees spend most of the day on the workplace and exhibit sedentary behaviours also beyond the working time, which is linked to health issues. Active breaks (ABs) are short interruptions in the academic setting where PA is performed. Recently, ABs have gained prominence in the scientific literature, especially among university students. However, ABs are not widely explored across the adult academic employee's population, leaving gaps in the understanding of their effectiveness. To assess if a 10-week ABs program can increase moderate-to-vigorous physical activity (MVPA), physical fitness, improve quality of life, work ability and decrease sedentary behaviours in employees of an academic community.

Methods: Participants will be assigned to either an experimental group (n = 10), which will participate in the ABs program, or a control group (n = 10). Physical activity levels through wearable activity tracker (MVPA and daily steps), physical fitness (upper limb grip strength, lower limb strength, lower back and hamstrings flexibility, cardiorespiratory fitness), quality of life (36-Item Short Form Health Survey—SF36), work ability (Work Ability Index—WAI) and sedentary behaviors (Sedentary Behavior Questionnaire—SBQ) will be assessed before (t0) and after (t1) the intervention. The 10-week ABs program will consist of a 10-min outdoor supervised walk and a 10-min combined strength and mobility short session on 4 times/week, plus a 60-min mobility session on a separate day.

Expected results: A tendency to an increase in MVPA, PF, quality of life, work ability and a decrease in sedentary behaviours are expected at t1 after 10 weeks of ABs program. The results of this research could guide universities toward creating active workplaces and mobility systems to support employees' well-being, healthier lifestyles and to prevent non-communicable diseases.

P0061 - EFFECTS AN EIGHT-MONTH OF SOCIAL DANCE PROGRAM ON BIOCHEMICAL HEALTH-RELATED PARAMETERS IN OLDER ADULTS

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Purpose: Aging induces a reduction in the homeostatic mechanisms regulating intermediate metabolism, leading to an increase in dys-metabolic diseases in older adults. Further, aging leads to deregulation of hematopoietic stem cell (HSC-CD34⁺) expression with a reduced capacity of stem cells to self-renew and differentiate leading to anaemia, and hematologic malignancies¹. Moreover, HSCs are considered markers of neovascularization and vascular repair, and sedentary style affects their expression². Social dance activity, represent a useful choice to improve active style in older and counteract age-related metabolic decline. The present study evaluated the effects of an eight-months social dance program on biochemical and haematological markers health-related and on the circulating HSC-CD34⁺ in older volunteers.

Methods: Older volunteers of both genders were recruited in social dance school in Catanzaro and assigned to a control group (CG, n = 25, age: 70.1 ± 7.3 years, BMI: 28.5 ± 3.6 kg/m²) or a Dance Group (DG, n = 25, age: 74.4 ± 6.5 years, BMI: 28.9 ± 3.9 kg/m²). The DG participated in an 8-months social dance program (two times/week); the CG maintained its lifestyle routine and was not involved in any structured exercise. Social Dance exercise was kept at low to moderate intensity. Blood samples were collected from all the volunteers at baseline (T0) and after 8-mo of Social Dance program (T1) and biochemical/clinical and haematological parameters as well as CD34⁺ were evaluated.

Results: A two-way ANOVA revealed a significant time × group interaction ($p < 0.05$) for CD34⁺ expression, with a stronger effect observed in subjects over 75 years of age ($p = 0.01$). Furthermore, two-way ANOVA revealed a significant time × group interaction ($p < 0.01$) for HDL and for blood haemoglobin levels ($p < 0.05$), both of which increased post-intervention in the Dance Group (DG).

Conclusions: Our preliminary results suggest promising effects of the Social Dance program on various biochemical and haematological health-related parameters in the older population.

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P0062 - MOTOR LEARNING PROPOSALS FOR SCHOOL-AGE CHILDREN. BASIC MOTOR SKILLS IMPLEMENTATION PROJECT

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Purpose: Physical activity plays a fundamental role in the life of individuals and with the increase in a sedentary lifestyle, it is becoming ever more important to present quality protocols. To improve motor performance, it is necessary to promote coordination and conditioning skills in the best way possible as they pertain to the sensitive stages of development. The aim of this research is to investigate the level of certain coordination skills through the execution of ability tests that are scientifically validated. Furthermore, we need to verify if, by introducing legitimate activity measures in line with the proposed goals, an improvement in the aforementioned tests can be obtained when repeated for a second time three months later.

Methods: The protocol of activity requires a program of 10 weeks involving an experimental group and a control group made up of individuals between the ages of 3 and 11. Two tasks chosen from the MOBAK assessment tests will be used to evaluate the motor competencies in primary schools. One test involves throwing and the other jumping. They vary according to the ages of the individuals. These specific tests were chosen with the goal of understanding the evolution of the examined skills beginning in kindergarten in order to determine adequate protocols that can be developed in a vertically aligned curriculum (such as within comprehensive schools).

Results: The results gathered demonstrate that childhood planning linked to coordinative and multilateral education is able to significantly stimulate the learning of some basic motor skills that have been examined.

Conclusions: This model contributes to achieving spatial-temporal awareness and to the realization of an efficient motor action. It would be advantageous to continue rhythmic sensitization activities over time and extend them to other track and field disciplines (such as jumping, throwing, etc.) on more numerous and mixed work groups. It would also be important, on the part of the sports federations, to expand technical training in rhythmic areas with the creation of standardized protocols on the basis of scientific evidence and good practices.

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P0063 - EFFECTS OF A DYNAMIC STRETCHING AND CORE STABILITY EXERCISE TRAINING PROTOCOL ON PERFORMANCE IN A GROUP OF U-16 VOLLEYBALL PLAYERS

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Purpose: Dynamic stretching and core stability exercises are often used during the warm-up phase to improve performance in different sports (1–3). Therefore, the aim of present study was to evaluate the effects of a training protocol (TP) including together dynamic stretching and stimulation of core stability on performance in a group of U-16 volleyball players.

Methods: 21 young volleyball players (age: 13.9 ± 1.0 yrs; BMI: 23.9 ± 3.0 kg/m²) were randomly assigned to intervention group (IG; n = 12; 5 boys and 7 girls) and control group (CG; n = 9; 6 boys and 3 girls). IG group performed a TP, in addition to specific volleyball training, four-a-week for 12 weeks while the CG performed traditional volleyball training alone. TP consisted in eight exercises, with ball, combining both dynamic stretching and core stability stimulation of the main muscles group involved in volleyball such as the ischio-crural, hip flexors, shoulder as well as the core muscles. Before (T0) and after intervention period (T1), in all participants: agility (T-test), Counter Movement Jump (CMJ) and the Athletic Shoulder test I-position (ASH-I) using a force platform, Vertec (V) test, normalized anterior (nA), posteromedial (nPM), posterolateral (nPL) distances, and composite score (COMP) of modified SEBT (mSEBT) performances were assessed.

Results: At T0 no differences between IG and CG were evidenced. At T1 compared to T0, IG showed significant differences ($p < 0.001$) in: T-test (12.3 ± 1.1 s vs 11.6 ± 1.2 s); CMJ height (33.3 ± 6.6 cm vs 28.6 ± 7.6 cm); right and left shoulder strength (96.2 ± 28.0 N vs 82.5 ± 27.0 N and 91.0 ± 29.2 N vs 82.2 ± 29.6 N, respectively); vertical jump height (62.0 ± 17.6 cm vs 56.2 ± 15.8 cm), and also for mSEBT parameters: right and left nA ($77.2 \pm 7.5\%$ vs $70.2 \pm 8.5\%$ and $76.4 \pm 7.6\%$ vs $70.3 \pm 6.8\%$, respectively); right and left nPM ($96.3 \pm 4.2\%$ vs $91.6 \pm 4.2\%$ and $94.1 \pm 4.6\%$ vs $89.8 \pm 4.8\%$, respectively); right and left nPL ($106.4 \pm 11.2\%$ vs $101.5 \pm 12.4\%$ and $104.3 \pm 11.6\%$ vs $97.9 \pm 10.5\%$, respectively); right and left COMP ($93.3 \pm 7.4\%$ vs $87.8 \pm 7.5\%$ and $91.1 \pm 7.3\%$ vs $86.0 \pm 7.0\%$, respectively). No differences were observed in the CG at T1 compared to T0.

Conclusions: Our preliminary results suggests that a training protocol including the combination of dynamic stretching and core stability exercises, in addition to traditional volleyball training, improves agility, jump performance, the shoulders strength and dynamic balance in U-16 volleyball players.

Acknowledgments: We would like to thank SSD Marcianise Volley.

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P0064 - MATCH DAY GLUCOSE FLUCTUATIONS IN ELITE FEMALE SOCCER PLAYERS: INSIGHTS FROM INTERSTITIAL MONITORING

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Purpose: Female's soccer remains an understudied field. To sustain the physical demands of a match, the body relies on carbohydrates as an energy source. Understanding glucose fluctuations during a match provides valuable insights into the metabolic profile of athletes. This study aimed to characterize the glucose profile of female soccer players during official matches.

Methods: Ten elite female soccer players (age: 27.2 ± 3.8 years; weight: 64.8 ± 5.7 kg; height: 172.8 ± 4.6 cm; BMI: 21.7 ± 1.5 kg/m²) from the same team had their interstitial glucose (iG) continuously monitored over two match days using a continuous glucose monitoring (CGM) system. Matches external loads were recorded using global positioning systems. Players were categorized as either starters or bench players, and match day was divided into four periods: night-time, pre-match, match, and post-match. Both matches were played at the same time of day.

Results: The between-subject coefficient of variation (CV) for iG over the entire day was 13%, while the within-subject CV was 17%. Starters exhibited greater between- and within-subject variability (16% and 20%, respectively) compared to bench players (9% and 13%). iG remained consistent across both observation days ($F = 0.20$, $p = 0.6$, $\eta^2 = 0.001$) and match periods ($F = 1.19$, $p = 0.3$, $\eta^2 = 0.001$). However, starters displayed higher iG during the match period compared to night-time ($+26.5$ mg/dL, $p = 0.001$), pre-match ($+22.2$ mg/dL, $p = 0.002$), and post-match ($+25.9$ mg/dL, $p = 0.004$).

Conclusions: CGM may help practitioners develop individualized nutritional strategies, given the substantial inter-individual variability observed. This study highlights the need for further research in this area, which remains largely unexplored across different sports contexts.

P0065 - MOTOR AND NON-MOTOR IMPLICATIONS IN A NEUROSCIENCE-BASED TREATMENT PROTOCOL OF NEUROLOGIC MUSIC THERAPY FOR APATHY IN PARKINSON'S DISEASE

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Purpose: Apathy is a prominent feature of Parkinson's disease and predicts significant motor impairment and cognitive decline. Its multidimensional nature, including executive dysfunction, blunted affect, and deficits in goal-directed behavior, encompasses and challenges the motor and non-motor domains.

Recent music therapy research has hypothesized that instrumental music training using piano, drums, or guitar may address manual dexterity, foster motor learning, and enhance fine motor skills and executive functions.

Music neuroscience investigates the mechanisms underlying auditory-motor entrainment, emotional response, and musical reward through auditory motor, frontal, and limbic circuits, as well as multisensory integration.

Despite mechanistic insights and theoretical support, music-based interventions for addressing apathy in individuals with Parkinson's disease have been insufficiently explored.

This study protocol investigates the effects of Neurologic Music Therapy (NMT) harp-based interventions on apathy (primary outcome), executive function, upper limb movement, somatosensory function, emotion recognition, mood, and quality of life (secondary outcomes) in people with Parkinson's (PwP) compared to Vibroacoustic Harp Therapy (VAHT) and physical therapy (PT).

Methods: After variable minimization, fifty-four participants with idiopathic PD and apathy will be randomly assigned to three groups: individual NMT sessions, individual VAHT sessions for one hour thrice weekly for eight weeks, or no-treatment waitlist.

Subsequently, participants will be allocated to either group NMT sessions or group PT sessions. Neuropsychological blind assessments will be conducted at baseline and post intervention to assess within group and between group differences.

Physiological assessments will evaluate arousal/relaxation responses and ANS activities.

Results: We predict that harp NMT training will affect outcomes more significantly than VAHT and PT, with stronger correlations between primary and secondary outcome changes.

Conclusions: The different dimensions of apathy in PwP call for targeted music therapy techniques. Owing to its shape and ergonomics, the harp holds the potential for optimal functional exercise and cognitive stimulation, eliciting aesthetic emotions and addressing multidimensionality.

As a form of applied music neuroscience, NMT appears to be an evidence-based treatment system for designing complex interventions that target motor and non-motor objectives.

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References: (non obbligatorio).

P0066 - MULTISPORT PLAY-BASED PRACTICE IMPROVES MOTOR COORDINATION IN CHILDREN: EVIDENCE FROM A CROSS-SECTIONAL KTK STUDY

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Purpose: This study aimed to evaluate the effectiveness of a structured, play-based multisport program—implemented within the Italian "Centri CONI" initiative—on motor coordination development in primary school children aged 6 to 10 years. The association

between body mass index (BMI) and coordination levels was also investigated.

Methods: An observational cross-sectional design was used. The sample included 320 children (mean age 8.1 ± 1.4 years; 52% male) from the Apulia region, divided into a Multisport Group (MG; $n = 162$) and a Curricular Group (CG; $n = 158$). MG participants followed a weekly 2-h multisport protocol over 8 months, while CG received standard physical education. Motor coordination was assessed using the Körperkoordinationstest für Kinder (KTK), generating a standardized Motor Quotient (MQ). Anthropometric measures and BMI were collected. Statistical analyses included ANOVA, Pearson's correlations, logistic and linear regression, and interaction effect testing (BMI $\times$ Age).

Results: The MG showed significantly higher MQ scores (108.3 ± 12.5) compared to CG (101.2 ± 13.4 ; $p < 0.001$), with medium-to-large effect sizes, especially in balance and agility-related subtests. Strong correlations were observed between all KTK subtests and the MQ ($r \geq 0.68$). A significant BMI $\times$ Age interaction ($\beta = -0.75$; $p = 0.003$) revealed that higher BMI had a more pronounced negative effect on coordination in younger children. The MG had fewer children classified as "impaired" and more in the "good" and "very good" MQ categories.

Conclusions: Structured multisport programs significantly improve motor coordination in school-aged children and may help reduce disparities linked to BMI and age. These findings highlight the educational and preventive potential of multisport-based physical education models and support their integration into school curricula and public health strategies.

Acknowledgments: We thank all participating schools, children, families, and the technical staff involved in the project.

References: (non obbligatorio).

P0067 - SKI MOUNTAINEERING VERTICAL RACE: PHYSIOLOGICAL DETERMINANTS AND EXERCISE INTENSITY

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Purpose: The aim of this study was to identify the physiological demands and the predictors of performance in ski mountaineering vertical races.

Methods: 24 (5 F) national- and international-level athletes (VO_2max : $70.8 \pm 8.6 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) completed a laboratory assessment to determine maximal aerobic power and exercise thresholds. Athletes then competed in a vertical race featuring 590 m d + for senior athletes and 500 m d + for U20 and U18 categories. Heart rate data were recorded during the races whilst blood lactate (BLa) was measured at the end of the race. A one-way ANOVA was conducted to assess differences among categories in race-related parameters. Multiple correlation analyses were performed to assess the relationship between performance and laboratory parameters.

Results: Mean exercise intensity was found to be equal to $95.6 \pm 1.2\%\text{HRmax}$ ($100.9 \pm 1.3\%\text{HRVT2}$) with peaks at $98.7 \pm 1.5\%\text{HRmax}$ ($104.1 \pm 1.6\%\text{HRVT2}$) and blood lactate was $7.5 \pm 2.0 \text{ mmol/L}$ at the end of the races, without significant differences among categories (all $p > 0.148$). Very large to almost perfect

negative correlations were found between race time and both maximal and submaximal metabolic variables (all $p < 0.001$). The variable most linked to race time was the speed associated with VO_2max ($r = -0.942$, 95%CI $[-0.976, -0.863]$, $p < 0.001$).

Conclusions: Laboratory-based variables related to the second ventilatory/lactate threshold and maximal aerobic power were all highly correlated with race performance. The high mean HR sustained during the race together with peak values exceeding the $\%\text{HRVT2}$, highlights the high-intensity nature of the effort. These findings also support the strong association between performance and the speed at VO_2max . No significant differences in in-race physiological responses were observed between categories, suggesting that the similar exercise duration led to comparable intensity domains across age groups.

P0068 - PERCEIVED MOTOR COMPETENCE, GENDER, AND LIVING ENVIRONMENT IN 7–9 YEARS OLD CHILDREN

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Background: Research on perceived and actual motor competence in children showed complex relationship. Past research has shown that achieving a high level of perceived sporting competence in children through object control skills is crucial for participation in physical activity and fitness during adolescence (Barnett et al., 2008).

Purpose: This study aimed to investigate the effect of gender and urban and rural living environments on children's perceived motor competence.

Methods: A convenient sample of 130 children ($M = 70$; $F = 59$) aged 7–9 years (mean = 7.87 ± 0.68) attending two primary school in urban and rural living environments in Sicily were involved in this study. The perceived motor competence of the participants was assessed using the "Pictorial Scale of Perceived Competence and Acceptance for Young Children" (Barnett, Ridgers, Zask & Salmon, 2015; Harter & Pike, 1980). Parents were asked about their children's physical activity practice, in addition to school physical education (type of activity/sports practiced, frequency, age at start of practice, activities/sports practised in the past).

Results: ANOVA showed that boys had higher means than girls in two ball skills tasks-bouncing ($p < 0.05$) and kicking ($p < 0.05$); furthermore, rural children had higher means than urban children only in bouncing ($p < 0.05$). MANOVA revealed significant differences between genders and no differences by living environment (Gender: Lambda's Wilks = 0.887 $F(13, 115) = 2.164$ $p = 0.01$ Partial $\eta^2 = 0.197$; Environment: Lambda's Wilks = 0.835 $F(13, 115) = 1.747$ $p = 0.06$ Partial $\eta^2 = 0.165$; Gen*Env.: Lambda's Wilks = 0.887 $F(13, 115) = 1.121$ $p = .ns$ Partial $\eta^2 = 0.113$).

Conclusions: Our findings showed differences between gender in bouncing and kicking, and between environments only in bouncing. However, previous empirical studies have often produced conflicting results, suggesting inaccurate self-perceptions (Clark et al., 2018; Morano et al., 2020). Considering the role of perceived competence in physical activities participation, these findings highlight the importance of interventions that target and improve perceived and actual motor competence in children.

P0069 - PHYSICAL INACTIVITY AND BODY IMAGE DISSATISFACTION: THE ROLE OF SCREEN-VIEWING TIME IN A SAMPLE OF ITALIAN ADOLESCENTS

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Purpose: A substantial amount of evidence suggests that screen-viewing time (SVT) plays a significant role in adolescents, influencing their self-esteem and body image perception (BIP). Many adolescents exceed the recommended hours of screen time and do not meet the recommended amount of physical activity (PA). The aim of this study was to examine the degree of body image dissatisfaction (BID) in adolescents in relation to SVT and PA.

Methods: The present cross-sectional study was carried out on a sample of 236 schoolchildren, 144 boys and 92 girls aged between 12 and 15 years old, recruited from a lower secondary school in Ferrara (northern Italy). BIP was assessed using Body Silhouette Charts for preadolescent children. The degree of BID was assessed through the Feel minus Ideal Discrepancy (FID) index. Three dummy variables were created for BID based on the difference between the Feel figure and Ideal figure: satisfied (Feel = Ideal), dissatisfied (Feel-Ideal = ± 1), very dissatisfied (Feel-Ideal $\geq + 2$ or -2). The SVT was self-reported and measured by asking participants the number of hours per day spent viewing television, smartphone, tablet, and computer. The SVT was categorized into three levels of intensity: < 2 h per day, from 2 to 4 h per day, and > 4 h per day. The participants were divided into two groups in relation to the practice of extracurricular sports.

Results: Most of the sample (60.2%) spends from 2 to 4 h per day in front of the screens; 25.8% spends less than 2 h per day, while 14% spends more than 4 h. The main results of the study show that in the total sample there is a positive correlation between the BID and SVT ($k = 0.1994$; $p = 0.0000$). It is observed that the highest level of BID increases more than double moving from the first to the third level of SVT (21.3% vs 19% vs 45.4%) ($p = 0.0009$). The percentage of subjects who spend more than 4 h in front of screens is higher in those who do not practice extracurricular sports (26.3% vs 5.6%). Differences in the effect of SVT according to gender were also evaluated: the BID and satisfaction were similar in boys and girls for each level of SVT.

Conclusions: Our results suggest that SVT is associated with BID in adolescents of both sexes. It would be necessary to reduce excessive device use and educate adolescents to engage in regular PA to promote physical and mental health and well-being.

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References: (non obbligatorio).

P0070 - PROMOTING THE DEVELOPMENT OF EXECUTIVE FUNCTIONS IN CHILDREN THROUGH PHYSICAL ACTIVITY: A SYSTEMATIC REVIEW

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Purpose: Current scientific literature shows a growing interest in the study of the evolution of executive functions in childhood and adolescence, as they are widely recognized to be closely linked to cognitive, physical, social, and psychological development, with implications for academic performance. In this context, physical activity emerges as an effective strategy for promoting and enhancing executive functions. In particular, motor activities that integrate cognitive components—i.e., those that require skills such as problem solving, decision making, and other fundamental life skills—are particularly useful, as they stimulate not only the body but also the mind and allow for the transfer of skills to other areas of daily life. This systematic review of the literature aims to explore the influence of physical activity on executive functions during childhood.

Methods: The research was conducted in the following databases: Google Scholar, PubMed, Scopus, and Web of Science, following the PRISMA guidelines and including studies published between 2000 and 2025, using the following keywords: physical activity, cognitive development, executive functions, inhibition, working memory, cognitive flexibility, children, cognitive functions. Studies were selected based on the following inclusion criteria: age between 3 and 14 years, experimental studies, and analysis of the effects of physical activity on executive functions.

Results: The results of the review indicate that physical activity can contribute to the improvement of the main components of executive functions (inhibition, working memory and cognitive flexibility).

Conclusions: However, the effectiveness of the intervention varies depending on the characteristics of the protocol adopted. Physical activities that involve greater cognitive involvement are particularly effective, as they stimulate both physical and mental aspects simultaneously. For this reason, when designing educational and training interventions, it is essential to consider how the different variables involved can contribute to the overall development of the individual and the acquisition of transversal skills. Future research could consider longitudinal studies in order to analyze the long-term effects of physical activity on the development of executive functions.

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P0071 - ASSESSMENT OF VITAMIN D STATUS IN ELITE SOCCER PLAYERS DURING THE ITALIAN SERIE COMPETITIVE SEASON

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Background: Scientific literature has highlighted the vital importance of vitamin D in the human body, and more recent investigations also underscore its key role in athletes. Vitamin D, in fact, influences skeletal muscle function and is essential in various physiological mechanisms, particularly those related to immune system, cardiovascular health, athletic performance and muscle injuries. Numerous elements—such as sunlight exposure, skin pigmentation, body fat percentage, and chronic health conditions—can impact vitamin D concentrations. The purpose of this study is to assess vitamin D levels among professional soccer players in Italy and to explore the differences in these levels among players who train in regions with varying latitudes.

Methods: The conducted study is a retrospective observational analysis focusing on 25-hydroxy vitamin D levels in professional soccer players from Italy's top-tier league (Serie A). Two teams were selected for observation during the competitive season: Team A, located at a latitude of 41° N in southern Italy, and Team B, based at a latitude of 45° N in northern Italy. The calendar year was divided into three distinct timeframes: the first quarter (May through August), the second quarter (September through December), and the third quarter (January through April). The aim was to examine the mean vitamin D concentrations throughout the year in relation to varying degrees of sunlight exposure. Each player underwent at least one blood sample collection during each of the three periods of the competitive season.

Results: Both vitamin D insufficiency (10.1%) and clear deficiency (1.93%) were identified among players in Italy's Serie A. Insufficient levels of vitamin D are defined as concentrations between 20 and 29 ng/mL, while deficient levels are classified as values below 20 ng/mL. The findings also showed a notable fluctuation in vitamin D concentrations based on the phase of the competitive season and the geographical latitude of the teams' cities. Specifically, no statistically significant difference was observed in the first quarter; however, Team B exhibited a marked increase in vitamin D levels during the second and third quarters, with significance levels of $p < 0.01$ and $p < 0.05$, respectively.

Conclusions: Geographic latitude and seasonal variation have a substantial influence on vitamin D levels. As a result, it is crucial to regularly assess vitamin D status in professional football players, particularly during the spring and winter seasons, in order to track fluctuations related to seasonal changes and location and to determine the need for supplementation.

P0072 - ADAPTATIONS IN JUMP, SPRINT, AND REPEATED SPRINT PERFORMANCE IN YOUTH SOCCER PLAYERS: A COMPARISON BETWEEN VELOCITY-BASED AND HIGH-LOAD TRAINING

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Purpose: This study aimed to compare the effects of Velocity-Based Training (VBT) using the squat exercise and High-Load Training (HLT) using the horizontal leg press on physical performance parameters in youth soccer players.

Methods: Eighteen non-professional male soccer players (mean age 17.4 ± 0.8 years) were randomly assigned to two groups: VBT ($n = 9$)

or HLT ($n = 9$). Both groups completed a 7-week strength training protocol (2 sessions/week), integrated with regular sport-specific training. The VBT group performed squat exercises based on a 15% velocity loss threshold, while the HLT group followed a traditional 4×4 repetition protocol on the leg press. Training intensity ranged between 80–85% of 1-RM in both groups. Performance was assessed pre- and post-intervention using 1-RM test, 10–20–30 m sprint, Repeated Sprint Ability (RSA), Countermovement Jump (CMJ), and horizontal jump tests.

Results: Both groups showed significant improvements ($p < 0.05$) in all performance measures, except for RSA, where only the HLT group showed a significant improvement in best and average times. No statistically significant differences were observed between groups for any of the variables. Notably, the HLT group completed a higher training volume and load (33% and 62% more, respectively), yet the VBT group achieved similar performance outcomes with less work.

Conclusions: Both training modalities are effective in improving physical performance in youth soccer players. However, VBT may offer a more time- and volume-efficient alternative for strength development. This has practical implications for optimizing in-season training while minimizing fatigue and injury risk.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0073 - DYNAMIC DIFFICULTY ADJUSTMENT TO IMPROVE THE PENALTY KICK PERFORMANCE IN FOOTBALL: A PILOT STUDY

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Purpose: The penalty kick represents one of the most decisive moments in football. Despite its apparent simplicity, it is influenced by multiple biomechanical, psychological, and technical factors. This study aims to assess the efficacy of Dynamic Difficulty Adjustment (DDA) in improving penalty accuracy in a group of amateur soccer players.

Methods: The goalkeeper's independent penalty kick strategy was chosen in this study, and the intervention was based on the 'perfect penalty' [1]. Twenty-four football players (mean age 22.7 ± 4 years; 14 females, 10 males) were divided into two groups: experimental (EXP, $n = 12$) and control (CON, $n = 12$). The EXP completed five training sessions where participants performed 30 penalties, aiming at the centre of a physical target (baseline width X height: 180 X 160 cm) placed in the top-right corner of the goal. The target size dynamically changed (5% variation) after each kick, based on its outcome (target hit or missed). The CON had no physical target and was instructed to kick the ball in the zone used during the familiarisation and test sessions. Pre- and post-intervention tests were carried out over two sessions: 20 penalties with a goalkeeper and 20 towards a physical target without a goalkeeper, maintaining a minimum ball speed (22 ± 2 km/h for males, 18 ± 2 km/h for females). Distance between ball and target centre, number of kicks on target and number of goals were considered as dependent variables..

Results: Within-group analysis showed higher hits on target in EXP ($p = 0.019$), after the intervention and no variation in other parameters ($p > 0.05$). No outcomes were changed for the CON ($p > 0.05$).

Conclusions: This pilot study showed the feasibility of the DDA strategy in penalty kick training and provided some helpful data for

both researchers and coaches. Although the small sample size included, the improvement obtained by the EXP deserves further analysis. Using the DDA in training skills requires setting a task difficulty that is strictly individual; in future studies, the baseline measures of the target could be chosen based on the starting skills of each participant.

Acknowledgments: (non obbligatorio).

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P0074 - MULTILATERAL APPROACH AND ATHLETICS: ITALIAN ACTIVITIES TREND FOR YOUNG ATHLETES

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Purpose: Scientific evidence shows the importance of multilateral activity in youth athletics (Balyi et al. 2013, Schiffer 2013). Despite this, the feeling is that young practitioners are already directed towards a monodisciplinary activity that, certainly in the short term, allows the achievement of better performances. With this work we analyzed the participation in federal competitions of the category Ragazzi (12–13 years) in an Italian region, Piedmont.

Methods: The sample examined is composed of 1238 athletes (673 F; 565 M) who competed during the year 2023 present in the federal rankings. The disciplines were divided into 5 groups: Speed (60 m), Endurance (1000 m–2 km walk), Hurdles (60 m hurdles), Jumps (Long jump and high jump)—throws (Shot put—Vortex throw). For each athlete, the categories in which he took part were indicated, defining the number of disciplines performed by each participant.

The following thesis does not take into consideration the activity carried out during weekly training, but only the competitions carried out during the season, therefore it is not possible to define the approach applied to an athlete participating in a single discipline as non-multilateral.

Results: The comparison of the data obtained has shown how, in both groups, there is a greater propensity to single competition (M 38.05%; F 39.23%) and only 6% of both males and females competed in all five specialty groups.

Conclusions: The lack of diversification in participation in different specialty groups may not reflect the content of training. But from the analysis of competitions it appears evident that, despite the scientific evidence orienting coaches in the direction of a multilateral approach to training, early specialization of young athletes seems to be the predominant trend.

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P0075 - INFLUENCE OF ANTHROPOMETRIC FACTORS ON POSTURAL CONTROL IN SCHOOL-AGED CHILDREN: A STABILOMETRIC EVALUATION

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Purpose: Postural control development in childhood is essential for stability, balance, and coordination. This study examines how anthropometric factors—height and weight—affect the center of pressure (COP) in children aged 5 to 13 years, using baropodometric evaluation.

Methods: A total of 141 children from Italian primary and lower secondary schools were analyzed, with a subgroup of 35 undergoing stabilometric testing. COP oscillations and plantar pressure distributions were recorded during a 10-s stance on a baropodometric platform. Statistical analysis included t-tests, ANCOVA, and linear regression to assess correlations between anthropometric measures and postural balance.

Results: Findings revealed a significant relationship between height and anterior pressure load ($p = 0.035$) and between weight and anterior–posterior COP oscillation speed ($p = 0.039$). The average rearfoot load was 62.7%, with a forefoot load of 37.3%. No significant differences emerged between boys and girls in plantar load distribution.

Conclusions: Children show distinct postural control patterns compared to adults, with height influencing anterior load and weight affecting COP oscillation. These insights underline the importance of targeted interventions to support balance development and prevent postural disorders.

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P0076 - INTEGRATING ESPORTS INTO TRAINING PROTOCOLS: IMPACTS ON SPEED AND REACTIVITY IN YOUNG FOOTBALLERS

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Background: Football eSports are growing rapidly due to their educational and social potential, combining learning and entertainment. eSports improve cognitive skills and professionals show reaction times similar to elite athletes. However, there is a lack of evidence in the scientific literature on the possible connections between improvements in physical and technical-tactical performance, obtained through an integrated training protocol with recreational eSport activities, and athletes' perceptions of motor learning, examined under the two main approaches: cognitive and ecological-dynamic.

Purpose: This study aims to explore the link between the physical and learning effects of 2 different training protocols, referring to the 2 approaches: cognitive and ecological-dynamic, and that the latter combines the use of football eSports in educational processes and the development of reactivity and speed.

Methods: The sample consisted of 40 young footballers (12–16 years), divided into a control group (CG) and an experimental group (EG). The CG followed a protocol based on the cognitive approach, while the EG performed exercises based on the dynamic ecological approach, which included football eSport sessions (EA Sports FC 25). Both groups were evaluated pre, mid and post implementation of the protocol, using the *BlazePod* with the FIFA 360° test, and the 30-m sprint test to measure speed. Repeated measures ANOVA was used to compare data between groups and time steps.

Results: Repeated-measures ANOVA analysis showed significant effects of time on reaction time to the FIFA 360° test ($F = 168.599$, $p < 0.001$) and on 30-m sprint time ($F = 141.119$, $p < 0.001$) with significant improvements between pre, mid and post tests. The interaction between time and group was significant, indicating that the EG showed a more pronounced improvement than the CG. Post-hoc analyses confirmed significant differences between all-time conditions, with the EG showing greater improvement in both tests (FIFA 360° and 30-m sprint) than the CG.

Conclusions: This study shows that an integrated training protocol with structured football eSport sessions can significantly contribute to the improvement of reactive skills and speed in young footballers, compared to a traditional approach.

P0077 - MOBILE PHONE USE WHILE WALKING: THE IMPACT ON DUAL-TASK COSTS AND GAIT PARAMETERS IN OLDER ADULTS

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Purpose: the use of mobile phones has become widespread over the past 20 years, even among the older people. As with drivers, using a mobile phone while walking reduces attention to and awareness of the surrounding area, thereby increasing the risk of injury, such as falling. Previous studies (Crowley et al., 2021) have reported that mobile phone use negatively affects walking dynamics in adults. However, there is limited evidence regarding older people, who are already at high risk of falling. Consequently, this study aims to examine the effect of mobile phone use on the cost and the spatiotemporal parameters of walking in a sample of older adults.

Methods: a total of 94 people took part in this study with a mean age of 75 ± 9 years, and a 74% of women. Gait was measured using the 10 m walk test (10MWT) in three randomized conditions: (1) walking only; (2) walking + talking; and (3) walking + texting. Spatiotemporal parameters such as gait velocity and cadence were detected using the Baibot inertial sensor system. Data were treated with repeated measure ANOVAs and post hoc tests.

Results: the dual-task cost in gait speed was + 11.4% (SD = 20.1) for walking + talking, and + 18.3% (SD = 20.1) for walking + texting. Significant differences in gait speed ($F = 52.81$; $p < 0.001$) and cadence ($F = 57.05$; $p < 0.001$) were observed across the three conditions. Gait speed was higher in the first condition (walking only; 1.26 ± 0.26 m/s) than in the second (walking + talking; 1.11 ± 0.26 m/s; $p < 0.001$) and the third (walking + texting; 1.00 ± 0.23 m/s; $p < 0.001$) conditions. Furthermore, gait speed was higher in the second condition than in the third ($p < 0.001$). Similarly, cadence was higher in the first condition (123 ± 15 steps/min) than in the second (115 ± 17 steps/min) and the third (107 ± 19 steps/min) conditions. Cadence was higher in the second condition than in the third ($p < 0.001$).

Conclusions: using a mobile phone while walking increases the costs and has a negative impact on older adults' gait speed and cadence, particularly when they walk and text. Based on these results, there is a need to raise awareness of the "price" that older adults pay for using mobile phones during walking. The recommendation is for targeted exercise training, since it can boost the attentional resources needed for dual-tasks.

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P0078 - CENTER OF PRESSURE AND POSTURAL BALANCE IN ACROBATIC GYMNASTICS

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Purpose: This study aimed to characterize postural balance capability of acrobatic gymnasts, focusing on the Center of Pressure (CoP) parameters. An individual analysis of the base gymnast (who gives support) and the top gymnast (who is lifted) was carried out to get a deeper understanding of the role they play in achieving balance in the whole pyramid (i.e. where base and top work together).

Methods: Sixteen acrobatic gymnasts (15 females and 1 male; age range 13.6 ± 3.22 years) were grouped into ten different pairs. A single pair was formed by two gymnasts with different roles: base (BG, $n = 9$) or top (TG, $n = 7$). Static postures were maintained above a force platform (AMTI AccuPower, USA, sampling rate 1000 Hz) for at least 10 s. BG were asked to lift a barbell overhead of the same mass as that of the top (BG_B) and TG were asked to perform the straddle lever squad (TG_SO) and the half lever with bent knees (TG_SC) first alone (hands on platform) and then in pairs (hands held by the base): the straddle lever pyramid (BGTG_SO) and the half lever bent knees pyramid (BGTG_SC). The variables investigated were path amplitude, range trajectory and surface area of CoP (Floria et al., 2015). Furthermore, three national experienced-level judges provided a score (E-Score) based on the years of experience and the technical penalties during the execution of the individual postures and the pyramids.

Results: Maintaining balance is more difficult in the pyramids (when top and base work in pairs) compared to the static postures maintained individually (TG_SO and TG_SC had the least pronounced sway). No differences in the CoP parameters were found between TG_SO and TG_SC, whereas the more pronounced CoP sway occurred in BGTG_SC (in the pyramids). The E-Score was highly correlated with the parameters of the CoP ($r = 0.710$; $p < 0.001$, on average for all postural parameters) when the gymnasts work together (in the pyramids): the higher the score the lower the postural stability. No correlations between E-score and CoP parameters were observed when the static postures are maintained individually.

Conclusions: Our findings show that: i) an important focus on postural control is necessary for base athletes in order to maintain optimal posture during the execution of pyramids; ii) the analysis of the CoP can be a useful tool for quantifying performance in acrobatic pyramids.

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P0079 - BODY AND MIND: A POSTURAL APPROACH TO LOW BACK PAIN IN A GROUP OF SEDENTARY ADULTS

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Purpose: Postural education has become increasingly widespread over the past few decades, establishing itself as a fundamental component in many re-education and preventive programs. The aim of the present empirical study is to investigate the effects of a postural exercise program on low back pain, body image, and quality of life in a group of sedentary adults. Specifically, the study explores how structured movement and postural awareness may contribute to both physical relief and improved self-perception.

Methods: The study involved a group of 20 sedentary adults (F 13, M 7), aged between 50 and 65 (60.3 ± 4), all new members of the Venice Center for Physical Activity and Postural Gymnastics. The intervention combined breathing techniques and postural re-education strategies. Participants trained for 40 min, twice a week, for 12 weeks. Pre- and post-intervention assessments were conducted using the Body Image State Scale (BISS) and the Short Form-36 items health survey (SF-36s). The BISS is a 6 item questionnaire with a 9 point response format for each item; the components of the 6 items are: (a) overall satisfaction with one's appearance; (b) body size and shape satisfaction; (c) weight satisfaction; (d) feeling of physical attractiveness; (e) feelings about one's looks compared with how one usually feels; (f) appearance evaluation in comparison with how the average person looks. Higher score reflect a more positive BI state. The SF-36s is a questionnaire for assessing health-related quality of life. It measures 8 domains of health status: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), emotional role (RE), and mental health (MH).

Results: The results of the BISS showed statistically significant improvements ($p < 0.05$) across all six components (a, b, c, e, f). The SF-36 questionnaire also showed significant improvements ($p < 0.05$) in the scores for PF, BP, GH, VT, RE, and MH scales.

Conclusions: The improvements observed suggest that addressing postural and motor habits can positively influence not only physical symptoms, but also psychological aspects such as body image and emotional well-being, reinforcing the mind–body connection in the management of low back pain.

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References: (non obbligatorio).

P0080 - ASYMMETRY AND MOVEMENT QUALITY IN ELITE YOUTH FOOTBALL PLAYERS

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Purpose: Movement quality is essential for injury prevention and performance in youth athletes. While traditionally assessed using composite scores from tools like the Functional Movement ScreenTM (FMSTM), evidence highlights movement asymmetry as a more sensitive indicator of dysfunction and injury risk. During adolescence, growth and temporary coordination decline exacerbates these issues. Given the asymmetrical nature of football and changes from biological maturation, this study aims to evaluate movement asymmetry trends across a competitive season in elite youth football players, analyzing movement quality variations through FMSTM.

Methods: A longitudinal observational study was conducted in an elite U13-U17 football academy. Movement quality was assessed via FMSTM at start-, mid-, and end-season. Maturity offset by Mirwald and colleagues, was collected concurrently.

Injuries were recorded by club medical staff. Asymmetries were identified when unilateral sub-test scores differed. Players were categorized as non-, slightly (1) or highly asymmetrical (> 1). Based on median FMSTM scores at mid, players were classified as low (LC) or high competence (HC). Changes in asymmetry status were evaluated, and players were categorized as “worsened,” “improved”, or “unchanged”.

Results: 142 players were included. At start, 61% exhibited ≥ 1 asymmetry. Asymmetry prevalence peaked at mid before declining by end-season, despite overall improvement in composite scores. U14 and U15 players, closer to PHV, showed the largest asymmetry increase at mid and the highest injury rate. LC players showed significantly more asymmetries than HC ($p = 0.03$). Directionality of asymmetries varied across time points. Rotary Stability showed the highest asymmetry prevalence and correlated with all other sub-tests, highlighting the key role of trunk control.

Conclusions: Asymmetry is a dynamic and sensitive indicator of movement quality in elite youth football. Monitoring asymmetries, especially around PHV, may guide targeted interventions to optimize movement quality and reduce injury risk.

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P0081 - LIFESTYLE AND PERCEIVED WELL-BEING IN CHILDREN AND TEENS: IMPORTANCE OF EXERCISE AND SEDENTARINESS

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Purpose: One of the priorities in clinical and public health campaigns is preventing chronic non-communicable diseases. Childhood and adolescence are critical stages for promoting healthy behaviors that influence both present and future health. This observational study aims to define a straightforward, sustainable strategy for assessing lifestyle and well-being in children and teens, as well as to investigate how lifestyle impacts their perception of well-being while controlling for sex and age effects.

Methods: We collected data by administering a lifestyle and well-being questionnaire to 225 children and teens at an Italian school complex. To evaluate whether healthy lifestyles positively influence the well-being perception of children and teens, independent of sex and age, we first applied nonlinear principal component analysis to create indicators for lifestyle and well-being perception. Next, we adjusted the well-being perception indicator for sex-by-age effects and compared its distribution across various lifestyle typologies defined by the lifestyle indicators.

Results: We developed two lifestyle indicators; the first represents sedentariness and sleep, while the second reflects nutritional quality and the volume of physical activity. By combining these indicators, we identified four lifestyle typologies. In the healthiest typology, 44.4% of individuals were 5 to 7 years old, compared to 6.7% of those aged 13 to 14; in the least healthy typology, 5.2% were 5 to 7 years old, compared to 42.1% of those aged 13 to 14. The sex-adjusted perceived well-being indicator demonstrated an increasing trend from the least healthy to the healthiest typology ($P = 0.005$). Furthermore, reduced sedentary time and increased hours of sleep contributed to a better perception of well-being ($P = 0.040$).

Conclusions: In this observational study, we defined a straightforward, sustainable strategy to evaluate children's and adolescents' lifestyle and well-being characteristics, which could aid in the development of tailored, age-sensitive educational interventions. Our results indicate that lifestyle quality deteriorates rapidly between early childhood and adolescence and is closely linked to a decline in perceived well-being. These findings underscore the urgent need for lifestyle-oriented health promotion campaigns that address key behavioral components, such as physical activity and sleep hygiene, to enhance well-being in youth and support the long-term prevention of chronic diseases.

P0082 - RESPONSE OF JUGULAR VENOUS PULSE TO EXERCISE IN CARDIOVASCULAR PATIENTS ASSESSED BY A WEARABLE PLETHYSMOGRAPHIC SENSOR: A FEASIBILITY PILOT STUDY

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Purpose: Jugular venous pressure is a pivotal parameter in patients with heart failure (HF), but data on its response to exercise are limited due to the complexity of standard assessment methods. Our device is capable of detecting the jugular venous pulse (JVP) waveform, a parameter associated with Jugular venous pressure, in patients. In recent studies high jugular venous pressure after exercise was associated with exercise intolerance and poor prognosis, venous pressure is typically assessed visually in the sitting position, classified simply as visible or not visible.^{1,2} Such a basic clinical method could be significantly improved by the introduction of a novel and portable plethysmographic devices, which in addition might allow to identify useful functional parameters to guide the rehabilitation training. The aim of this study is to assess the reliability of our device in detecting changes in jugular venous pressure (JVP) before and after the 6-min walk test (6MWT), a validated prognostic indicator of mortality in patients with cardiovascular disease.³

Methods: 2 patients affected by heart failure underwent a 6MWT, in accordance with the guidelines of the American Thoracic Society. We've performed a jvp detection before and after the test. Data were after processed with our software that give us a waveform representation of the JVP. We've evaluated amplitude and time differences between the different peaks.

Results: The patients walked an average of 316 ± 8 meters. After the 6-minute walk test (6MWT), we observed a shift of the X and Y peaks closer to the R wave, despite their mutual temporal distance remaining unchanged, while the amplitude of the V wave increased ($p < 0.002$). The increase in V wave amplitude correlates with the distance walked by the study subjects.

Conclusions: The most plausible clinical interpretation is that the systolic ejection fraction occurring at the V wave is insufficient to match the increased venous return to the right atrium, revealing an unfavorable mismatch between venous return and cardiac systolic output. This may effectively reflect the pathophysiological essence of heart failure. In light of the statistical significance observed, it is deemed necessary to extend the study to a larger patient population to explore potential clinical applications in assessing the effects of rehabilitative training.

Acknowledgments: The project is carried out in the framework of Italian Space Agency (ASI) contract n. 2021-1-R.0 and is developed by a team which also included Argotec srl. Support to ASI for the utilization of the ISS has been provided by ALTEC SpA.

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P0083 - MOBILITY AND STRENGTH-BASED WARM-UP: A PILOT STUDY IN YOUNG COMPETITIVE OVERHEAD ATHLETES

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Purpose: In sports involving overhead movements, shoulder function depends not only on joint range of motion (ROM), but also on the ability to generate force and maintain motor control in positions of greatest mechanical demand. Although mobility exercises are frequently included in prevention and athletic preparation protocols, they are often relegated to the final phase of the session, limiting their possible improvement on performance. The present study aims to compare the effects of an active warm-up, based on scapulohumeral joint-specific mobility and strength exercises, versus a traditional warm-up, evaluating its influence on ROM, scapulohumeral control, and neuromuscular performance in young competitive athletes (16–21 years old).

Methods: Thirty athletes were randomly assigned in two groups: control (traditional warm-up) and experimental (active warm-up). The protocol was performed three times a week for six weeks, before the usual training. Assessments (T0, T1, T2) included: Rom with Gyko sensor, Handgrip test, Ckcuest and Supine medicine ball throwing test. Statistical analysis was conducted with ANOVA for repeated measures ($p < 0.05$).

Results: The experimental group showed significant increases in Rom in abduction and external rotation, while internal rotation was unchanged. The control group reported minimal changes in all movements. Throwing the Medicine ball resulted in a significant increase in the experimental group ($+11.4 \text{ cm} \pm 5.8$; $p < 0.05$), and there was a positive correlation between the increase in Rom and the distance achieved. The Ckcuest test showed a positive trend in the experimental group, with a smaller, similar trend in the control group. The handgrip test showed modest, nonsignificant improvements in both groups.

Conclusions: The findings suggest that a structured warm-up with dynamic mobility and specific strength exercises may be a promising strategy to positively influence functional mobility in young athletes. However, further investigations with larger samples and long-term follow-up are needed to confirm the preliminary results

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P0084 - EFFECTS OF SMALL-SIDED GAMES VS HIGH-INTENSITY INTERVAL TRAINING ON PHYSICAL CAPACITIES AND PERCEPTION OF EFFORT IN U11 FOOTBALL PLAYERS

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Purpose: In youth soccer, the effects of Small-Sided Games (SSG) and running-based High-Intensity Interval Training (HIIT) on physical performance remain unclear. This study aimed to compare the impact of SSG and HIIT programs on aerobic fitness, sprint performance, change of direction ability, and internal load in young soccer players.

Methods: Sixteen male U11 soccer players (age: 10.4 ± 0.5 years; body mass: 38.2 ± 7.2 kg; height: 146.2 ± 8.1 cm) from a professional academy were randomly assigned to either a SSG ($n = 8$; 4vs4 SSG format consisting of 5×3 min with 1 min of rest between bouts) or a HIIT group ($n = 8$; 5×3 min of 15 s run at 100% Vpeak alternating with 15 s run at 50% Vpeak, with 1 min of rest between sets). In addition to the experimental training (SSG or HIIT), the players performed two weekly technical-tactical sessions lasted in 60 min. Aerobic fitness (Yo-Yo Intermittent Recovery Level 1 Children's Test, YYIR1C), sprint performance (10-m and 20-m line sprints), and change of direction ability (Arrowhead Agility Test) were assessed before and after the intervention. During the training sessions heart rate and rating of perceived exertion (RPE), via heart rate monitor and the Borg CR-10 scale respectively, were assessed as indices of internal load.

Results: A significant main effect of TIME was observed for YYIR1C performance, 10-m sprint time, and change of direction ability in both groups ($p < 0.001$), with no TIME $\times$ GROUP interaction, indicating similar improvements across interventions. However, only the SSG group showed a significant improvement in 20-m sprint time ($p = 0.001$), suggesting a group-specific effect for this variable. No between-group differences were found in peak or mean heart rate during training sessions. RPE was significantly lower in the SSG group across all training sessions ($p < 0.05$).

Conclusions: These findings indicate that Small-Sided Games effectively improve aerobic fitness, agility, and short-distance sprint performance in youth soccer players, similarly or higher to High-Intensity Interval Training (HIIT). However, only SSG enhanced 20-m sprint performance and was perceived as less demanding, suggesting it may be a more effective and enjoyable training option for youth development.

P0085 - RELATIONSHIP BETWEEN FIELD TESTS AND MATCH DEMANDS IN YOUNG MALE FOOTBALL PLAYERS

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Purpose: The relationship between field test performance and match demands in youth male soccer players remains unclear. This study aimed to investigate the associations between standard physical performance tests and match-derived external load metrics in young football players.

Methods: Twenty-four male youth soccer players from a professional academy were recruited and grouped as follows: U17 (n = 8; age: 16.2 ± 0.5 yrs; weight: 70.2 ± 4.6 kg; height: 179.0 ± 5.4 cm), U18 (n = 8; age: 17.6 ± 0.5 yrs; weight: 71.9 ± 4.7 kg; height: 178.2 ± 9.1 cm), and U19 (n = 8; age: 18.4 ± 1.4 yrs; weight: 77.5 ± 6.5 kg; height: 184.2 ± 6.4 cm). All participants were regular starters, having played over 50% of match time during the observation period. Over three separate sessions, players completed the Yo-Yo Intermittent Recovery Test Level 1 (YYIR1), countermovement jump test (CMJ), and 20-m sprint test. Each test was repeated three times during the study period. Match physical demands were assessed across eight official league matches using 50 Hz GPS units. External load metrics included total distance (TD), distance at high speed (DHS: 15–25 km/h), distance at very high speed (DVHS: > 25 km/h), match peak-speed (Vpeak), match maximal-acceleration (Accmax), number of high accelerations ($n^{\circ}\text{acc}$; $\geq + 3 \text{ m/s}^2$), and high decelerations ($n^{\circ}\text{dec}$; $\leq -3 \text{ m/s}^2$).

Results: CMJ performance showed significant positive correlations with several match-derived external load metrics, including DVHS ($r = 0.58$, $p = 0.001$), Vpeak ($r = 0.76$, $p = 0.0001$), Accmax ($r = 0.70$, $p = 0.0001$) and $n^{\circ}\text{acc}$ ($r = 0.55$, $p = 0.002$). Conversely, 20-m sprint time was significantly and negatively correlated with DVHS ($r = -0.46$, $p = 0.012$), Vpeak ($r = -0.60$, $p = 0.001$), Accmax ($r = -0.59$, $p = 0.001$), $n^{\circ}\text{acc}$ ($r = -0.50$, $p = 0.007$) and $n^{\circ}\text{dec}$ ($r = -0.46$, $p = 0.011$). No significant correlations were found between YYIR1 results and match-play physical performance metrics. Additionally, no significant differences were observed in physical test performance across age groups ($p > 0.05$).

Conclusions: CMJ and 20-m sprint tests appear to be valid indicators of high-intensity match performance in youth male soccer players. Their strong associations with external match metrics support their application in training monitoring, physical development tracking, and talent identification within professional academy settings.

P0086 - NON-INVASIVE ASSESSMENT OF THE GAIT CYCLE IN DIVERSE ENVIRONMENTS: CAN VIDEO ANALYSIS MATCH OR OUTPERFORM INERTIAL MEASUREMENT UNIT DEVICES? AN EXPLORATIVE APPROACH

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Purpose: The Gait Cycle (GC) has been extensively studied in scientific literature over the past decades. Inertial Measurement Unit (IMU) have gained prominence for their high precision assessing dynamic variables. Video Analysis (VA) offers an alternative approach to motion evaluation. Recently, Artificial Intelligence (AI) has been integrated with VA to overlay biomechanical models for accurate motion analysis. This study aims to discuss the compare and IMU and VA + AI methods for gait assessment, ultimately to develop a practical, easy-to-use and low-cost VA tool for biomechanical analysis.

Methods: The Gait Cycle (GC) has been extensively studied in scientific literature over the past decades. Inertial Measurement Unit (IMU) have gained prominence for their high precision assessing dynamic variables. Video Analysis (VA) offers an alternative approach to motion evaluation. Recently, Artificial Intelligence (AI) has been integrated with VA to overlay biomechanical models for accurate motion analysis. This study aims to discuss the compare and IMU and VA + AI methods for gait assessment, ultimately to develop a practical, easy-to-use and low-cost VA tool for biomechanical analysis.

Results: Both IMU and VA captured the overall test duration and the duration of distinct gait phases. They also assessed trunk Range of Motion (ROM) and angular velocity during the initial and final rotation. The IMU provided additional insights into linear accelerations (mediolateral, anteroposterior, vertical) and angular accelerations (X, Y, Z axes). Conversely, AI-based VA differentiated between gait phases (stance/swing) and measured spatial variables such as step length and upper limb oscillations. It further measured ROM of the hip, knee, ankle, shoulder, and elbow, offering a comprehensive analysis of movement symmetries, including step length, phase durations, and arm swing.

Conclusions: While IMUs are minimally invasive, the device can still be a bit uncomfortable to the patient, potentially introducing bias. VA instead, offers a fully non-invasive solution that could be conducted in any environment. AI can enhance VA reliability reaching high levels of precision in extracting movement variables, thus emerging as a practical and cost-effective alternative for gait evaluation. Given its versatility and patient-friendly nature, AI leveraging rich VA, could integrate with less precise IMU (e.g., in smartphones), fostering a practical, broadly applicable tool for clinical and research gait analysis.

P0087 - THE FUNCTIONAL EVALUATION OF THE LOWER LIMBS IN OBESE SUBJECTS: STUDY EXPERIMENTAL FOR THE PREVENTION OF TRAUMA

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Purpose: Obesity represents a major public health concern. It is defined as a condition involving excessive accumulation of adipose tissue, which may lead to significant health complications. The musculoskeletal system is significantly involved in the quality of life of individuals with obesity. The excessive accumulation of adipose tissue in the musculoskeletal and locomotor systems, particularly in the visceral region, places strain on the spine, leading the individual to adopt incorrect postures. This results in a shift of the body's center of gravity and a misalignment of the spine, which is no longer properly aligned. The increased body weight restricts the range of motion in daily activities, reducing overall quality of life. The aim of the study is to assess the functional overload affecting the musculoskeletal and osteoarticular systems in individuals with obesity, and to demonstrate how an effective adapted physical activity protocol can serve as a valuable tool for the prevention and management of the identified impairments.

Methods: For the study, 90 participants aged between 30 and 45 years were recruited, including 40 males and 70 females. The experimental group participated in an adapted training program. The parameters assessed included joint pain levels (hip, back, and knee) and joint range of motion (ROM). These parameters were measured at three time points: baseline (T0), after 6 months (T1), and after 20-months of training (T2).

Results: Our results indicate that the implemented exercise program may be a valid option for improving postural balance, reducing pain symptoms and functional limitations in individuals with obesity, while also enhancing their overall quality of life.

Conclusions: The present study demonstrated that the adapted physical activity protocol, tailored to the individual's needs and identified postural deviations, led to significant improvements in quality of life, physical performance, and a reduction in perceived pain levels.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0088 - STATE OF THE ART ON TAOPATCH® DEVICES AND PHOTOBIOMODULATION-BASED NANOTECHNOLOGIES: A BIBLIOMETRIC AND NARRATIVE ANALYSIS

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Purpose: The purpose of this analysis is to provide a quantitative and qualitative overview of the existing literature on TaoPatch® devices and similar technologies to understand the evolution of the scientific field and identify emerging trends.

Methods: A bibliographic search from 1970 to 2025 was performed across Scopus, PubMed, and Web of Science using a unified search string adapted to each database, without language or document-type restrictions. The analysis was conducted in two stages. First, a bibliometric evaluation was performed using the Bibliometrix package in R (v. 4.5.0), including descriptive metrics and science mapping (e.g., keyword co-occurrence, co-citation, collaboration networks) to explore the structure and evolution of the field. After removing 7 duplicate or incomplete records, the final dataset included 110 articles. In a second phase, a narrative review was conducted on articles consistent with the identified trends, selected according to PRISMA guidelines, to qualitatively synthesize emerging research directions.

Results: Scientific output began in the early 2000s, with a peak in 2023. The main journals belong to the fields of materials science, biotechnology, and nanomedicine. Most authors contributed only one article, while a minority produced recurring publications, indicating a concentrated scientific output typical of emerging or highly specialized fields. A small core of journals ('core sources') publishes most of the relevant articles and represents the primary dissemination channels. The most relevant words among keywords, titles, and abstracts were respectively "human", "therapy" and "pain." From 1970 to 2025, the most frequent terms included "adult", "aged", "animals" (keywords); "delivery", "device", "diode" (titles); and "applications", "device", "light" (abstracts). Two distinct phases of scientific interest can be identified. From 1970 to 2022, research primarily focused on light, pain, and treatment. Since 2023, however, there has been a shift toward themes such as therapeutic efficacy, the integration of physical exercise with light therapy, and the need to demonstrate outcomes of functional interaction. Currently, the most prominent topics are physical activity, aging, and chronic pain.

Conclusions: The findings highlight an emerging field shifting from technological innovation to clinical application, with growing interest in interdisciplinary and translational research.

P0089 - INTEGRATING FNIRS AND INERTIAL SENSING TO ASSESS ATTENTIONAL FOCUS EFFECTS ON BALANCE

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Purpose: The investigation into the dynamics of external and internal attentional focus within the context of maintaining balance reveals critical insights into motor control. Numerous studies have shown that adopting an external focus significantly enhances balance performance [1]. The investigation into external and internal attention focus concerning balance and brain activity may be notably enhanced by portable neuroimaging techniques such as functional Near-Infrared Spectroscopy (fNIRS) [2]. This study aims to evaluate the relationship between the area of the center of pressure (CoP) during a static

balance test and the fNIRS signals over the frontal, prefrontal, and motor cortex.

Methods: 21 healthy moderately-active participants (7 F, age: 25.3 ± 4.2 years) were enrolled in the study. The participants were requested to maintain a static balance on a firm surface with their eyes closed for 30 s under two conditions (i.e., internal and external focuses). During the experiment, the brain activity was recorded through the portable fNIRS Cortivision Photon cap device delivering a montage with 35 channels and 4 short channels placed according to the 10–20 system, covering the prefrontal, frontal and motor cortices. The area of the CoP was evaluated through the Gyko device, a wearable inertial sensor system developed by Microgate. The fNIRS signals were converted into optical densities, motion artifacts were corrected, filtered (3rd order Butterworth filter, cut-off frequencies 0.001–0.4 Hz), and converted into oxyhemoglobin (HbO) and deoxyhemoglobin (HHb) concentrations. The mean values of the changes of HbO and HHb signals were computed and the Pearson's correlation between them and the area of the CoP was computed. A False Discovery rate correction was then applied.

Results: Regarding the external focus, moderate correlations between the CoP area and the HbO and HHb variations on the prefrontal cortex ($r = -0.78$, $p = 2.69 \cdot 10^{-5}$ and $r = 0.68$, $p = 7.37 \cdot 10^{-5}$ for HbO and HHb, respectively) and motor cortex ($r = -0.58$, $p = 0.006$ and $r = 0.57$, $p = 0.007$ for HbO and HHb, respectively) were revealed. Conversely, reduced effects were assessed in response to the internal focus.

Conclusions: This study provides preliminary evidence on the relationship between the area of the CoP and brain activity during the external focus condition, demonstrating the importance of the typology of focus employed, and highlighting the role of brain control on postural adjustment.

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P0090 - ATTITUDES AND PERCEPTIONS TOWARDS PHYSICAL ACTIVITY IN ITALIAN PEOPLE WITH SPINAL CORD INJURY: A CROSS-SECTIONAL OBSERVATIONAL STUDY

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Purpose: Physical activity (PA) is a crucial tool for managing comorbidities and preventing secondary complications in individuals with spinal cord injuries (SCI). Despite its well-documented benefits, participation in PA among individuals with SCI remains low, with significant barriers affecting engagement. The aim of this study was to assess the attitudes of Italian individuals with SCI towards PA and to identify the factors that influence these attitudes.

Methods: A cross-sectional observational study was conducted using ad-hoc questionnaire to assess five domains of the attitude towards PA: physical benefits, psychological benefits, motivation, social aspects, and perceived barriers. Demographic characteristics were

analyzed using descriptive statistics. Spearman's correlation was used to examine associations between domains. Group differences based on activity levels were assessed using the Mann–Whitney U test.

Results: A total of 54 participants (mean age 51.0 ± 13.89 years) completed the questionnaire. Among them, 49 acknowledged the physical benefits of physical activity for health, while 44 recognized its psychological benefits. However, 17 participants (31.5%) reported barriers related to accessibility, cost, and lack of adapted programs.

Conclusions: Individuals with SCI demonstrate a predominantly positive attitude toward PA, but significant barriers limit their participation. Previous sports participation showed a promising contribution in shaping attitudes toward PA, particularly in the psychological, motivational, and social domains.

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References: (non obbligatorio).

P0091 - THE CORRELATION BETWEEN THE LEVELS OF EXECUTIVE FUNCTIONS AND THE ENJOYMENT IN CHILDREN WHO PLAY SOCCER

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Purpose: The aim of this study was to evaluate the correlation between the functions and enjoyment level experienced during soccer training sessions in children.

Methods: 96 children aged between 6 and 14 years (mean = 10.58; SD = 2.37; F = 4; M = 92) belonging to several soccer societies, were recruited. After completing each set of 30 consecutive training sessions, participants were asked to rate the enjoyment they experienced during the final session. The level of enjoyment was measured using an emoji-based Likert scale ranging from 1 (extremely enjoyable) to 6 (not enjoyable at all). Children underwent a battery of computerized tests assessing executive functions at the beginning and conclusion of the 30-session training program, i.e.: the Stop-Signal Test, the Eriksen Flanker Test, and the Visual Search Test. A composite index and the delta scores (post–pre) using stepwise regression were analyzed to determine whether they could predict children's reported level of enjoyment.

Results: The results indicate that the composite score of the three executive function tests at pre-training was significantly correlated with the improvement in the level of enjoyment during the 30 training sessions ($p < 0.001$), with a determination coefficient $R^2 = 23\%$.

Conclusions: This result indicates that individuals who have more 'high-performing' executive functions at baseline are those who will improve the most in their levels of enjoyment experienced during training sessions over a period of 30 practices (approximately 4 months in our study). Regression analysis does not allow us to establish a causal link and therefore further studies are necessary to understand this relationship.

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P0092 - AN INNOVATIVE INTERDISCIPLINARY MODEL OF INTERVENTION FOR PEOPLE WITH CHRONIC MIGRAINE: THE EXEMIG01 STUDY

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Purpose: The literature and guidelines for the management and treatment of migraine (MIG) support a multidisciplinary approach that includes a combination of acute and preventive pharmacological treatment, therapeutic patient education (TPE), the use of evidence-based behavioural interventions, and lifestyle modification. This study aims to implement the TPE of the patient with migraine, promoting the improvement of outpatient clinical practice by interdisciplinary evaluation and counselling moments dedicated to known risk factors for MIG (overweight/obesity and sedentary lifestyle, physical inactivity, unhealthy eating habits), temporomandibular disorders, and postural aspects.

Methods: 140 adult volunteers with MIG will be enrolled. *Inclusion criteria:* chronic (≥ 15 attacks/month, for at least 3 months) or episodic and high frequency (8–14 attacks/month) MIG; age range 30–50 years; physical inactivity; ability to walk independently. *Exclusion criteria:* clinical condition contraindicating physical activity (PA); no informed consent. The study duration will be 2 years. Participants will be randomly assigned to 2 groups (standard care vs. TPE + 3 months of supervised exercise). All the participants will undergo an interdisciplinary assessment, including:

(1) first medical examination by a neurologist; (2) questionnaire administration; (3) kinesiologist and postural evaluation; (4) complete gnathology evaluation. MIG frequency; MIG-related aspects (i.e., anxiety, depression, disability, allodynia, kinesiophobia, and quality of life); PA and sleep levels; and Mediterranean diet adherence will be measured.

Results: We will expect a monthly MIG attack loss of at least 15–20% vs. baseline, a reduction of monthly medications assumption and MIG-related disability, linked to improvement of lifestyle habits.

Conclusions: Given the anticipated improvements in participants' lifestyles, such as increased physical activity, reduced sedentary time, and enhanced nutritional quality, we expect to see several clinical benefits. These include a decrease in both the number and intensity of migraine attacks, as well as an enhancement in quality of life due to reduced migraine-related disability and lower scores on the allodynia scale, which measures central sensitization. Additionally, we expect improvements in psychological aspects, particularly regarding symptoms of anxiety, depression, and sleep disorders, which are often comorbid with chronic migraine.

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P0093 - PHYSICAL ACTIVITY AND URINARY LOSS AS PREDICTORS OF PELVIC FLOOR DISORDERS IN WOMEN WITH URINARY INCONTINENCE

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Purpose: Urinary incontinence (UI) is often associated with significant physical and psychological distress. While the severity of UI can be objectively detected, the perception of symptoms play an important role in daily life and may be influenced by lifestyle factors, such as physical activity. This study aimed to determine whether objectively measured urinary loss (UL) and physical activity, expressed by steps per minute (SPM), predict self-reported pelvic floor disorders in women with UI and examine how these relationships change following a five-week multimodal exercise intervention.

Methods: Twenty women with UI (57.4 ± 7.3) underwent a five-week intervention with thrice-weekly exercise sessions. UL was objectively assessed by weighing absorbent pads before and after use during a predefined period, according to the method proposed by the International Continence Society (PAD test). Physical activity was measured using ActiGraph GT9X devices (ActiGraph Corp., Pensacola, FL) and symptoms severity was evaluated using the Pelvic Floor Distress Inventory-20 (PFDI-20). All assessments were conducted pre- and post-intervention. Linear regression analyses were used to examine whether changes in SPM and UL predicted changes in symptoms severity.

Results: Three linear regression models were performed using the total PFDI-20 score as the dependent variable, with UL and SPM as predictors. The first model (pre-intervention) was significant ($F(2,17) = 3.740$, $p = 0.045$; $R^2 = 0.306$; adj. $R^2 = 0.224$), with both UL ($\beta = 2.685$, $p = 0.043$) and SPM ($\beta = -7.900$, $p = 0.032$) as significant predictors. The second model (post-intervention) was also significant ($F(2,17) = 5.444$, $p = 0.015$; $R^2 = 0.390$; adj. $R^2 = 0.319$), with UL remaining a significant predictor ($\beta = 5.927$, $p = 0.006$), and SPM showing a trend toward significance. The third model, based on Δ scores, was significant as well ($F(2,17) = 4.360$, $p = 0.030$; $R^2 = 0.339$; adjusted $R^2 = 0.261$), with Δ UL being a significant predictor ($\beta = 3.645$, $p = 0.023$), while Δ SPM did not reach significance.

Conclusions: UL was a significant predictor of pelvic floor disorders severity across all models. Physical activity seemed to play a more relevant role in pelvic floor disorders before intervention, while after the intervention the impact of physical activity seemed to be lower, possibly because both UL and pelvic floor disorders were significantly reduced due the treatment, while physical activity remained unchanged.

P0094 - THE IMPACT OF SPORT-SPECIFIC TRAINING ON INTER-MUSCULAR STRENGTH RELATIONSHIPS IN PARALYMPIC ATHLETES WITH A LOCOMOTOR IMPAIRMENT

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Purpose: Strength (S) is a fundamental health related physical fitness component (1) and also, in paralympic athletes with a locomotor impairment (PA-LI) competing in winter sports, upper body S (UB-S) is a main determinant of performance (2). In this study, aimed at describing UB-S in PA-LI competing in 4 different sport types, we hypothesize that sport-specific muscular adaptations, assessed through 2 distinct UB-S measurements, occurs in these PA-LI.

Methods: Four groups (G) of 16 PA-LI, matched for body mass (73.3 ± 10.94 kg) competing in 4 sport types (G1, skill sports—SS; G2, power sports—PS; G3, aerobic and anaerobic mixed metabolism sports—MS; and G4, endurance sports—ES) were recruited for the present study. Maximum voluntary isometric contraction (MVC) of both right and left hand finger flexors (handgrip, HG) and shoulder lowering muscles (SLM) was measured using a laboratory made dynamometer (MK7, Dal Monte, Italy). The best value of 3 MVCs of the 2 sides were summed for the each UB-S. ANOVA was used to assess different UB-S of the 4 Gs. Spearman’s correlations and Pearson’s correlation were applied to assess the relationship between the two UB-S assessments in general and within each group, respectively.

Results: Mean values and standard deviation of the entire cohort are reported below: HG (1252.1 ± 271.41 N); SLM (997.3 ± 173.06 N). Mean values and standard deviation of each group are: G1(1217.1 ± 198.45 N – 1025.5 ± 122.02 N); G2(1242.7 ± 332.70 N – 1048.6 ± 172.76 N); G3(1175.8 ± 83.65 N – 926.1 ± 208.02 N); G4(1331.5 ± 359.36 – 989.3 ± 169.28). Spearman’s correlation revealed significant correlation between HG and SLM ($r = 0.406$; $p < 0.001$). Strength within group showed significant correlation in three groups: G2($r = 0.589$; $p = 0.016$), G3($r = 0.589$; $p = 0.016$), G4($r = 0.568$; $p = 0.021$) but not in G1($r = 0.371$; $p = 0.157$).

Conclusions: Sport lead to similar muscular adaptations in the upper body (hand-forehand and shoulder) in male paralympic athletes with a locomotor impairment. However PA competing in skill sports seems to improve strength of lowering shoulder muscles more than handgrip muscles.

Acknowledgments: (non obbligatorio).

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P0095 - THE EMOTIONAL AND MOTIVATIONAL COMPONENTS INVOLVED IN PHYSICAL EDUCATION DURING THE ADOLESCENT PERIOD: A SYSTEMATIC REVIEW

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Purpose: During adolescence emotional and relational factors could influence the physical education experience by affecting motivation. Lower levels of perceived self-efficacy have been shown to negatively influence students’ intentions to engage in physical activity (Lodewik, 2018), which may, in turn, compromise their overall educational development and success. The present systematic review investigates how these variables can be included within a coherent theoretical framework aimed at informing the planning of educational pathways capable of promoting meaningful and lasting learning. The primary aim is to identify which dimensions that should be systematically integrated into the planning and execution of physical education programs to foster autonomous, motivated, and skillful participation.

Methods: The review included 21 peer-reviewed articles published between 2018 and 2025, identified through systematic searches across Google Scholar, PubMed, EBSCO, Scopus, and MDPI databases. Keywords used included: *Self-determination in physical education*, *emotivity in physical education*, *physical education in secondary school*. The selected studies included both empirical and theoretical contributions, all situated within the context of secondary education.

Results: Eight studies emphasized the role of collaborative pedagogical approaches, specifically gamification (Soriano-Pascual et al., 2022) and the integration of traditional games (Aliriad et al., 2024), in promoting student participation. Other studies, however, have correlated the role of psychological needs in the development of motivational regulation with active participation during physical education lessons (Yun et al., 2024). Student’s perception of their own competence, alongside their actual performance level, can positively influence their self-determination and involvement (Estevan et al., 2020). Also the teacher’s attitude and the type of activity proposed can also affect the student’s motivation (Van Doren et al., 2021).

Conclusions: The reviewed studies suggest that motivation should not be regarded as an individual datum, independent of educational proposals, but rather as the product of an intentional educational relationship. In this perspective, physical education has the potential to significantly enhance adolescents’ psychophysical and social well-being, fostering more equitable and participatory educational pathways, particularly when teachers actively contribute to the development of inclusive and meaningful learning environments, oriented towards ‘meaning’ rather than mere performance.

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References: (non obbligatorio).

P0096 - THE EFFECT OF TELEREHABILITATION IN IMPROVING COGNITIVE AND GAIT PERFORMANCES

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Purpose: Previous studies reported a close relationship between gait and cognitive performances in adults. However, to date, literature data concerning the potential beneficial role of cognitive rehabilitation protocols on motor function are still scarce. The aim of this study was to evaluate whether a cognitive rehabilitation protocol, administered via a telerehabilitation app, can determine improvements in the motor and neuropsychological performance in cognitively unimpaired adults affected by subjective cognitive decline.

Methods: Twenty participants (7 males, 13 females, mean age = 63.72 ± 9.1 years, mean education = 12.16 ± 6.39 years) were enrolled. All the subject underwent a comprehensive neuropsychological evaluation and gait analysis at a baseline and after 8-weeks of telerehabilitation protocol carried out through NeuroNation, administered twice a week. Timed Up and Go Test (TUG) was performed by each participant and the relevant parameters were acquired by means of a wearable sensor positioned near S2-S3 of each subject. To estimate patients' cognitive level, a neuropsychological assessment battery consisting of 25 different tests was administered (MMSE, MoCA, FAB, HAM-D, EQTOT, EQCE, EQER, EQSS, TAS-20TOT, TAS-DIF, TAS-DDF, TAS-EO, TOM, MAC-Q, ReyImm, ReyDiff, Prosaimm, Prosadiff, StroopTempo, StroopErrori, TMT-A, FAS, RAVEN, Clock, Copiafigure).

Results: After the rehabilitation protocol, a significant improvement was observed in the Memory Assessment Clinics Questionnaire (Mdiff = -9.1 $r = 0.85$), in the Toronto Alexithymia Scale Externally-Oriented Thinking (Mdiff = 4.6 *choens'd* = 0.67), in the Immediate Prose Memory (Mdiff = 11.7 $r = 0.87$), and the Delayed Prose Memory (Mdiff = 15.4 $r = 0.87$). Furthermore, motor improvements were observed in the sit-to-stand transition times: Sit to stand duration (Mdiff = -0.16 ; Cohen's $d = 0.66$) and Stand to sit duration (Mdiff = -0.33 ; $r = 0.71$). A significant improvement was also observed in walking speed, with reductions in Walking-out duration (Mdiff = -0.91 ; Cohen's $d = 0.66$) and Walking-in duration (Mdiff = -0.84 ; Cohen's $d = 0.66$).

Conclusions: The present study supported the beneficial role of cognitive rehabilitation in sustaining psychomotor skills in adults with cognitive decline. These findings seem to suggest that the applied telerehabilitation offers a feasible and effective approach to delivering rehabilitation interventions, potentially improving access to care and promoting functional independence.

P0097 - APPLICATION OF A SPORTS NUTRITION PROTOCOL IN "NON-ATHLETE" SUBJECTS AIMED AT BODY RECOMPOSITION: AN OBSERVATIONAL STUDY

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Purpose: Individuals with low levels of physical activity and above-normal fat mass often require targeted nutritional interventions to

achieve weight loss. However, such interventions frequently result in concurrent reductions in both fat mass and lean body mass. This observational study aimed to assess changes in body composition, specifically, fat mass reduction while preserving lean mass, in non-athlete individuals engaging in mild physical activity. Participants followed a structured nutritional protocol based on sports nutrition guidelines typically designed for athletes, particularly regarding protein intake and macronutrient distribution.

Methods: Measurements were carried out on 57 subjects aged $34.5 (\pm 15.87)$ who carried out 'Fitness' physical activity 3 times a week, therefore a mild physical activity. The measurements were taken before (T0) and after (T1) a minimum period of 3 months from the start of the nutritional plan. The measurements were carried out with a multi-frequency BIA “InBody 320”.

Results: Non-athlete subjects who received an application even for short periods (3 months) of a specific nutritional protocol for athletes accompanied by mild physical activity seemed to obtain an improvement in body composition, a decrease in weight ($p < 0.001$), in particular a reduction in fat mass ($p < 0.001$), and a maintenance, and sometimes also an increase in lean mass, i.e. metabolically active mass ($p < 0.001$). No less important aspect is represented by the improvement of general health conditions with the improvement of blood chemistry parameters, with the reduction of the possibility of developing metabolic syndrome and with the increase in basal metabolism at the end of the course, which guarantees greater stability over time of the achieved results.

Conclusions: In conclusion, the nutritional protocol structured according to athlete-specific guidelines proved effective in promoting fat mass reduction while preserving—or in some cases enhancing—lean body mass, alongside an increase in basal metabolic rate. These findings suggest that such nutritional strategies can be beneficial for improving body composition even in non-athlete individuals with low to moderate physical activity levels. Furthermore, the observed improvements in general health indicators support the potential safety and efficacy of these protocols when applied over short-term periods.

P0098 - THE PHARMACY SERVICES AS A HEALTH HUB FOR THE MILANO-CORTINA 2026 WINTER OLYMPICS: AN INTEGRATED MODEL OF HEALTH, SPORT, AND TERRITORY

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The Milano-Cortina 2026 Winter Olympics, spanning multiple Alpine regions, will attract millions of visitors and generate significant economic activity. In this context, ensuring widespread, timely, and integrated health services becomes a strategic priority for public health protection. The Pharmacy services emerges as a sustainable and innovative solution, capable of providing clinical services directly in the community, thus contributing to both prevention and the reduction of hospital burden. The proposed model includes first-level screening services (e.g., blood glucose, cholesterol, respiratory infections) and second-level services (e.g., blood pressure monitoring, oxygen saturation, spirometry, and real-time ECG), as well as vaccinations, rapid diagnostic tests, and active epidemiological surveillance. The experience from events such as London 2012 Olympic and Paralympic Games and PyeongChang 2018 Winter Olympics has shown how pharmacists, integrated into

multidisciplinary teams, can contribute to the safe management of medications, anti-doping compliance, and the control of health emergencies in complex environments. The implementation of well-equipped territorial pharmacies, staffed by multidisciplinary teams including pharmacists, exercise science professionals, nutritionists, physiotherapists, and nurses, will enhance healthcare support for both athletes and the general public. This approach will promote infection prevention and optimize clinical, nutritional, and functional interventions. Furthermore, continuous monitoring of pharmaceutical dispensing data will enable the early detection of potential infectious outbreaks.

Such a model could reduce pressure on hospital facilities while ensuring timely and accessible care. The Pharmacy services thus becomes a true health hub, fully integrated with the National Health Service and capable of enhancing multidisciplinary expertise. Its application during the Milano-Cortina 2026 Winter Olympics will help align the host regions with international public health standards for large-scale events, strengthening the connection between sport, health, and the local community.

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P0099 - OUTDOOR PHYSICAL ACTIVITY IN ELDERLY WOMEN OVER 65: EFFECTS OF DIFFERENT COMPLIANCE ON BALANCE PERFORMANCE

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Purpose: The exposure to natural environments and social interaction further contribute to a better quality of life and reduced risk of cognitive decline [1]. The effort to change sedentary lifestyles uses a wide variety of strategies to adapt to the highly heterogeneous elderly population [2]. So far, physical-recreational activity has received only modest attention, although it is recognized that it is the first step toward an active lifestyle and, therefore, successful aging. [3]. This study aims to (a) test the effectiveness of recreational physical activity on the balance performance of women over 65, (b) ascertain what level of compliance may actually provide greater advantages for balance.

Methods: This is a retrospective, observational cohort study using data from a health project activated in a small town in the South of Italy in the 2023 (from June to July). A sample (n = 45) women over

65-years-old (68.6 ± 2.9 years, 69.8 ± 5.4 kg, 166.2 ± 3.7) participated in the investigation. The activity under observation lasted 12 weeks and included 3 sessions/week for a total of 36 classes. The compliance to the outdoor physical activity sessions was noted for each participant, and 3 subgroups were obtained as follows: a) with compliance of at least 33.3% (1 lesson/week, n = 12), b) with compliance between 33.3% and 70% (2 lessons/week, n = 19), and c) with compliance > 70% (approximately 3 lessons /week, n = 14). The assessment was conducted through the following the 8-foot-up-and-go test (8foot) to evaluate dynamic balance and speed walk, Single Leg Stance test (SLST) to evaluate the static balance, Tandem Walk test (TW) was used to assess the dynamic balance.

Results: The subgroup with > 70% adherence showed statistically significant differences (baseline vs final values, $p < 0.01$) in the 8-foot, SLST, TW; the subgroup with > 70% adherence also showed statistically significant differences ($p < 0.05$) when comparing the final values against the 33.3–70% adherence subgroup in the 8foot (7.4 ± 1.6 vs 8.7 ± 1.9 s) and in the SLST (19.9 ± 2.5 vs 16.1 ± 2.9 s). No statistically significant differences were observed in the group with compliance of 33.3% between baseline and final values.

Conclusions: Balance can also be increased through outdoor physical activity in the elderly population. Compliance plays a crucial role in increasing this function. Adapted physical activity kinesiologists should monitor the compliance of elderly during outdoor classes.

Acknowledgments: (non obbligatorio).

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P0100 - THE ROLE OF PHYSICAL ACTIVITY IN FOSTERING CREATIVE THINKING: EFFECTS OF DIFFERENT TEACHING STYLES IN PHYSICAL EDUCATION FROM AN ECOLOGICAL-DYNAMICS PERSPECTIVE

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Purpose: Physical activity plays a key role in cognitive and emotional development, with growing evidence supporting its impact on creativity and adaptive thinking.

The WHO highlights creative thinking as essential for well-being, similarly movement provides a dynamic, information-rich context for problem-solving and self-expression. From an ecological-dynamics perspective, creativity in movement emerges through self-organization, perception–action coupling, and affordance exploration. Nonlinear motor learning theories suggest that free initiative, adaptive coordination, and exploratory behavior enhance divergent thinking. This study investigates the role of physical activity in fostering creative thinking by comparing two teaching styles: a prescriptive approach, promoting reproductive behavior, and a productive approach, encouraging exploratory and adaptive movement solutions in physical education.

Methods: A quasi-experimental study was conducted with 107 primary school students (mean age 7.5 ± 0.50), randomly assigned to either an experimental group (n = 57), engaging in creative movement activities, and a control group (n = 50), involved in traditional, prescriptive PE lessons.

Treatment activity for the two groups took place over nine weeks, with weekly one-hour sessions. The assessment of creative thinking involved the administration of the ACR test in pre- and post-test phases.

Results: The results indicate improvements in cognitive expansion (A) within each group when comparing pre- and post-intervention data. The productive teaching approach group consistently outperformed the control group, with percentage increases of 9.33% vs. 21.33%, respectively.

For item A1, both groups improved (16% control vs. 17.5% experimental). However, greater differences emerged in items A2 and A3. In item A3, the control group improved by 6%, while the experimental group reached 21%. The most significant difference was observed in item A2, where the control group improved by 6%, while the experimental group achieved a 26% increase ($p < 0.05$).

Conclusions: These findings support the ecological-dynamics framework, suggesting that a productive teaching approach may enhance exploratory movement strategies, improving motor adaptability and creative problem-solving. By allowing students to interact with affordances and self-organize movement solutions, this approach might foster nonlinear learning and self-determined behavior, reinforcing creative thinking.

From an educational perspective, integrating productive teaching styles in PE curricula could promote active exploration, adaptability, and cognitive flexibility, leading to enhanced creative capacities. Future research should explore the long-term impact of creativity-based PE interventions and assess whether these cognitive gains can be transferred to other life contexts.

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P0101 - THE ACTION STUDY: A MULTIDISCIPLINARY EDUCATIONAL CAMP EXERCISE- AND NUTRITION- BASED TO IMPROVE GLYCEMIC CONTROL IN ADULTS WITH TYPE 1 DIABETES

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Purpose: Educational camps aimed at managing exercise for people with type 1 diabetes (T1D) have grown in popularity in recent years. The collaboration of multiple practitioners offer participants tailored strategies to manage glycemic fluctuations during the exercise practice. In addition, physical exercise has to be supported by a proper nutritional approach and mental attitude. Therefore, the aim of this study was to evaluate the effectiveness of an educational diabetes camp analyzing participants glycemic control and strategies to improve exercise management in people with T1D.

Methods: 48 adults (42.4 ± 12.3 years; 21 (47.7%) women) with T1D were recruited through consecutive sampling for the ACTION study. Participants were divided into two groups ($n = 24$ each): an exercise- and nutrition- based educational camp group (EG) was compared to a usual care group (UC). Glycemic control outcomes (HbA1c, GMI, Time-in, above, and below range, mean, and CV of glucose) were assessed 3 months before and after the intervention. Moreover, the IPAQ-SF and IFIS questionnaires were filled out by the participants at both time points. A generalized linear mixed model for repeated measures was conducted to determine the intervention effects on primary and secondary endpoints.

Results: Results indicated that EG had significantly greater reductions in HbA1c, GMI, time above range, mean glucose, and SD compared to the UC ($p < 0.050$). Moreover, a significant increase for EG time in range compared to the UC was found while no differences are shown in the time below range ($p = 0.010$). However, self-reported physical activity, sedentary time, and fitness perception did not differ between groups ($p > 0.050$). No participants dropped out of the EG, while four dropped out of the UC.

Conclusions: Our findings highlighted that an educational camp with a multidisciplinary approach improves glycemic control management in adults with T1D, potentially lowering the risk of diabetes complication as shown by decrease in HbA1c and GMI. These results enhance the effectiveness of structured educational interventions. Future research should be focused on the long-term sustainability of these outcomes and the promotion of awareness-based multidisciplinary approach in T1D management.

Acknowledgments: (non obbligatorio).

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P0102 - THE USE OF GAMIFICATION IN PHYSICAL EDUCATION: PRELIMINARY RESULTS ON THE EFFECTIVENESS IN GROSS MOTOR COORDINATION, ENJOYMENT AND SATISFACTION IN PRIMARY SCHOOL CHILDREN

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Purpose: Gamification is defined as the use of typical game elements in non-game contexts, to encourage participation and involvement. For this motivational aspect, gamification has the potential to be used for educational purposes to optimize students' learning. This study aimed to explore the use of gamification in physical education (PE) on gross motor coordination, enjoyment and satisfaction in a fourth-grade class and to compare the results with those of a class that carried out traditional PE.

Methods: Two fourth-grade classes were involved: the experimental class (EC; $n = 24$) exposed to a gamified program in PE, and the

control class (CC; $n = 18$) performing the traditional PE. The classes were evaluated before (T0) and after (T1) 8 weeks, in which 2 lessons per week were scheduled. The gamified program used the ClassDojo application, where each student chose an avatar and in each lesson the teacher assigned specific points to each of them. In each lesson, students were introduced, through storytelling, to an adventure in which they had to recover the gems of movement. Each lesson consisted of different missions and points with the aim of exercising a specific gross motor skill. The Test of Gross Motor Development-3 (TGMD-3) was used to assess locomotion skills (LS), ball control skills (BS), and global gross motor coordination (GGMC). To evaluate the perception of enjoyment of the physical activity practiced, the Physical Activity Enjoyment Scale (PACES) was administered. Moreover, the Satisfaction With Physical Activity was used to assess the level of satisfaction derived from the practice of physical activity. **Results:** For the TGMD-3, although in the LS we found significant improvements from T0 to T1 in both classes, the EC showed higher enhances ($p < 0.001$) compared to the CC ($p = 0.026$). both groups showed the same significant improvements from T0 to T1 in the BS ($p < 0.001$) and in the GGMC ($p < 0.001$). Results from the PACES, showed that both the EC and the CC enjoyed significantly the physical activity ($p < 0.01$), while in the Satisfaction With Physical Activity only the EC improved significantly the satisfaction derived from the practice of physical activity from T0 to T1 ($p < 0.05$).

Conclusions: Although practicing PE through gamification seems to lead to greater satisfaction than traditional lessons, further studies are required to evaluate whether this intervention can lead to effective motor learning.

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P0103 - ACTIVE BREAKS TO REDUCE SEDENTARY BEHAVIOUR AMONG OFFICE WORKERS: A PROTOCOL STUDY

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Purpose: Sedentary behaviour (SB) is associated with increased risk of metabolic disorders, cardiovascular diseases, all-cause mortality, and accelerated decline in musculoskeletal power. Office workers are particularly vulnerable, spending up to 82% of their working hours in SB. Active breaks (ABs), defined as brief bouts of physical activity integrated into the workday, could represent a promising strategy to mitigate SB and its related health risks. This protocol study describes the design of an ABs intervention to be implemented during working hours, with the aim of reducing SB.

Methods: A non-randomized controlled study will be conducted among sedentary office workers, who will self-select into an intervention group (IG) or a control group (CG). Both groups will be assessed at baseline (T0) and after four months (T1) using accelerometers (ActiGraph WGT3X) and the following validated questionnaires: Nordic Musculoskeletal Questionnaire, Job-related affective well-being scale, Copenhagen Burnout Inventory, Stress Indicator Tool, International Work Addicted Scale. Additional ad-hoc Likert-scale items will explore satisfaction regarding the work environment.

The IG will take part in a four-month ABs intervention, starting with a 30-min counseling session with a kinesiologist and continuing with three short daily videos (≤ 5 min each) promoting ABs during working hours. To monitor adherence, compliance and engagement, IG participants will complete brief daily surveys during two weeks at the beginning and two weeks at the end of the intervention, and an adherence diary for the full four-month ABs intervention. A final ad-hoc ABs programme satisfaction questionnaire will also be administered to the IG.

Results: Results will be available at the end of the intervention. Pre-post and between-group analyses will be performed to evaluate the effects of ABs on SB and on workers' physical and psychological well-being.

Conclusions: This protocol study outlines a research project aimed at implementing ABs in the workplace. The findings will contribute to a better understanding of the effects of ABs on SB and workplace well-being.

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References: (non obbligatorio).

P0104 - SIX MONTHS OF BIKRAM YOGA: EFFECTS ON BODY FAT IN ADULT WOMEN

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Purpose: Bikram Yoga is a type of yoga performed in a heated room (about 40 °C, high humidity). It consists of a fixed sequence of 26 postures and two breathing exercises for 90 min. The goal is to improve flexibility, strength, balance, and detoxification through heavy sweating. The aim of this study was to investigate the effects of a 6-month Bikram Yoga training program on body fat percentage in women of different age groups and training frequencies using anthropometric measurements.

Methods: $N = 30$ women aged 20–65 years were recruited and stratified by age (20–35, 36–50, 51–65) and training frequency (1 vs. 3 times per week). Participants completed a 6-month supervised Bikram Yoga program. Body composition was monitored at four time points (T0, T1, T2, T3) using anthropometric measures (skinfolts and girths). Body fat percentage was estimated using multiple prediction equations from the Exercise Science Toolkit software, with the median of all equations and a single total value as the primary outcome.

Results: In the entire sample, body fat percentage decreases significantly from $29.38 \pm 6.57\%$ at T0 to $23.55 \pm 5.69\%$ at T3. For women who trained 3 times per week ($N = 23$), it decreased from $30.35 \pm 7.00\%$ to $24.09 \pm 6.13\%$; for women who trained 1 time per week ($N = 7$), it decreased from $26.16 \pm 3.69\%$ to $21.77 \pm 3.73\%$. The results stratified by age showed that the proportion of the 20–35 age group ($N = 12$) decreased from $27.33 \pm 5.44\%$ to $21.43 \pm 4.10\%$, the proportion of the 36–50 age group ($N = 11$) decreased from $29.99 \pm 8.42\%$ to $23.75 \pm 7.19\%$, and the proportion of the 51–65 age group ($N = 7$) decreased from $31.93 \pm 4.43\%$ to $26.87 \pm 4.18\%$. It is worth noting that the 20–35 age subgroup with a 3 times per week frequency ($N = 8$) showed the most significant improvement ($28.54 \pm 5.75\%$ to $21.92 \pm 4.38\%$), while the 51–65 age subgroup with a 1 time per week frequency ($N = 2$) showed a

slight decrease ($28.05 \pm 2.69\%$ to $23.83 \pm 4.70\%$). Although the samples were small for some subgroups, overall trends indicated continued improvement in all domains.

Conclusions: A regular Bikram Yoga regimen considerably modified body composition in adult women over a span of six months. The amount of fat loss was more pronounced in younger individuals and those engaging in more regular practice, indicating a dose–response relationship. The findings endorse the incorporation of Bikram Yoga as a viable strategy for enhancing body composition in older women.

P0105 - MUSCLE SYNERGY ANALYSIS IN SPORT FROM AN ECOLOGICAL DYNAMICS PERSPECTIVE: A SYSTEMATIC REVIEW AND NARRATIVE SYNTHESIS

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Purpose: Muscle-synergy analysis is increasingly used to describe neuromuscular coordination in sport, yet findings are highly dependent on EMG protocols and decomposition techniques. Adopting an ecological-dynamics lens, viewing synergies as order parameters that emerge from the athlete–task–environment interaction, this review updates current knowledge by quantifying the number, composition and explained variance of synergy modules and by examining the influence of movement type and athletic experience.

Methods: Following PRISMA 2020 and SWiM guidelines, PubMed, Scopus, Web of Science and SPORTDiscus were searched up to 30 April 2025. Two independent reviewers selected 35 peer-reviewed, English-language studies involving athletes ≥ 18 years. Extracted data included sport/movement analysed, sample characteristics, EMG parameters, decomposition algorithm, number of synergies and risk of bias.

Results: Non-negative matrix factorisation (NMF) was the predominant algorithm (30/35 studies, 86%), whereas the remaining five studies (14%) used mixed decomposition methods. Explained-variance thresholds ranged from 80 to 95%, with no shared standard. Only 13 studies explicitly reported the number of synergies: cyclic movements typically exhibited 2–4 modules explaining $> 90\%$ of EMG variance; strength/training exercises showed 2–3 synergies governing the extensor chain and trunk stabilisation; individual precision sports displayed 3–4 sequential modules. Twenty-eight studies (80%) enrolled fewer than 15 athletes, and only three ($\sim 9\%$) applied systematic muscle-selection criteria, limiting generalisability.

Conclusions: This review offers one of the first sport-specific comparative overviews of muscle-synergy research. Results support the self-organising nature of synergy modules but reveal substantial heterogeneity in EMG protocols and analyses and a lack of shared guidelines. The main limitations are small sample sizes, a marked male predominance and variability in EMG settings. Future priorities are: (i) standardising signal acquisition and decomposition (with NMF

currently dominant); (ii) enlarging samples, particularly in female sport; and (iii) transparently reporting methodological choices so that synergy analysis can become a reliable tool for neuromuscular training and injury prevention.

P0106 - EFFECTS OF CLUSTER VS. TRADITIONAL RESISTANCE TRAINING PROTOCOLS ON HEMODYNAMIC RESPONSES IN PATIENTS WITH CORONARY ARTERY DISEASE: PRELIMINARY STUDY

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Purpose: In this preliminary study, we aimed to investigate the effects of two different resistance training protocols—each involving a distinct load condition—on hemodynamic responses of patients with coronary artery disease. Specifically, we assessed systolic (SBP) and diastolic (DBP) blood pressure, heart rate (HR), stroke volume (SV), cardiac output (CO) and rate of perceived exertion (RPE) in four patients with coronary artery disease (age: 68.0 ± 3.6 yr).

Methods: Two resistance training protocols—a traditional (TRAD) and a cluster (CLUSTER) format—were investigated using a bilateral leg press (LP) exercise. Both protocols followed a configuration of three sets of twelve repetitions: 3×12 for TRAD and $3 \times (4 + 4 + 4)$ for CLUSTER. Rest intervals between sets were standardized at 90 s for both protocols. However, the distribution of rest differed: in the TRAD protocol, the entire rest period was taken after each set, while in the CLUSTER protocol, it was split into two 15-s intra-set rests (between repetition clusters) and one minute post-set. Training load was set at 60% of the estimated one-repetition maximum (1RM), calculated using Brzycki’s formula based on a 10RM test, a method preferred for cardiac patients. Hemodynamic variables were recorded at the end of each set. Systolic (SBP) and diastolic (DBP) blood pressure were measured manually by a trained operator using a sphygmomanometer and a stethoscope. Heart rate (HR), stroke volume (SV), and cardiac output (CO) were measured using the Physioflow QLink device and recorded via its proprietary software (Physioflow Software v2.8.9).

Results: Compared to pre-exercise values, SBP and HR at the end of each set were higher for TRAD protocol compared to the CLUSTER protocol: SBP: SET1 11 ± 8 vs 9 ± 5 mmHg, SET2 15 ± 13 vs 11 ± 3 mmHg and SET3 22 ± 9 vs 12 ± 2 mmHg; HR: SET1 18 ± 4 vs 8 ± 7 bpm, SET2 21 ± 5 vs 11 ± 9 bpm and SET3 22 ± 4 vs 14 ± 10 bpm. However, no differences were found between training methods on DBP, SV, CO and RPE.

Conclusions: Based on these preliminary findings, it could be speculated that a CLUSTER set protocol may help attenuate the rise in SBP and HR during bilateral leg press exercise in individuals with coronary artery disease. These results could be helpful for trainers to encourage the use of CLUSTER protocols in cardiac patients.

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P0107 - TOWARDS IMITATION AND BEYOND: THE HIDDEN SKILLS OF 3–5 YEAR OLDS

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Purpose: This study addresses play-motricity, a guided play and movement experience, made up of motor and body patterns, prematurely introduced into the everyday life of children already from early childhood. It is now proposed by numerous sports organisations due to the change in human lifestyle, conditioned by an increasingly technological but even more sedentary society. The focus is on demonstrating that motor learning in children occurs through the activation of “hidden,” intrinsic abilities, not easily interpreted by the untrained adult eye. They are related to the mirror neuron system, to observation and to spontaneous imitation. The influence of empathy, emotions, along with para-verbal and non verbal communication is also discussed.

Methods: The research is developed based on scientific articles from the Pubmed database, on insights from texts on child psychology and the teaching of team sports didactics, particularly related to basketball and rhythmic gymnastics. Finally, there are also considerations drawn from personal experiences as an instructor, resulting from direct observation of a group of mixed-age children, between the ages of 3 and 5 years old, participating in play-motricity lessons.

Results: Scientific findings have confirmed that there is no motor learning without the activation of certain areas of the brain, without direct observation and without the enactment of movement itself, associated with cognitive-neural and emotional aspects. Nevertheless, how exactly the mirror neuron system develops in early childhood is still unclear but its activation is evident during motor learning through observation and imitation.

Conclusions: In conclusion, the literature has given us evidence that motor experience is important and can change the way children perceive and process actions they observe. Therefore, the play-motricity instructor has a fundamental role in a child's life and possesses the power to teach movement through play.

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P0108 - RHYTHMIC ABILITY IN SPORT: AN EXPERIMENTAL STUDY WITH YOUNG ATHLETES

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Purpose: This work is the continuation of research carried out with young athletes practicing track and field. Daily human activities are marked by a circadian rhythm and the cyclical nature of the events is a determining factor in the life of human beings themselves. Athletic activity does not take away from this process and in athletic disciplines such as track and field the essential role of this factor is highlighted. The aim of this study is to examine individuals' rhythmic ability and their sensitivity to it, when practicing track and field, to improve athletic performance.

Methods: The research examined a non-parametric sample and involved 20 individuals between the ages of 12 and 13, divided into two homogenous groups: 10 subjects in the work group (GL) and 10 subjects in the control group (GC).

All the participants were evaluated at the beginning of the observation period (T0) and also at the end of the observation period (T1). They underwent four motor tests: standing long jump, 60 m dash, 60 m hurdles, and the Sergeant test. The observation period lasted two and a half months, from October to December, and the individuals attended practice three times a week.

Results: The statistical analysis conducted has revealed that the experimental group, benefitting from the rhythmic protocol, registered significant statistical improvements in the various tests that were administered. It is essential to push for the introduction of specific training based on rhythm for building efficient and successful performances starting with the category of young athletes.

Conclusions: This model contributes to achieving spatial-temporal awareness and to the realization of an efficient motor action. It highlights the important contribution that this motor skill makes to the process of learning motor gestures in young athletes. It would be advantageous to continue rhythmic sensitization activities over time and extend them to other track and field disciplines (such as jumping, throwing, etc.) on more numerous and mixed work groups.

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P0109 - EFFECTS OF PHYSICAL EXERCISE TRAINING AS SUPPORTIVE CARE IN PATIENTS AFFECTED BY CANCER CACHEXIA

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Purpose: Cancer-cachexia (CC) is a multifactorial syndrome characterized by involuntary weight loss, muscle mass impairment, and functional decline. CC is prevalent in patients with advanced, gastrointestinal, or thoracic cancer, and it is associated with a reduction in quality of life and an increased risk of mortality. To date, no effective standard treatments for CC exist, and data about the role of exercise are lacking. This study explores the feasibility and impact of exercise in patients with CC.

Methods: Nine patients with CC ($n = 6$ pancreatic, $n = 2$ breast, $n = 1$ head and neck cancer) were enrolled at the Oncology Unit of the University of Verona. A 12-week supervised exercise intervention, twice a week, including progressive aerobic and resistance training, and performed at moderate intensity, was proposed. Assessments included body composition, using the bioimpedance analysis, muscle strength, with the handgrip strength test, functional capacity, using the 6-minute walking test, flexibility, with the chair sit and reach and back scratch tests, anthropometric values, i.e., weight, body mass index (BMI), and waist-to-hip ratio, and quality of life using the EORTC QLQ-C30. Descriptive statistics and Paired t-tests were applied.

Results: The median attendance rate to exercise was 77%, 75% for aerobic, and 79% for resistance training. One mild adverse event (nausea) was registered during the sessions. At post-intervention, no changes were observed for muscle mass (42.7 ± 7.7 kg vs. 41.7 ± 6.2 kg, $p = 0.297$), fat-free mass (42.4 ± 10.6 kg vs. 42.1 ± 9.1 kg, $p = 0.665$), body fat percentage ($20.9 \pm 11.3\%$ vs. $19.3 \pm 12.1\%$, $p = 0.254$), and waist-to-hip ratio (0.844 ± 0.113 vs. 0.839 ± 0.136 , $p = 0.789$). Significant improvements were found for muscle strength (44.9 ± 12.8 kg vs. 48.6 ± 14.8 kg; $p = 0.011$), functional capacity (442.6 ± 126.6 m vs. 506.0 ± 80.1 m; $p = 0.027$) and lower-limb flexibility (-9.7 ± 11.8 cm vs. -5.0 ± 12.5 cm ($p = 0.028$)). Concerning EORTC QLQ-C30, an improvement in the emotional functioning domain (62.0 ± 32.3 vs. 73.1 ± 28.1 , $p = 0.007$) was detected.

Conclusions: This study suggests that an exercise program is feasible and safe for patients with CC. Although no significant changes in body composition were observed, the intervention prevented further weight and muscle loss. Improvements in physical function and emotional well-being support exercise as a valuable supportive strategy.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0110 - WITHIN-SET RANDOMIZED LOAD MODULATION ENHANCES STRENGTH GAINS: A CROSSOVER COMPARISON WITH TRADITIONAL CONTRAST TRAINING IN RECREATIONALLY TRAINED FEMALES

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Purpose: The continuous advancement of training techniques and equipment has prompted the exploration of novel strength training methodologies. This study aimed to evaluate the effectiveness of a contrast set training approach using a device with within-set randomized load modulation, compared to traditional contrast training. The goal was to determine which method yields greater strength adaptations and practical applicability.

Methods: A randomized crossover design involved ten recreationally trained female participants (aged 20–30), recruited from the HumanDesign Center, a fitness facility in Canavaccio, Italy. All had at least six months of resistance training experience and no current shoulder-specific programs. Each participant completed two 8-week interventions, separated by a 3-month washout. Participants were randomly assigned to begin with either the randomized load or traditional contrast training condition, switching modalities after the washout. Both protocols involved unilateral dumbbell lateral raises for both arms. The randomized load condition used a device applying load variations within each repetition (75–85% 1RM; 4 sets of 7 reps). The traditional condition followed a contrast set scheme (9-5-9-5 reps at 75% and 85% 1RM). Tempo was standardized at 30 bpm using a metronome, and participants trained with their backs against a wall to minimize compensation. Maximal isometric strength of the shoulder abductors was tested pre- and post-intervention at 90° shoulder abduction using three 5-s contractions with 3-min rests. Both peak force and mean force over 5 s were recorded. Anthropometrics, training history, and max loads were collected at baseline. Data were analyzed with repeated measures ANOVA using JASP.

Results: Both training conditions improved isometric strength. However, the randomized load condition led to significantly greater gains in both peak and mean force ($p < 0.05$). These results were confirmed when group assignments were reversed post-washout, demonstrating reproducibility.

Conclusions: Within-set randomized load modulation resulted in superior strength adaptations compared to traditional contrast training. This approach shows promise for both performance enhancement and rehabilitation, warranting further research into its broader applications in strength training.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0111 - THE EFFECTS OF FLYWHEEL INERTIAL VERSUS TRADITIONAL RESISTANCE TRAINING ON VERTICAL JUMP: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Purpose: Recently flywheel inertial training (FIT) is widely used to maximize the gains on strength [1]. Accordingly, significant enhancement on sport-specific abilities [2] and lower injury risk were observed [3]. In the literature few studies have investigated the benefits elicited by FIT compared with several strength methods in soccer training. Therefore, the aim of this systematic review and meta-analysis (SRMA) is to compare the effects of flywheel protocols than traditional resistance training (TRT) on vertical jump (VJ).

Methods: PubMed, Scopus, Web of Science and SportDiscuss were used to search for original articles up to 09 March 2025. In the present SRMA the studies included strictly adhered to the PICOS criteria: i) *population*: soccer player of each age and level; ii) *intervention*: flywheel protocols; iii) *comparator*: TRT program; iii) *outcomes*: pre-

post values on vertical jump test; iii) *study design*: randomized studies. The methodological quality of the study included was measured using PEDRo scale [4]. Means and standard deviations for VJ of FIT were used to compute the Hedges' g effect size (ES). The ES were interpreted using the following thresholds [5]: < 0.2, trivial; 0.2–0.6, small; 0.6–1.2, moderate; > 1.2–2.0, large; > 2.0–4.0, very large; > 4.0, extremely large. In all analysis p-value < 0.05 was considered statistically significant. Statistical analysis were carried out using Jasp.

Results: An electronic search yielded 1685 articles, four of which were included in the SRMA involving commonly amateur soccer players. One study receiving 5 points was deemed to have moderate methodological quality, while the remaining three studies obtaining 6–10 points were assessed as high methodological quality. Between-group analysis showed a significant benefits favoring FIT over TRT in VJ (ES = 1.67; $p = 0.001$). A within-group analysis reported a significant favoring effect of FIT (ES = 1.22; $p < 0.001$) and TRT (ES = 0.34; $p = 0.006$) to improve the capacity of VJ in soccer players.

Conclusions: FIT e TRT are considered as valid methods to increase VJ of soccer players. The findings suggest that flywheel protocols should be supplemented during strength sessions in order to provide greater advantages on this sport-specific ability. However, considering few studies and the sample tiers, it is needed to extend this topic on elite soccer players.

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P0112 - COMPARATIVE ANALYSIS OF PHYSICAL ACTIVITY, CLIMACTERIC SYMPTOMS, AND OPTIMISM IN EARLY VS LATE POSTMENOPAUSAL WOMEN

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Purpose: Numerous studies highlight the importance of maintaining a healthy lifestyle and being physically active to improve quality of life and reduce the risk of developing chronic non-communicable diseases. These precautions are particularly crucial for menopausal women, as the reduction in estrogen levels can lead to increased body fat, stress, and depression. These changes often result in feelings of inadequacy and a reduced desire to exercise and care for oneself. This cross-sectional study aims to evaluate the differences in physical activity (PA), body composition, climacteric symptoms, and optimism between women in early and late postmenopause.

Methods: The sample included 20 women, divided into early postmenopause (EP; $n = 10$) and late postmenopause (LP; $n = 10$)¹. All women wore the accelerometers Actigraph GT3X + 4 consecutive days to monitor their levels of PA (sedentary, light PA, moderate-vigorous PA and steps/day). The cut-off points proposed by Kamada et al.² were considered and physical activity was classified according

to WHO³ guidelines. Body mass index was calculated, and the presence of obesity was considered for values $\geq 35\%$ ⁴. Climacteric symptoms were evaluated using the Greene Climacteric Scale⁵, and the Revised Life Orientation Test⁶ was used to assess optimism. Data were summarized using descriptive statistics, and analysis was conducted using either the Student's t-test or the Mann-Whitney test. Significance was accepted as $p \leq 0.05$.

Results: The majority of the sample had a natural menopause (95%) and didn't report using hormone therapy (85%). Differences in age ($p = 0.01$) were identified between the two groups under analysis (55.80 ± 4.84 years in EP and 62.32 ± 5.28 years in LP), and obesity was identified in 9 participants.

Most of the sample was physically active (90%), but 75% of them took fewer than 10,000 steps per day. The average Greene Climacteric Scale score was 0.96 points (± 0.57), with significant differences ($p = 0.05$) observed only between the two groups in relation to vasomotor symptoms. Women in LP presented less sedentary behaviour (3833.30 min/week in LP and 4125.00 min/week in EP; $p = 0.05$) and a higher number of daily steps (9769.30 and 7733.00, respectively).

Conclusions: The findings suggest that women who have been menopausal for more than 6 years experience higher levels of vasomotor symptoms compared to those in early perimenopause (EP). Conversely, these women exhibit less sedentary behavior and take more steps per day.

P0113 - THE ROLE OF MATURITY OFFSET IN PREDICTING PERFORMANCE OUTCOMES IN YOUNG CYCLISTS

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Purpose: Biological maturation status is a key factor to consider when evaluating performance in young cyclists (1). The maturity offset (MO), defined as the time before or after the Peak High Velocity (PHV), can influence both aerobic and anaerobic capacities, as well as absolute and relative power. This study aimed to evaluate the effect of MO on Peak Power Output (PPO) during a ramp test and during a power-cadence test.

Methods: Twenty-two young cyclists (15 m, 7f) were recruited from the Research and Development Technical Centre of the Sicilian Regional Committee of the Italian Cycling Federation. The maturity offset of each participant was calculated using the Mirwald's predictive model (2). Participants were evaluated on their own bikes installed in a specific bike roller (Magnetic Days). A bike fitting was performed to improve their joint function using a 3D kinematic analysis system (STT System). Before testing, participants were asked to warm up for 10 min at self-selected pedalling intensity. Then, they performed a power-cadence test that involved five maximum sprints

lasting 12 s using different gear ratios (chainring/sprocket: 4.55, 3.85, 3.33, 2.27, 2). Later, participants were asked to perform a ramp test with an initial power output of $2.8 \text{ W} \cdot \text{kg}^{-1}$, increasing by $10 \text{ W} \cdot \text{min}^{-1}$ until exhaustion. The PPO of the two tests were taken into consideration for statistical analysis.

Results: Our results showed that the MO was a significant predictor of PPO performed during both the ramp test ($p = 0.008$) and the power-cadence test ($p = 0.003$). Nevertheless, MO did not appear to be a significant predictor of cyclists' relative power-to-weight ratio.

Conclusions: MO appears to be a strong predictor of absolute PPO rather than relative PPO. This suggests that biological maturity mainly affects total aerobic and anaerobic absolute power. However, early mature status is not necessarily associated to higher performances compared to peers with late mature status.

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P0114 - TRAINING LOAD, INTENSITY DISTRIBUTION, AND PERIODIZATION STRATEGIES IN AMATEUR RUNNERS

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Purpose: Periodization strategies in endurance training are well-documented in elite athletes, but few studies have examined their relevance for amateur runners. Recent literature highlights the importance of training load quantification and structured intensity distribution even in non-professional contexts [1]. This study aimed to explore how training volume, intensity distribution (TID), internal load, and session typology influence performance in amateur marathon and half-marathon runners.

Methods: Forty-eight runners (43 males, 5 females; age: 39.5 ± 8 years) were included and stratified by race type and performance level (A = faster, B = slower). Training data from the 12 weeks preceding their goal race were collected via wearable devices. Analyses focused on TID (Zone 1: $< 80\%$ HRmax; Zone 2: $80\text{--}89\%$; Zone 3: $> 89\%$), internal load (eTRIMP), weekly volume (km, minutes, sessions), and session type (steady state, fartlek, HIIT). Distribution models (pyramidal, polarized, threshold) were also classified.

Results: Marathon runners showed higher weekly volume ($66 \pm 12 \text{ km}$ vs $53 \pm 15 \text{ km}$, $p = 0.002$) and internal load ($p = 0.010$) compared to half-marathoners. In both race types, faster runners performed more sessions per week ($p = 0.013$) and accumulated more km in Zones 1 and 2 ($p < 0.05$). In half-marathoners, performance positively correlated with km/week ($R^2 = 0.449$; $p = 0.001$) and number of sessions ($R^2 = 0.326$; $p = 0.002$). Internal load per session (eTRIMP/session) was inversely associated with performance, possibly reflecting better load distribution in higher-level runners. The pyramidal TID model predominated ($\sim 80\%$) across all groups, with no significant differences by performance level. Faster runners performed more steady-state sessions ($p < 0.05$), whereas the type and distribution of HIIT sessions did not differ.

Conclusions: Training volume, frequency, and load distribution are key determinants of performance in amateur runners. A pyramidal intensity distribution, with a higher proportion of Zone 1 and 2 training, and more frequent weekly sessions, appears most beneficial. These findings may inform the development of structured, evidence-based periodization strategies for non-elite endurance athletes.

Acknowledgments: (non obbligatorio).

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P0115 - POST-EXERCISE HYPOTENSION INDUCED BY AN ISOMETRIC EXERCISE SESSION IN CARDIAC PATIENTS: A COMPARISON WITH COMBINED EXERCISE (AEROBIC + DYNAMIC RESISTANCE)

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Purpose: Short sessions of isometric exercise have been shown to reduce blood pressure (BP) in normotensive and hypertensive subjects. However, there are few data in hypertensive patients with underlying ischemic heart disease (IHD). The present study compared post-exercise hypotension (PEH) induced by isometric versus combined, aerobic plus resistance, exercise in IHD patients. The first aim of the study was to compare acute changes in systolic BP; the secondary endpoint was to compare acute changes in diastolic BP.

Methods: Twenty-five stable patients with established IHD already taking drug therapy for hypertension were enrolled. The study had a cross-over design. All patients performed in different days: 1) Isometric exercise session (IES) consisting of bilateral knee extension, performed at 20% of maximal voluntary contraction and lasting 20 min; 2) Combined exercise session (CES) including moderate-intensity continuous exercise at and dynamic resistance exercise performed at 60% of 1 repetition maximum, and lasting 90 min. 3) Control session (no exercise). BP was measured at rest, immediately after the training, and then every 15 min up to 90 min.

Results: The repeated measures ANOVA analysis showed important effects of the exercise interventions on blood pressure. Systolic BP significantly decreased after the CES session, compared to control ($F = 6.2$; $p = 0.001$) and to the IES session ($F = 4.4$; $p = 0.004$). Additionally, systolic BP significantly decreased after IES compared to control ($F = 3.6$; $p = 0.036$), although the reduction was less pronounced than that observed with CES. As for diastolic BP, both CES and IES significantly decreased compared to control (CES vs control: $F = 3.5$; $p = 0.042$; IES vs control $F = 3.7$; $p = 0.038$). However, there was no significant difference in diastolic BP changes between CES and IES (CES vs IES: $F = 1.8$; $p = 0.152$).

Conclusions: These findings suggest that CES was more effective than IES in reducing systolic BP; IES was as effective as CES in inducing diastolic PEH in hypertensive patients with underlying IHD.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

P0116 - MIR-1303, DOWN EXPRESSED IN SERUM FROM LIFELONG FOOTBALL PLAYERS, IS INVOLVED IN DU-145 HUMAN PROSTATE CANCER CELL PROLIFERATION AND INVASION

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Purpose: We evidenced that miR-1303 expression was reduced in both serum samples and *vastus lateralis* muscle biopsies of Veteran Soccer Players (VPG) compared to untrained controls (CG)¹. Very recently, we demonstrated that miR-1303 overexpression in human breast cancer MCF-7 cells induced proliferation and invasion processes, reverted by miR-1303-Inhibitor (I) treatment; the treatment with sera from VPG parallels the effects mediated by miR-1303 inhibition². The present study aims to enlarge our knowledge on the effects mediated by miR-1303 and of lifelong training in other tumour cell system.

Methods: Human prostate cancer DU-145 cell proliferation was assessed by wound healing assay. In brief, cells were starved in 0.5% FBS for 18 h, scratched and cultured in 5% sera pool from VPG or CG or FBS (as control) or transiently transfected with 25 mM of miR-1303 or miR-1303-Inhibitor(I) for 24 h, 48 h or 72 h, respectively. VPG and CG sera were obtained from 15 (VPG; trained at least 40y) and 15 untrained (CG) healthy males matched for age (74.4 ± 4.1 y)³. The wound closure percentage was calculated in each and among the groups. For the invasion assay, cells were treated as described above and then layered over GrowDex in the 24-transwell chamber². After 24 h, the cells were fixed and stained with crystal violet and then counted.

Results: At 48 h, a significant increase in wound closure percentage was observed in DU-145 cells transfected with miR-1303 compared to miR-1303-I ($p < 0.05$). Moreover, DU-145 cells treated with VPG pool sera showed a significant reduction in wound closure percentage compared to CG ($p < 0.05$) and to cells over-expressing miR-1303 ($p < 0.05$). Further, miR-1303 over-expression increased the DU-145 invasion compared to miR-1303-I ($p < 0.05$) treatment. The treatment of cells with VPG pool sera reduced the invasion of DU-145 cells compared to CG ($p < 0.05$) and parallels the effects mediated by miR-1303-I treatment.

Conclusions: Our preliminary results further support that miR-1303 overexpression affects proliferation and invasion pathways in human cancer cells. Further the results obtained in prostate cancer DU-145 cells mirrors the effects evidenced in human breast MCF-7 cells suggesting the involvement in the same pathways.

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P0117 - PROMOTING ACTIVE LIFESTYLES AMONG UNIVERSITY STUDENTS: THE ME.MO PROGRAM PROPOSAL

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Purpose: University students are prone to psychological distress and mental health issues, yet university counselling centers lack a comprehensive approach that integrates exercise and psychotherapy. Although regular exercise is known to mitigate mental-health risk factors, integrated university-based interventions are limited. The proposal outlines the national project “Me.Mo—Mente in Movimento” funded by the Italian Ministry of University and Research (MUR), currently being carried out at the University of L'Aquila. The project aims to promote the overall psychophysical well-being of university students through three types of interventions: two focused on individual and group psychological support, and one centered on physical activity. The aim of the present study is to assess the effects of a 4-week supervised exercise intervention on the Physical Fitness and active lifestyles of university students.

Methods: The 4-week supervised exercise module includes two sessions per week of activities such as Pilates, urban trekking, functional strength training and combined aerobic-resistance circuits. Each 60-minute session is preceded by a short educational introduction. Physical fitness will be assessed through standardized tests: 6-Minute Walk Test (Cardiorespiratory fitness), Handgrip Strength Test (upper limb grip strength), 5-Repetition Sit-to-Stand (lower limb strength), and Sit-and-Reach Test (flexibility). Physical activity levels will be self-reported using the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Moreover, movement-related behavior (step count, minutes spent walking, running, or exercising, average heart rate and nocturnal heart rate) will be assessed using wearable devices (Garmin vivoactive 5). All of these variables will be assessed before (t0) and after (t1) the intervention.

Expected Results: Improvements in Cardiorespiratory fitness, strength and flexibility, higher IPAQ-SF scores and reduced sedentary time are expected. Wearable data should confirm this trend by showing more frequent and more intense activities. These outcomes would confirm more active habits among students, showing that such programs can well integrate the help already offered by university counselling services.

P0118 - THE ADDITION OF BODY-CENTERING TO CORE TRAINING ENHANCES MOTOR OUTCOMES IN ADOLESCENT FEMALE VOLLEYBALL PLAYERS: A RANDOMIZED CONTROLLED STUDY

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Purpose: Core stability (CS) training is considerably important for body stabilization and strength development in volleyball players. It is recognized as a crucial element for improving performance and preventing injuries in athletes, particularly in sports that require complex movements and dynamic jumps, such as volleyball (1, 2). To maximize the effects of physical preparation with limited training time, it is necessary to identify new strategies for optimizing CS training. This study examined the impact of integrating the body-centering (BC) technique (defined as the conscious modulation of intra-abdominal pressure to optimize postural stability during motor actions) into a CS training protocol. The objective was to evaluate its effects on balance, trunk control, and lower limb explosive strength in young female volleyball players.

Methods: Forty-four competitive female volleyball players (15.6 ± 1.4 years of age) were randomly assigned to three 8-week intervention groups: CS ($n = 16$), CS + BC ($n = 14$), and standard conditioning (SC— $n = 14$). All groups continued their sport-specific volleyball training while participating in two 30-min experimental sessions per week. Primary outcomes assessed at baseline (T0), post-intervention (T1), and at the 12-week follow-up (T2) included: static balance (Stork Balance Stand Test, SBST), trunk control (Trunk Control Test, TCT), and lower-limb explosive power (Squat Jump, SJ; Drop Jump, DJ).

Results: At T1, data showed a significant improvement ($p < 0.05$) in SBST, DJ and TCT in both CS + BC and CS groups compared to baseline values. These improvements persisted until T2 in both groups, except for DJ. Moreover, the CS + BC group showed a significant improvement ($p < 0.01$) in SJ at T1 compared to T0. Finally, the SC group did not show any significant improvement after the intervention. In the analysis of delta scores (T1 vs T0), the CS + BC group showed a greater improvement in SBST and DJ compared to the CS group ($p < 0.01$). Both CS + BC and CS groups showed significantly greater improvements than the SC group in SJ, DJ and SBST ($p < 0.01$).

Conclusions: The results suggest that core training improves balance, trunk control, and explosive strength in young female volleyball athletes. However, integrating the body-centering technique into core exercises yields greater improvements in balance and jumping power compared to core stability training alone.

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PP001 - A 12-WEEK TELECOACHING AEROBIC TRAINING PROGRAM IN A GREEN ENVIRONMENT: IMPACT ON MIGRAINE FREQUENCY AND QUALITY OF LIFE. A PILOT STUDY

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Purpose: This pilot study aimed to evaluate the effects of a 12-week telecoaching (TC) aerobic training in a green environment on headache characteristics, quality of life (QoL), and physical activity in patients with migraine.

Methods: At baseline (T0), assessments related to physical activity and migraine-specific QoL were collected, including the International Physical Activity Questionnaire (IPAQ) and the Migraine-Specific QoL Questionnaire (MSQ). Participants started a 12-week TC aerobic training consisting of moderate-intensity walking sessions in a natural environment, progressively increasing from 30 to 50 min. The same assessments were evaluated after the intervention (T1).

Results: 20 patients (18F) with a mean age of 48.95 ± 12.17 years were included. Physical activity levels were already high at baseline and remained stable throughout the program (total MET 4121.39 ± 8961.93 vs 5399.45 ± 5968.58 , $p = 0.275$). Although migraine intensity did not change significantly (mean NRS 5.86 ± 1.41 vs 5.50 ± 2.14 , $p = 0.285$), a significant reduction in frequency was observed (headache days/4 weeks 13.50 ± 7.29 vs 11.40 ± 6.88 , $p = 0.013$). No significant improvement was detected in MSQ scores (61.00 ± 20.19 vs 57.44 ± 24.86 , $p = 0.433$). A significant reduction in BMI was found (23.44 ± 3.88 vs 23.01 ± 4.00 , $p = 0.016$), indicating potential benefits on body composition.

Conclusions: These preliminary findings suggest that a TC-based aerobic training program may contribute in reducing migraine frequency and improving body composition, even in physically active individuals. Although no significant changes were observed in migraine intensity or QoL, the intervention may support overall health maintenance. Further studies with larger samples are needed to confirm these results and to evaluate the impact of similar interventions in individuals with low-to-moderate physical activity levels.

PP002 - LEISURE-TIME PHYSICAL ACTIVITY AND BALNEOTHERAPY: A COMBINED APPROACH TO ENHANCING SLEEP QUALITY

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Purpose: Achieving and maintaining good sleep quality is increasingly recognized as essential for overall health. In a previous publication, we reported that during a week-long spa stay with balneotherapy treatments, objective sleep quality improved in association with either higher physical activity or more prolonged thermal water immersion. In the current study, we aimed to verify

whether subjective sleep quality could improve in a sample of local customers undergoing two-week balneotherapy treatments and whether such improvements were associated with leisure-time physical activity.

Methods: Seventy-five participants (21.3% male; 61.5 ± 10.5 years) completed the Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSL-TPAQ) and the Mini Sleep Questionnaire (MSQ) at the beginning and end of a two-week balneotherapy program. The treatments were prescribed by hydrologist medical doctors and conducted at Terme di Castel San Pietro (Bologna, Italy). Higher values in GSL-TPAQ and MSQ indicate higher leisure-physical activity level and worse sleep quality, respectively. ANCOVA analyses (covariates: age and sex) were used to evaluate differences in MSQ scores and delta values based on GSL-TPAQ categorization. FORST funded the study.

Results: ANCOVA revealed no statistically significant differences in MSQ scores between active and inactive participants at baseline. After two-week balneotherapy treatments, active participants (60%) reported better self-perceived sleep quality (active: 6.2 ± 1.9 , inactive: 5 ± 2.5 , $p = 0.03$), MSQ-final score (active: 31.1 ± 10.1 , inactive: 38 ± 13.1 , $p = 0.02$), MSQ-sleep component (active: 19.4 ± 7.5 , inactive: 22.7 ± 8.8 , $p = 0.08$), and MSQ-awake component (active: 11.6 ± 4.2 , inactive: 15.3 ± 6.2 , $p = 0.02$). Changes in MSQ values (delta scores) suggested greater improvements among active participants, though none reached statistical significance: delta MSQ-final score: active = -1.9 ± 0.6 , inactive = 0.57 ± 0.4 , $p = 0.2$; MSQ-sleep component: active = -0.9 ± 0.5 , inactive: -0.5 ± 0.4 , $p = 0.02$; MSQ-awake component: active = -1.1 ± 0.6 , inactive: 0.5 ± 0.3 , $p = 0.1$).

Conclusions: After two weeks of balneotherapy, subjective sleep quality showed greater improvements in participants who engaged in more leisure-time physical activity. Although the absence of a control group limits our findings, we may hypothesize that an active lifestyle, combined with a period of self-care such as balneotherapy, may contribute to improvements in self-perceived sleep quality.

Acknowledgments: The authors thank all the volunteers who decided to participate in the study and the staff of *Terme di Castel San Pietro*, especially Sara Girardi, for their support in recruitment.

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PP003 - CONTINUOUS GLUCOSE MONITORING IN FEMALE VOLLEYBALL ATHLETES: METABOLIC RESPONSES TO DIFFERENT EXERCISE MODALITIES AND THE IMPACT OF NUTRITIONAL SUPPLEMENTATION

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Purpose: Continuous glucose monitoring (CGM) provides real-time information on glucose dynamics and is essential during exercise, as it allows to develop personalized strategies for performance and recovery. Volleyball, with its combination of anaerobic and aerobic demands, presents unique metabolic challenges both in competition and depending on the training types. This study aimed to monitor blood glucose responses: 1) across the same time slot of different training days (i.e., resistance training, on-court training, and match) versus rest day; 2) from 1.5h pre- to 4.5h and 6h post-training; 3) during the 24h of training days and rest day.

Methods: Fourteen players of a volleyball team, participated in the Italian Serie B2 championship, were recruited. Each player was prescribed a personalized nutritional protocol and supplementation (including creatine, essential amino acids, and maltodextrins) and monitored using a real-time CGM biosensor applied to the left triceps (Abbott Libre Sense) and the related software (Supersapiens). Continuous glucose data over a week were considered for statistical analysis. The MAGE (Mean Amplitude of Glycemic Excursions) is an index used to quantify glycemic variability, which refers to the fluctuations in glucose levels over time.

Results: Resistance training showed significantly lower mean glucose level compared to on-court training ($p < 0.05$). During resistance training, a significant increase in mean glucose level was detected from 1.5h pre- to 4.5h post-training ($p < 0.05$). No significant differences ($p > 0.05$) were found in 24h MAGE between different training days and rest day, nor across different time slots.

Conclusions: As different training types require specific physical demands, the glucose responses change according to the related energetic substrates. Glucose responses varied according to training type with higher glucose difference observed during the time slot of resistance training. The glucose trend during the 24h did not change among training days and rest day. Hence, considering the physical demands of volleyball and the related training program, these findings suggest that personalized nutritional protocols and supplementation are effective in order to manage training program and consequently to optimize performance.

PP004 - EXPLORING THE LINK BETWEEN METABOLIC SYNDROME RISK AND PHYSICAL FITNESS IN CHILDREN WITH OBESITY: A CROSS-SECTIONAL STUDY

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Purpose: Given the growing relevance of physical fitness for cardiometabolic health in children with obesity and the rising prevalence of MetS, this study aimed to explore the relationship between physical fitness and MetS. The goal was to evaluate the role of muscular fitness as a key marker of metabolic health in the pediatric population, providing insights for targeted interventions.

Methods: We consecutively recruited a total of 62 children and adolescents (aged 7–17 years) with obesity (BMI z-score > 2SD). For all the patients we evaluated cardiorespiratory fitness, muscular strength and speed agility. We computed the MetS z-score, a continuous severity score based on BMI z-score, HDL-C, systolic blood pressure, triglycerides, and fasting glucose and MetS was defined as having a z-score > 0.75.

Results: Cardiorespiratory fitness and speed-agility were not significantly associated with MetS. Lower limb muscular strength, measured by the standing broad jump was inversely associated with the odds of having MetS (OR: 0.47; 0.22–0.88; 95% CI), with a 1SD (24 cm) increase in SBJ corresponding to a 53% reduction in risk. Additionally, cardiorespiratory fitness was not related to any cardiometabolic outcomes ($p > 0.05$), whereas muscular strength showed an inverse association with the MetS z-score ($\beta_2 = -0.266$, $p = 0.043$), BMI z-score ($\beta_2 = -0.443$, $p = 0.001$), SBP ($\beta_2 = -0.304$, $p = 0.020$), and waist-to-height ratio ($\beta_2 = -0.328$, $p = 0.012$).

Conclusions: We demonstrated a link between MetS and physical fitness in children with obesity, with muscular strength showing a stronger association compared to cardiorespiratory fitness and speed-agility. The findings support the role of muscle integrity in metabolic health, emphasizing the importance of educating individuals from an early age about daily PA to promote lifelong healthy habits.

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PP005 - DO ACTIVE AND NON-ACTIVE DAYS DIFFERENTLY IMPACT ON GLYCEMIC CONTROL IN YOUNG ADULTS WITH TYPE 1 DIABETES MELLITUS?

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Purpose: It is well known that physical exercise is recommended to prevent complications in individuals with type 1 diabetes mellitus (T1DM). However, scientific literature reports that fear of hypoglycemia is the most common barrier to physical activity (Brazeau et al., 2008). Therefore, the aim of this study was to evaluate the impact of moderate and vigorous physical activity (MVPA) on glucose monitoring in a cohort of young adults with type 1 diabetes

mellitus (T1DM). Participants' daily data were divided into active (i.e., ≥ 60 min of MVPA) and non-active days.

Method: The study included young adults aged 18–25 years with T1DM. MVPA and continuous glucose levels were measured for a minimum of 4 and a maximum of 8 days, using a Fibion Research accelerometer (Fibion Inc., Jyväskylä, Finland) and a Freestyle Libre 3 glucose sensor (Abbott Laboratories Ltd., Chicago, Illinois), respectively. The following parameters were considered: time in range percentage (TIR%), time above range percentage (TAR%), time below range percentage (TBR%), and mean glucose monitoring (GM). A non-parametric statistical approach (i.e., Mann–Whitney U test) was applied to compare data from active and non-active days.

Results: A total of 68 days were analyzed (35% active days). No differences ($p > 0.05$) were found between active and non-active days in relation to any of the measured parameters.

Conclusions: Our findings suggest that, compared to non-active days, MVPA did not have any negative short-term effects on glucose control in young adults (i.e., the TBR%, a parameter related to hypoglycemia risk, did not differ between active and non-active days). In particular, the complexity of the relationship between MVPA and glycemic outcomes appears to be influenced by various factors and/or individual differences. In conclusion, MVPA does not increase the short-term risk of hypoglycemia, which hence should not be perceived as a barrier to exercise for young adults with T1DM. At the same time, further studies should be encouraged to explore personalized exercise strategies to both optimize glycemic control and minimize the risk of associated complications.

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PP006 - MARATHON TRAINING PROGRAM WITH AI: HOW RELIABLE ARE THEY IN PRESCRIBING EXERCISE?

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Purpose: The growing integration of artificial intelligence in healthcare and sports science has raised questions about these systems capability to provide scientifically sound training recommendations. This investigation examined the effectiveness of various AI models in formulating marathon preparation programs across athletic levels and their adherence to established endurance training principles.

Methods: A comparative analysis was conducted involving eight AI platforms: Claude 3.5 Sonnet, Claude 3.5 Haiku (free), ChatGPT-4o, ChatGPT o1, ChatGPT 4 (free), Gemini 2.0 Flash, Gemini 2.0 Flash Thinking, and DeepSeek R1. Each system developed six-month training protocols for three categories: beginners (target < 4 h), intermediate (< 3 h), and advanced (< 2.5 h). Responses were evaluated by analysing training paces, weekly plan, and volume progression, comparing outcomes against scientific literature on marathon performance determinants, including intensity distribution and pre-competition tapering protocols.

Results: All systems provided weekly training volume guiding the athlete up to the 20th week with an increase in volume (~ 93 km), and 4 weeks of tapering. Claude 3.5 Sonnet integrating precise pace guidelines and load management based on literature. ChatGPT o1

exhibited high-quality progressions but reduced precision in beginner-specific recommendations. Claude 3.5 Haiku produced adequate protocols for recreational runners but structural limitations. ChatGPT 4o presented clear organization but insufficient overall volumes. DeepSeek R1 showed acceptable performance for beginners and intermediate athletes but inadequate progressions. Gemini models revealed significant gaps, including absent pace data and inconsistent volume patterns.

Conclusions: AI systems demonstrate capabilities in generating structured training content considering volume and intensity for planning, but it does not consider physiological aspects such as VO2MAX, Lactate Threshold, Heart Rate or Critical Speed. Claude 3.5 Sonnet and ChatGPT o1 produced the most aligned result with what is supported by the literature in terms of programs. However, considerable variability persists among models regarding accuracy, completeness, and scientific adherence. AI currently cannot fully replace specialized professional supervision, with no possibility to reschedule training if problems arise. No one describes a test to place the user towards an experience level. Future investigations should assess practical outcomes through randomized controlled, exploring integration of personalized physiological data to enhance prescriptive accuracy.

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PP007 - EFFECTS OF A COMBINED NUTRITIONAL AND PHYSICAL TRAINING PROGRAM APPROACH IN A CASE OF FACIOSCAPULOHUMERAL DYSTROPHY: A ONE-YEAR FOLLOW-UP

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Purpose: Facioscapulohumeral dystrophy (FSHD) is characterized by progressive loss of fat-free mass (FFM) and increased fat mass (FM), leading to impaired physical efficiency. A personalized diet combined with physical exercise may improve body composition and mitigate functional decline. We present the case of a 19-year-old male FSHD patient who underwent a one-year nutritional and training intervention aimed at counteracting disease-related body composition changes and associated sequelae.

Methods: Baseline assessments included dietary intake (nutritional anamnesis), body composition (bioimpedance analysis), biochemical parameters (blood tests), resting metabolic rate (RMR; indirect calorimetry), physical efficiency, and quality of life (Checklist Individual Strength Fatigue and FACIT-Fatigue). Initial findings revealed insufficient caloric intake, inadequate leucine distribution, and abnormal glycemia. A personalized nutritional plan (50% carbohydrates, 30% fats, protein at 1.5 g/kg/day, leucine 1–3 g/meal) and supplementation (11 g/day essential amino acids) were prescribed, alongside a training program including two resistance and one aerobic session per week.

Results: After one year, the patient showed improvements in body composition (FFM + 6.9 kg; body cell mass + 3.3 kg; FM – 2.1 kg), RMR (+ 309 kcal/day), fasting glycemia (– 1.6 mmol/L), and

perceived physical efficiency (reduced fatigue), with a concurrent improvement in quality of life.

Conclusions: This case suggests that a tailored nutritional and exercise intervention may be a promising strategy to counteract physical deconditioning in FSHD. These findings support the need for further research in larger patient cohorts.

PP008 - PRESENCE AND PERSISTENCE OF THE RELATIVE AGE EFFECT IN ITALIAN REGIONAL YOUTH SELECTIONS ACROSS AGE CATEGORIES, TOURNAMENT EDITIONS, AND GEOGRAPHIC REGIONS

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Purpose: The relative age effect (RAE) refers to a birthdate-related bias in sport, where relatively older athletes tend to be favoured in talent identification due to their typically greater physical development and body size (1,2). This study examined the distribution of birth quartiles among male youth football players selected for the *Torneo delle Regioni*, a youth national-level tournament organized by the Lega Nazionale Dilettanti of the Italian Football Federation. The aim was to assess the presence and consistency of RAE across age categories, tournament editions, and geographic regions.

Methods: Data were collected from an open-access amateur football database for the 2018/2019, 2022/2023, and 2023/2024 editions, including players from Under-15 (U15), Under-17 (U17), and Under-19 (U19) categories. Players’ birth months were grouped into quartiles: Q1 (January–March), Q2 (April–June), Q3 (July–September), and Q4 (October–December). After data cleaning, 2000 unique athlete profiles were retained. Chi-squared goodness-of-fit tests were used to compare observed distributions against the expected uniform distribution (25% per quartile). Standardized residuals were calculated for interpretation.

Results: The overall sample showed a significant deviation from uniform distribution ($\chi^2(3, N = 2000) = 129.92, p < 0.001$), with Q1 athletes representing 32.8% and Q4 only 16.0%. Similar patterns were observed across age categories, with the strongest RAE in U15 ($\chi^{2(3)} = 124.00, p < 0.001$) and a reduction in U19 ($\chi^{2(3)} = 11.82, p = .008$). The RAE was consistent across tournament editions (2018/2019: $\chi^{2(3)} = 53.48, p < .001$; 2022/2023: $\chi^{2(3)} = 47.50, p < .001$; 2023/2024: $\chi^{2(3)} = 38.62, p < .001$), with no significant differences between them. Apart from Abruzzo and Basilicata, all regions exhibited significant RAE patterns. Among athletes selected in multiple editions, Q1 was also overrepresented (Q1 = 33.3%, Q4 = 12.8%, $\chi^{2(3)} = 7.95, p = 0.047$).

Conclusion: The findings confirm the presence of a robust and persistent RAE in regional representative football selections in Italy. The effect appears stronger in younger age categories and consistent across time and geography.

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SC001 - PRELIMINARY RESULTS ON THE MODERNIZATION OF PROFESSOR CARMELO BOSCO'S METHOD FOR ESTIMATING MUSCLE FIBER COMPOSITION IN ATHLETES: INTEGRATION OF BIOMECHANICAL, GENETIC, AND IMAGING TECHNOLOGIES

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Purpose: This study provides an updated overview of the pioneering work of Professor Carmelo Bosco, who, over forty years ago, introduced an innovative method for estimating muscle fiber composition in the leg extensor muscles of athletes using jump tests. Various parameters from these tests were subsequently incorporated into a regression model to estimate muscle fiber composition, considering covariates such as jump height (e.g., CMJ, SJ, and CM15"), along with factors such as gender, age, sport type, and training level. At that time, muscle biopsies, despite being an invasive procedure, were the gold standard for determining muscle fiber composition. Our objective is to replicate this robust, field-friendly methodology without relying on biopsies, providing valid and accurate estimates of muscle fiber composition.

Methods: Our approach involves a critical review of the original methodology by collecting archival data and conducting interviews with historical collaborators of Professor Bosco to gain insights into the experimental conditions and techniques employed. The aim of our research is to replicate his methodology using modern, non-invasive techniques such as genetic testing, Magnetic Resonance Imaging (MRI), and other innovative technologies to determine muscle fiber composition. To better understand the dynamics of jump tests, we also employ 3D motion analysis, electromyography (EMG), and force platforms. These technologies enable us to explore the biomechanical and physiological factors influencing jump performance, providing additional insights beyond the original methodology.

Results: Although the research is still ongoing, we have completed a comprehensive review of the literature and testimonies concerning Professor Bosco's work, providing a solid historical foundation. This review has not only helped us understand the experimental conditions and techniques used at the time, but also highlighted key areas where modern technologies can enhance the accuracy and applicability of Bosco's original methodology. Preliminary data collected using modern technologies, such as 3D motion analysis, EMG, and MRI, will be used to compare and validate his original method, aiming to modernize it with contemporary advancements.

Conclusions: This research aims to modernize Professor Bosco's method for estimating muscle fiber composition by replacing invasive biopsies with non-invasive techniques such as genetic testing and MRI. Our goal is to develop regression models that, by incorporating classic jump test parameters, can provide valid estimates of muscle fiber composition. This approach offers a scientifically rigorous and non-invasive method for assessing muscle fiber distribution in athletes.

Acknowledgments: (non obbligatorio).

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SC002 - A NEW TRAINING PARADIGM FOR THE ELDERLY: EFFECTS OF GREEN EXERCISE AND TELECOACHING ACROSS DIFFERENT PHYSICAL ACTIVITY LEVELS

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Purpose: The global increase in the elderly population highlights the need for multidisciplinary interventions aimed at improving functional abilities and overall well-being. Promoting adherence to physical activity remains a key challenge in this demographic. This study aimed to evaluate the effectiveness of a combined training program, incorporating Green Exercise and telecoaching (TC), in older adults, with consideration of their baseline physical activity levels.

Methods: A total of 94 participants (F = 57, M = 37; mean age: 70.5 ± 5.8 years; mean weight: 70.8 ± 15.5 kg; mean height: 160.0 ± 9.0 cm) were enrolled and stratified into three groups based on self-reported physical activity: Sedentary Group (SG), Active Group (AG), and Very Active Group (VAG). Functional performance was assessed at baseline (T0) and after 8 weeks of intervention (T1) using the Timed Up and Go (TUG) test, Short Physical Performance Battery (SPPB), the Tinetti Scale, and a Stabilometric Evaluation.

Results: Significant improvements were observed in the SG across all outcome measures, except for gait parameters ($p > 0.05$). In contrast, the AG and VAG did not show significant changes in gait parameters or TUG performance ($p > 0.05$).

Additionally, no significant improvements were observed in the VAG for the Tinetti Scale ($p = 0.126$) or Stabilometric Evaluation ($p > 0.05$).

Conclusions: These findings suggest that the combined training program is particularly effective in enhancing physical function in sedentary older adults. Future interventions should consider baseline physical activity levels into account to optimize outcomes and improve adherence in elderly populations.

SC003 - AI-BASED MOTOR SKILL EVALUATION IN SPORTS EDUCATION: CLASSIFYING BASKETBALL PLAYERS USING DROP JUMP PERFORMANCE

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Purpose: This study aims to explore the potential of artificial intelligence (AI) as a tool for objective motor skill assessment in sports education. By leveraging AI techniques, we investigated whether it is possible to accurately classify amateur and professional basketball players based on their drop jump performance. The drop jump is a widely used test in sports science to evaluate neuromuscular coordination and explosive strength. Integrating AI into movement analysis can provide educators, coaches, and sports scientists with reliable, data-driven insights, facilitating better training design and early talent individuation.

Methods: The research utilized a publicly available dataset (Zhao et al., 2023), which includes data from both amateur and professional basketball players performing the drop jump. An AI approach was adopted by implementing a Support Vector Machine (SVM) classifier. The classification was based on the smoothness of joint movements, quantified using the dimensionless jerk ratio (a metric that captures movement fluidity and coordination). The algorithm was trained and tested (with cross-validation) to determine its accuracy in distinguishing between professional and amateur athletes.

Results: The SVM classifier achieved an accuracy of 80% in distinguishing between professional and amateur basketball players. Furthermore, we investigated the presence of significant differences in specific joints between amateur and professional players. The analysis revealed significant differences in knees' smoothness between the two groups, with professional athletes demonstrating greater fluidity. These findings suggest that professionals exhibit superior neuromuscular coordination during the drop jump, likely due to more advanced training and experience.

Conclusions: The study demonstrates the feasibility of using AI-driven movement analysis to objectively classify athletes based on performance metrics. Integrating machine learning tools into sports education offers promising opportunities to support coaches and educators in monitoring progress, tailoring training programs, and identifying possible talent. By providing objective and reliable assessments, AI can contribute significantly to evidence-based motor learning and skill development. This approach aligns with the growing emphasis on data-informed teaching practices, enhancing the overall quality of sports education.

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SC004 - FEASIBILITY AND EFFECTIVENESS OF TELEMEDICINE-BASED ADAPTED PHYSICAL ACTIVITY PROGRAMS FOR PEDIATRIC ONCOLOGY PATIENTS IN ACTIVE ONCOLOGICAL CARE

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Purpose: Survival rates for pediatric hematological malignancies have significantly improved over the last 50 years. However, children undergoing cancer treatment face long-term health challenges,

including musculoskeletal impairments and reduced physical activity levels, which contribute to poorer quality of life (QoL) and elevated cardiovascular risks. Barriers to accessing traditional physical activity and rehabilitation programs necessitate innovative approaches like telemedicine-based interventions. To evaluate the feasibility, adherence, and effectiveness of a telemedicine-integrated adapted physical activity (APA) program for improving functional and psychosocial outcomes in pediatric oncology patients.

Methods: The study included children and adolescents (5–18 years) with onco-hematological conditions. Participants underwent baseline (Pre-APA) and six-month (Post-APA) assessments using different functional tests and validated QoL evaluation tools (PedsQL). The intervention comprised personalized exercise regimens targeting strength, aerobic capacity, flexibility, and balance. Supervised training sessions were conducted both in-person and remotely via telemedicine solutions. Outcomes included quadriceps muscle and hand-grip strength, balance, fatigue, and health-related QoL. Statistical analyses utilized mixed regression models to evaluate pre-post intervention changes and the impact of remote training.

Results: Eighteen subjects (8 female, median age 12 years) were included. The APA program demonstrated high adherence (median 77.08%). Significant improvements were observed in QoL (PedsQL child, $p = 0.007$), fatigue ($p = 0.035$), and functional performance (chair stand test, $p = 0.033$). Regression analysis indicated a positive correlation between remote training frequency and QoL improvement ($p = 0.027$, $R^2 = 0.235$). Although strength measures showed no significant improvement, remote training significantly influenced flexibility outcomes. Parental perceptions of fatigue and QoL also improved significantly ($p = 0.049$).

Conclusions: Telemedicine-based APA programs are a feasible and effective approach for enhancing QoL and functional capacity in pediatric oncology patients. These preliminary findings support the integration of digital health solutions in long-term survivorship care, though larger studies are needed to confirm these results.

SC005 - MONITORING LEVODOPA RESPONSIVENESS IN PARKINSON'S DISEASE USING WEARABLE SENSORS: THE DIGITAL LEVODOPA CHALLENGE

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Purpose: In Parkinson's disease (PD), conventional clinical assessments may overlook subtle motor changes and inadequately represent real-world performance. The aim of this study was to test the response of different cohorts of patients to a Levodopa Challenge protocol, and to investigate the application of wearable sensor devices for the objective evaluation of gait changes after the initiation of dopaminergic therapy in PD patients.

Methods: A total of 70 patients with suspected PD underwent a Levodopa Challenge test to clinically evaluate their response in a Day-Hospital setting at one Neurology clinic. Out of them, 52 were not taking any dopaminergic treatment (LEDD = 0) and were therefore selected for this study as drug-naïve patients. Among them, 41 received a diagnosis of PD, either Clinically-Established or Probable (Postuma et al., 2015). All patients underwent a clinical examination comprehensive of UPDRS III at baseline, 60 min, 120 min and after 7 days of continuous treatment. A subset of 36 patients diagnosed with idiopathic PD were further evaluated from a motor stand-point collecting gait data through wearable sensor devices at baseline (T0), at 90 min post-administration of a single levodopa dose (T90), and

following seven days of continuous treatment (T7d). Walking tasks encompassed normal, fast-paced, and dual-task conditions, box-checking and serial subtraction. Stride length and step duration served as the principal metrics. Patients were either classified as responders ($\geq 15\%$ or $\geq 30\%$ improvement in UPDRS III) or non-responders.

Results: The PD group saw greater improvements in UPDRS III scores than the non-PD group at all time-points. Within the PD group, significant improvements were especially greater among the Clinically-Established compared to the Probable group, specifically at T120 and at T7d. Significant motor improvements were noted from T0 to T90, in stride length and step duration across all walking conditions, with the most pronounced changes occurring during fast-paced and dual-task walking. Normal walking tasks demonstrated the greatest sensitivity to Levodopa. No enhancements were seen at T7d.

Conclusions: Data obtained from the devices did not match clinical classifications because of sensors revealing measurable improvements in both responders and non-responders. Wearable sensors effectively detected motor improvements after Levodopa administration and highlighted the variability in individual responses. Wearable sensor devices demonstrated enhanced sensitivity to subtle motor changes when compared to traditional assessments, supporting their application in real-world monitoring and personalized management of Parkinson's disease.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC006 - THE POTENTIAL ROLE OF HSP47 IN BLOOD COAGULATION IN ATHLETES: A PRE- AND POST-TRAINING ANALYSIS

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Purpose: While regular and properly conducted physical activity is widely recognized as beneficial for both physical and mental health, prolonged and intense exercise can lead to metabolic adaptations that alter specific biomarkers. This condition can bring an inflammatory status and muscular injuries. Heat shock proteins (HSPs) are essential chaperones that help proteins fold correctly and prevent their aggregation during stress. HSP47 plays a key role in collagen folding and secretion by binding to procollagen and stabilizing it during maturation in the endoplasmic reticulum; at the same time, HSP47 is important for platelet function and thrombus formation in hemostasis

by ensuring stable collagen in the extracellular matrix, which supports effective platelet–collagen interaction. It is involved in both arterial and venous thrombosis and has also shown inhibitory effects on thrombus formation in vitro, making it a potential target for anti-thrombotic therapies. In this scenario, our aim was to investigate the impact of intensive physical activity on inflammatory and coagulation status, and the possible role of HSP47 in the coagulation cascade.

Methods: We recruited a team of 12 elite basketball players and we collected a venous blood sample before and after intense training. We analysed plasma concentration of coagulation parameters: Factor VII, Factor VIII, PT, APTT, Fibrinogen and D-Dimer. In addition, through RT-PCR experiments, we measured gene expression levels of HSP47.

Results: Our results showed a post-training significant increase in plasma concentration of Factor VIII (POST 218.0 (IQR 171.5–240.0) vs 104.0 (IQR 89.0–118.0) PRE, $p < 0.002$) and D-Dimer (POST 487.0 (IQR 356.5–579.0) vs 239.0 (IQR 202.0–294.0) PRE, $p < 0.006$); these increases might suggest a possible state of hypercoagulability in the athletes post-training. By RT-PCR, we observed that HSP47 gene expression levels increase slightly after intense exercise compared to before (POST 0.5 (IQR 0.3–0.7) vs 0.3 (IQR 0.2–0.9) PRE, $p < 0.969$). Finally, we correlated HSP47 and Factor VIII in both athletes pre and post training. We found that in both categories as the decrease in HSP47 increases Factor VIII (POST ($\rho = -0.545$, $p = 0.067$) and PRE ($\rho = -0.544$, $p = 0.068$)).

Conclusions: Our study showed that strenuous and intense training can increase a possible hypercoagulability state due to endothelial activation. In particular, the decrease in HSP47 correlated with the increase in Factor VIII, might suggest a protective role of HSP47 in counteracting the pro-thrombotic effect of Factor VIII. Infact, the down regulation of HSP47 not only delays inflammation, but also results in reduced platelet aggregation.

SC007 - DECODING THE CONTRIBUTION OF SHOULDER AND ELBOW MECHANICS TO THE STICKING REGION IN BENCH AND OVERHEAD PRESS EXERCISES: A LINK-CHAIN MODEL WITH SINGLE- AND TWO-JOINT MUSCLES

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Purpose: This study investigates the biomechanics of bench press and overhead press exercises by modeling the trunk and upper limbs as a kinematic chain of rigid links connected by revolute joints, actuated by single- and two-joint muscles, and constrained by the barbell. We aimed to *i*) explain the emergence of the sticking region, *ii*) clarify the contribution of shoulder and elbow torques during the lift phases and identify the kinematic and dynamic parameters contributing to joint loads, and *iii*) validate the model's ability to replicate experimental barbell kinematics.

Methods: The system's equations of motion and the joint reaction forces were derived analytically in closed form. Model inputs included segmental anthropometry, grip width, barbell mass, and constant torques at the shoulder and elbow, normalized to barbell weight. Two Reference conditions were simulated for the bench press and overhead press exercises, with vertical barbell velocity profiles obtained through direct dynamic simulations in different lifting conditions..Waveform similarity analysis was performed to compare the

model-predicted barbell velocity patterns with maximal bench press experimental data from the literature.

Results: The sticking region emerged when shoulder torque fell below critical thresholds, producing a velocity minimum at mid-lift. Introducing elbow torque reduced the depth and shifted the sticking point earlier (from ~ 47 cm to ~ 32 cm vertical displacement in the bench press) but prolonged the time to overcome it. Static analysis highlighted that system geometry (grip width and segment angles) influenced joint torque demands more than muscle architecture parameters. The elbow extensors were largely inactive early but became dominant toward full extension. Waveform similarity analysis showed high agreement in the pre-sticking (Similarity Index, SI = 0.962, $p = 0.028$) and sticking (SI = 0.949, $p = 0.014$) regions, with lower, non-significant SI post-sticking (SI = 0.881, $p = 0.958$) as expected.

Conclusions: This study provides detailed insights into lift mechanics, emphasizing the critical role of joint torques and barbell constraints in shaping movement dynamics. These insights support targeted training strategies enhancing shoulder torque in early phases and elbow extensor strength in final stages to reduce sticking and improve performance, having significant utility not only for researchers but also for coaches, movement therapists, and athletes.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC008 - SIX WEEKS OF RESPIRATORY MUSCLE TRAINING ENHANCE PULMONARY FUNCTIONS AND SPRINT PERFORMANCE WITHOUT INFLUENCING ANXIETY AND STRESS IN ELITE BOBSLEIGH AND SKELETON ATHLETES

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Purpose: Respiratory muscle training (RMT) leads to improved exercise tolerance, with additional ergogenic benefits observed when inspiratory and expiratory muscle training are combined. However, devices with specific protocols for RMT and related software have been developed mainly to train only the inspiratory phase.

Methods: A specific inspiratory/expiratory RMT protocol has not yet been developed for elite athletes, and it is also unknown whether this training can have psychological effects. We investigated the effects of six weeks of RMT with the Airofit® Pro 2.0 device on pulmonary function, sprint performance, and psychological well-being in elite bobsleigh and skeleton athletes.

Results: The training, focused on strengthening the inspiratory and expiratory muscles, significantly improved spirometry parameters (FVC $p < 0.001$; FEV1 $p < 0.001$; FEF25/75 $p = 0.016$; PEF $p = 0.032$) and respiratory pressure (MIP $p = 0.002$; MEP $p < 0.001$) as well as the total time of the 30-m sprint with the trolley weighing 30 kg ($p = 0.001$). No significant changes were observed in peak velocity or in psychological variables such as stress and anxiety levels.

Conclusions: This suggests that enhanced respiratory muscle strength and core stability improve sprint performance in bobsledders. Additionally, they highlight the role of respiratory training in sports requiring explosive power and endurance, while indicating limited

psychological benefits of externally guided breathing protocols. These findings provide valuable insights into the potential of respiratory muscle training to improve performance in elite athletes, while addressing its limited psychological impact. Finally, further research into the integration of RMT within broader training programs and its effects on psychological outcomes is warranted.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC009 - GENDER ASYMMETRIES AND CONTEXTUAL MODULATION IN MIXED-DOUBLES PICKLEBALL: A SHOT OUTCOME ANALYSIS

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Purpose: This study quantified gender-based differences in mixed-doubles pickleball for three decisive shot outcomes (i.e., winners, forced errors and unforced errors) and analysed whether those gaps shift when pairs were ultimately victorious or leading the match. It also examined whether the gender of the penultimate shot (opponent male vs female) modulates any observed asymmetries, providing effect-size benchmarks to guide tactical coaching.

Methods: Seventeen regional mixed-doubles pickleball matches (3,356 rallies) were analysed. For every rally the last shot was coded into nine sex-specific outcomes [(i.e., male and female winners, forced errors and unforced errors, summarised (a) across the whole match, (b) by margin of victory (MoV) and (c) by current margin of advantage (MoA)], and further split according to whether the penultimate shot came from the opposing woman (PF) or man (PM). Depending on distribution, paired-samples t tests or Wilcoxon signed-rank tests ($df = 16$) were run, and effect sizes reported as Cohen's d_p or rank-biserial correlation, respectively. Statistical significance was set at $p \leq 0.05$.

Results: Analysis showed that males produced significantly more winners than females in every context (Overall: $t = 4.10$, $p < 0.001$, Cohen's $d \approx 1.0$; MoV: $t = 4.93$, $p < 0.001$, $d \approx 1.2$; MoA: $t = 2.30$, $p = 0.035$, $d \approx 0.5$). Females incurred more forced errors overall ($t = -3.41$, $p = 0.004$, $d \approx 0.8$), but this disparity vanished among winning ($p = 0.125$) and advantage ($p = 0.237$) pairs, indicating comparable defensive resilience under favourable conditions. Unforced errors did not differ by gender in any block ($p > 0.05$). A context-specific "penultimate-shot" effect emerged: when the penultimate ball was hit by a female, leading males finished with extra winners (AD-PF: $t = 2.14$, $p = 0.048$; Cohen's $d \approx 0.5$), whereas no gender gap appeared when the penultimate ball was male-hit (AD-PM: $p = 0.077$).

Conclusions: Male finishing effect is the dominant performance discriminator, yet gender gaps in error production are context-dependent: they vanish when skill (winning pairs) or score (advantage situation) is favourable. In fact, when the forced-error gap disappears among pairs that are ahead or ultimately win, the data suggest that the female players in those contexts defend just as effectively as their male partners. The penultimate-shot advantage appears only when the opponent's shot is played by a woman, giving the male on the receiving team an extra chance to finish the rally; this phenomenon disappears when the penultimate ball comes from an opponent man or

in specific contexts. Coaching should therefore couple drills that boost female forced-error tolerance with schemes that diversify final-shot responsibility, improving tactical unpredictability in mixed play. Future work should integrate ball-tracking metrics to verify speed, spin, and positional determinants of outcomes.

SC010 - SPECIFIC HIGH-INTENSITY INTERVAL TRAINING PROTOCOL IN BRAZILIAN JIU-JITSU: A COMPARISON OF WORKLOAD RESPONSES BETWEEN BEGINNER, INTERMEDIATE AND ADVANCED ATHLETES

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Purpose: Brazilian Jiu-Jitsu (BJJ) is a high-intensity combat sport in which specific training protocols may enhance both physical and technical-tactical performance. This study aimed to compare the physiological workload responses to a specific high-intensity interval training (HIIT) protocol (Magno et al., 2021) among BJJ athletes of different technical levels, in order to determine whether these responses vary according to experience or if the protocol can be effectively applied across all athletes regardless of technical level.

Methods: Twenty-one amateur BJJ athletes (age = 29 ± 8 years) were divided into three groups: beginners (BEG, white belt, $n = 6$), intermediate (INT, blue belt, $n = 8$), and advanced (ADV, purple/brown/black belt, $n = 7$). The HIIT protocol lasted 6 min for BEG and INT, and 8 min for ADV, divided into two blocks with a 20-s rest. Each block included low, medium and high-intensity drills with sparring partners matched for body mass and technical level, simulating real competition. Total workload (sum of weighted HR zones), time spent in each zone (Polar H10), and perceived exertion (Borg CR10 scale) were recorded. Data were analyzed using GLM via JASP software ($p < 0.05$).

Results: Total workload ($p < 0.001$, higher in the ADV group (workload = 33.0 ± 5.0 ; RPE = 16 ± 2) compared to BEG (workload = 25.6 ± 1.0 ; RPE = 14 ± 1) and INT (workload = 22.3 ± 2.2 ; RPE = 13 ± 1). The time spent across metabolic zones was similar between groups ($p > 0.05$), indicating a comparable cardiovascular distribution. Two outliers influenced overall variability: one ADV athlete showed a conservative strategy, reaching zone 5 only in the final phase; one INT athlete, a professional MMA fighter, remained mostly between zones 3 and 4, likely due to high aerobic conditioning.

Conclusions: The specific HIIT protocol effectively replicated the intensity of a BJJ match in line with previous research (Magno et al., 2021), regardless of the technical level. However, some workload responses appeared level-dependent: ADV athletes sustained higher loads and perceived more exertion, likely due to greater technical efficiency under fatigue and the longer protocol duration (8 min vs 6 min). Despite having a similar metabolic distribution, ADV athletes completed a longer task with a higher perceived effort. The observed inter-individual variability suggests the need to calibrate training protocols based on training habits and physiological profiles.

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Reference:

Magno et al., *Sci Sports*, 37(8):766–775, 2021.

SC011 - 4-WEEK STRETCHING PROGRAM AFTER SUBMAXIMAL STRENGTH AFFECTS PERFORMANCE BUT NOT HEART RATE VARIABILITY AND LACTATE CLEARANCE. AN EXPLORATORY STUDY

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Purpose: Previous research has demonstrated that stretching can enhance athletic performance and induce cardiovascular adaptations. This study aims to assess whether a 4-week preventative stretching routine can enhance heart rate variability and heart rate recovery, faster blood lactate clearance, and improve performance following submaximal strength exercises.

Methods: Twenty-four healthy adults were recruited and randomly allocated to either the experimental group or the control group. Both groups engaged in submaximal strength exercises (5 sets to voluntary failure at 60% of 1RM) comprising bench press and back squat exercises under baseline conditions and after stretching protocol. The experimental group followed the Stretching Protocol, while the control group adhered to their regular training routine.

Results: ANOVA analysis revealed a significant pre-post interaction effect between groups in the variable of squat repetitions, although no notable pre- or post-differences were observed in heart rate variability, heart rate recovery, blood lactate concentration, or bench repetitions in either group.

Conclusions: A 4-week preventative stretching program does not appear adequate to enhance lactate clearance and cardiovascular adaptation after submaximal strength exercises in resistance-trained individuals compared to the control group. However, it is plausible that such a stretching routine may mitigate muscle fatigue, though further investigation is warranted to substantiate this hypothesis.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC012 - EXPLORING THE EFFECTS OF BODY IMAGERY AND EXERCISE ON SOCIAL MEDIA CONSUMERS: RESEARCH AND INSIGHTS

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Purpose: This study aims to explore the impact of social media on adolescents, with a particular focus on the relationship between representations of motor and bodily activity, and young people's perceptions of well-being. Current research suggests that such content—especially when it features individuals who embody nearly unattainable beauty ideals—can lead to psychological distress, dissatisfaction, negative affect, despondency, and feelings of self-shame among users.

Methods: A systematic review was conducted to examine the use and impact of social media platforms (Instagram, Facebook, and TikTok) in promoting motor activity. The review focused on international literature published between 2019 and 2023 and was epistemologically grounded in the Psychology of the self. The analysis centred on key concepts such as *fitspiration* and *body image*, highlighting the

profound sociocultural influence exerted by body representations on social media.

Results: The findings, derived through the principle of saturation (i.e., perspectives convergence across the reviewed studies), indicate that social media use can often discourage engagement in physical activity. This is primarily due to the dissatisfaction users experience when comparing their own bodies with idealized, often unrealistic, models presented online. To counteract these effects, it is essential to promote internal dialogue among social media users, and enhance their self-awareness. Such a process aims to recalibrate the communicative and relational dynamics between content creators, users, and the mediating environment—namely, social media platforms—in a manner consistent with post-humanistic perspective.

Conclusions: To conceptualize this phenomenon, we propose the Plato's *Allegory of the Cave* as a pertinent epistemological framework, since it offers valuable insights into the nature of perception and its educational implications. Considering this, the self-compassion programs implementation—widely recommended in the literature reviewed—emerges as a crucial strategy to foster critical and mindful engagement with social media. This approach encourages adolescents to adopt a healthier lifestyle grounded not in unattainable aesthetic ideals but in the appreciation of individual uniqueness, thereby promoting more attainable and meaningful personal goals.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC013 - ORIENTEERING, FOR A QUALITY PHYSICAL-SPORTS EDUCATION. A SPORT THAT ACTIVATES BODY, MIND, EMOTIONS AND CONNECTS WITH NATURE

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Purpose: To demonstrate how orienteering is a recreational and sporting discipline with countless training and educational, transdisciplinary and cross-curricular values. For these reasons it should be included in the school curriculum.

Methods: Scientific bibliographic research.

Results: Orienteering

It allows the creation of a real laboratory of Motor and Sport Sciences, that is, a privileged fulcrum of interdisciplinary and transversal connections (Andersson, 2023; FISO, 2024, Chiodi et al., 2000).

It promotes personal growth and the development of autonomy, self-esteem, stress management, socialization, and cooperation skills. Observing, estimating, evaluating, deducing, comparing, memorizing, formulating hypotheses, managing stress, deciding, verifying and solving complex problems are fundamental skills, not only for orienteering, but for life (Da Re, 2018).

It promotes knowledge and understanding of one's own efforts, evaluating capabilities and limits that can be improved, in a fair confrontation with the opponent (Corradini, 2011).

It is a highly inclusive sport, practicable by people with motor difficulties (Trail-O), deaf, blind, and people with behavioral and/or mental fragility (Mittler, 2000; Booth & Ainscow, 2001).

It is a sport for everyone, which can be practiced at any age, with minimal financial commitment (Maddalena & Di Cecco, 2017; Peraro et al., 2018).

It is an outdoor training sport that strengthens the immune system, requires physical performance and intellectual commitment.

It promotes outdoor education. It is a perfect combination of physical activity and nature and/or physical activity and land (Brown & Wattchow, 2011; Mozzali, 2017; Farné et al., 2018)

It recovers the natural relationship between humans and nature, and it promotes environmental education and biophilia (Ferrari & Serafini, 1983; Durastani et al., 2016; Antonietti & Bertolino, 2017; Barbiero, 2011, 2016; Kals et al., 1999; Mayer e Frantz, 2004; Hughes et al., 2018; Wells & Kristi, 2006; Passera et al., 2023; Passafaro et al., 2010; Pirchio et al., 2020).

It is an environmentally sustainable sport without negative impacts on the natural environment and a high level of environmental, social and economic sustainability (Bisoffi, 2025).

It is a comprehensive motor practice. It develops emotional potential and physical fitness, as well as coordination and tactical-mental skills (Imhof & Mutti, 2009).

It intercepts several Goals of the 2030 Agenda.

It is useful for the tourist enhancement of the naturalistic areas of a given territory.

It's a means of assessing and improving team qualities and ways of working (Maddalena & Di Cecco, 2017).

Conclusions: Knowing how to orient oneself is a cultural baggage of man before being a sporting practice (Biella, 1997).

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC014 - PHYSICAL FITNESS, MOTOR SKILLS, AND PHYSICAL SELF-EFFICACY: A STRUCTURAL MEDIATION ANALYSIS FROM THE ROMA PROJECT IN APULIA

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Purpose: International findings have highlighted that both reduced opportunity for being physically active and the progressive increase in sedentary behavior, can results in the progressive depletion in individual motor development. Moreover, previous studies conducted in Italy have widely highlighted the significant associations between psychological and motivational factors (i.e., perceived self-efficacy) on physical fitness development. However, there's limited evidence in Italy about the influence of gross-motor development on physical fitness development and physical self-efficacy (PSE). In the light of these evidence, the aim of the present study is to provide a mediation analysis to explore the relationship between the gross-motor development, physical fitness components and PSE among Italian children.

Methods: The sample (N = 79, age = 10–11 years) was recruited by the school that joined the ROMA project with a simple randomization. The total sample was divided according to gender (male and female). A structural equation model was estimated to assess direct and indirect effects from physical fitness components—agility (4 × 10 shuttle run, 20m slalom), explosive strength (medicine ball throw and standing long jump) and speed (20m sprint)—on physical self-efficacy, with Gross-Motor Quotient Development (GMQD) specified as a mediating variable.

Model parameters were estimated using maximum likelihood with delta method standard errors.

Results: Results revealed that physical fitness components were significantly associated with GMQD, including the 4 × 10 shuttle run ($\beta = -0.045$, $p < .001$), 20m slalom ($\beta = -0.096$, $p < .001$), 20m sprint ($\beta = -0.030$, $p < .001$), SLJ ($\beta = 0.005$, $p = 0.037$), and MBT

($\beta = 0.016$, $p = 0.010$). In turn, GMQD showed a significant positive effect on Physical Self-Efficacy ($\beta = 0.579$, $p = 0.040$). These findings suggest that children with higher physical fitness levels highlight greater self-efficacy, and this relationship is partially mediated by their gross-motor development.

Conclusions: This analysis suggests that physical fitness components may play a significant role in shaping PSE, through its influence on gross-motor skills. These results offer valuable insights for designing experimental interventions and developing PE teachers' training to foster evidence-based didactic and enhance quality of physical education.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC015 - EFFECTS OF SEQUENCED MIXED AND FREE PLAY ON PRESCHOOLERS' MOTOR AND COGNITIVE DEVELOPMENT IN AN URBAN PLAYGROUND SETTING

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Purpose: This study was conducted in "Primo Sport 0246", a purposefully designed educational playground created to support motor development in children aged 0 to 6 years. The facility is located within a public preschool in Northern Italy. The objective was to investigate the impact of mixed activity (structured + free play) versus free play only on motor and cognitive development in children aged 3 to 5 years, and whether the sequence of these activities and/or the sex of the child influence outcomes.

Methods: Two groups followed a crossover design for 20 sessions (twice a week, 60 min each). Each session—regardless of group or condition—had the same total duration: Group A—Mixed Activity: 10 sessions combining 30 min of structured activity and 30 min of free play, followed by 10 sessions of free play only (60 min). Group B—Free Play: 10 sessions of free play only, followed by 10 sessions of 60 min of structured activity. Assessments were conducted at three timepoints: PRE (T1), POST (T2), and FOLLOW-UP (T3). Standardized tests included: Physical Fitness Test (Fjørtoft et al., 2011), Movement ABC-2 (Henderson & Sugden, 1992), Motor Competence Test (Sigmundsson et al., 2016), and Day/Night Task (Gerstadt et al., 1994).

Results: Non-parametric analyses ($N = 20$; Group A = 12, Group B = 8) revealed significant time effects (Friedman test) for: Long Jump ($\chi^2(2) = 8.60$, $p = 0.014$), Monkey Bar Steps ($\chi^2(2) = 7.20$, $p = 0.027$), Hanging on a Bar ($\chi^2(2) = 10.13$, $p = 0.006$), Building Bricks ($\chi^2(2) = 7.60$, $p = 0.022$), and Day/Night Task ($\chi^2(2) = 6.40$, $p = 0.041$). Wilcoxon post hoc tests showed improvements from T2–T3 and T1–T3. Mann–Whitney U tests revealed differences between groups for: Throwing Medicine Ball (T3): $U = 16.0$, $p = 0.031$ (favoring Free Play) and Hanging on a Bar (T2): $U = 13.5$, $p = 0.024$ (favoring Mixed Activity). A separate analysis comparing sex-based differences showed no significant effects between boys and girls across timepoints and outcome variables.

Conclusions: Both activity types improved outcomes, but sequence matters: beginning with structured activities enhanced endurance and postural control, while starting with free play improved explosive strength. No systematic differences emerged by sex. Purpose-built urban playgrounds like Primo Sport 0246 can effectively promote

early childhood development through well-sequenced physical activity programs.

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SC016 - PHYSICAL LITERACY ASSESSMENT ACROSS LIFESPAN: ITALIAN VALIDATION OF ADOLESCENTS PHYSICAL LITERACY QUESTIONNAIRE (APLQ)

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Purpose: Physical Literacy (PL) is a multidimensional construct, encompassing 4 domains: physical competence, motivation and confidence, knowledge, and behaviors necessary for lifelong engagement in physical and sport activities across the lifespan, aiming at aligning with strategies to combat sedentary lifestyles and foster lifelong health (1). Many survey-based instruments were appraised to be the most feasible to administer in schools to assess PL according to age, such as the Canadian Assessment for Physical Literacy version 2, Adolescent Physical Literacy Questionnaire (APLQ), Passport for Life, Physical Literacy in Children Questionnaire, and Portuguese Physical Literacy Assessment Questionnaire (2).

The present study aims to validate the Italian translation and cultural adaptation of the APLQ (3), to provide a valid tool to be adopted within the Italian educational context.

Methods: The APLQ questionnaire was translated using a forward-backward procedure carried out by bilingual experts. A pilot test involving 10 adolescents helped identify and address any comprehension and cultural issues. A sample of 60 adolescents (average age 16.6 ± 0.7 years) was recruited from a high school, and they completed the Italian version of the APLQ questionnaire twice over a 10-day interval under the supervision of trained personnel. Internal consistency was assessed using Cronbach's alpha. The study was approved by the IRB of the University of Cassino.

Results: A strong internal consistency in the psychological and behavioral dimensions was found (Cronbach's α : 0.92; mean: 34 ± 5.2) while the knowledge and awareness dimension revealed lower internal consistency (Cronbach's α : 0.6; mean: 21.9 ± 5.4) as well as the physical competence and physical activity dimension (Cronbach's α : 0.7; mean: 9.8 ± 7.6).

Conclusions: Findings demonstrate that this tool is not only a reliable measurement tool but also shows significant potential for application in educational contexts. The results indicate that the APLQ can effectively capture various aspects of students' PL dimensions.

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SC017 - INCLUSIVE PHYSICAL EDUCATION THROUGH BASKIN: ENHANCING PSYCHOSOCIAL AND MOTOR SKILLS IN CHILDREN WITH AND WITHOUT DISABILITIES

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Purpose: A mixed-methods approach was adopted. Thirty-seven students (aged 9–10), including two with intellectual disabilities, participated in a 4-week *Baskin* intervention. Quantitative assessments included questionnaires on physical self-efficacy, collaboration, and inclusion, alongside basketball-related motor skill tests (passing, dribbling, and shooting). Linear mixed-effects models were used to evaluate pre-post changes. Qualitative data were collected through observational analysis and structured interviews with the two children with disabilities.

Methods: Inclusive physical education (PE) is essential for promoting equity, psychosocial growth, and motor development in all students, including those with disabilities (Haegele & Sutherland, 2015). However, many children with disabilities continue to face exclusion due to organizational, instructional, and attitudinal barriers (Coates & Vickerman, 2008; Wang, 2019). This study examined the effects of Baskin, a modified and inclusive team sport, on the psychosocial and motor skills of primary school children with and without disabilities.

Results: The intervention led to significant improvements in self-efficacy, collaboration, and inclusion, as well as in all assessed motor skills. Although children engaged in team sports initially performed better in dribbling, those in individual sports showed significant improvement by the end of the program. Observational and interview data indicated increased engagement, self-confidence, and a sense of importance in the children with disabilities, confirming the inclusive value of the Baskin experience.

Conclusions: The Baskin intervention effectively enhanced both psychosocial and motor outcomes, fostering a more inclusive and collaborative learning environment. These findings support the use of adapted physical activities as tools for educational equity, highlighting the essential role of teachers in delivering structured, inclusive PE programs (Kiuppis, 2018; Sisti, 2021).

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SC018 - BENEFITS OF RELATIONAL PSYCHOMOTOR SKILLS ON COGNITIVE AND MOTOR DEVELOPMENT IN PRESCHOOL CHILDREN

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Purpose: The aim of Relational Psychomotor intervention is to support children's overall development. This preliminary study investigates the effects of a six-month school-based RP intervention on gross motor skills and executive functions in preschool children.

Methods: Twenty-nine children (17 males, 12 females), aged 2 to 4 years, were recruited from nursery schools in Catalonia. In this case-control study, the experimental group (EG; 11 males, 5 females) participated in relational psychomotor programs for six months. During the same period, the control group (CG; 6 males, 7 females) engaged in normal play activities. The Gross Motor Test (TGMD-3) and the Executive Functions-Preschool 2–6 years (FE-PS 2-6) test were administered both pre-and post-intervention.

Results: Preliminary results, analyzed using Repeated Measures ANOVA (RM-ANOVA) on the post-pre score differences, indicate significantly greater improvements in the EG compared with the CG for both the TGMD-3 sub-tests that was Locomotion ($p = 0.012$) and Ball control ($p = 0.003$). Concerning the FE-PS 2-6, results indicate a favorable situation for the EG in cognitive subtest "Delay of gratification", particularly regarding the ratio between time/violations ($p < 0.05$). A difference very close to statistical significance was observed in the subtest "Inhibition of response" ($p = 0.05$). No further statistical significance was found in the other cognitive subtests, although the mean values suggest a more favorable situation for the experimental group.

Conclusions: Preliminary data indicate that psychomotor intervention has a positive and significant effect on motor aspects related to locomotion and ball control. The collected data encourage further large-scale investigations to confirm that relational psychomotor intervention can be considered a valid tool to promote the motor and psycho-cognitive development of children in the preschool context.

SC019 - IMPACT OF EQUIPMENT SCALING AND MATURATION ON TECHNICAL-TACTICAL AND PHYSICAL PERFORMANCE IN U-13 BASKETBALL PLAYERS

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Purpose: The present study examines the effects of equipment scaling and competitive format on technical-tactical and physical performance in under-13 male basketball players, with consideration of biological maturation.

Methods: Thirty-seven players (mean age = 12.91 ± 0.57 years) participated in two consecutive tournaments under different rule conditions: one following standard U-14 regulations and the other with modified parameters, including reduced basket height (2.90 m) and a closer three-point line (4 m rectangular zone). Technical-tactical variables (e.g., ball recovery, 1v1 actions, shooting frequency and efficacy) and kinematic metrics (e.g., acceleration, sprint speed, player load) were assessed.

Results: Results showed a significant increase in offensive and individual actions under the modified format, particularly among late-

maturing players. Conversely, no significant differences in physical performance were observed between tournament types; however, early maturing players demonstrated superior values in most kinematic variables.

Conclusions: These findings support the implementation of equipment scaling and bio-banding strategies to foster equitable development and optimize performance in youth basketball settings.

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SC020 - EXPLORING DUAL CAREER EXPERIENCES OF STUDENT-ATHLETES THROUGH THE LENS OF EMPLOYABILITY: A PILOT STUDY

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Purpose: In recent years, research on Dual Career (DC) has grown significantly, with a predominant focus on the combination of sport and education. However, few studies have explored DC in the context of sport and work. Given the challenges athletes face during career transitions, particularly in terms of employment uncertainty, the construct of employability is of growing interest. This study aims to explore how student-athletes' DC experiences can support the development of employability, using the Employability Capital Growth Model (ECGM) recently proposed by Donald, Baruch, and Ashleigh (2024) as a theoretical framework.

Methods: A qualitative pilot study was conducted with 14 former student-athletes who graduated from a Northern Italian university offering a dedicated DC program. In-depth semi-structured interviews were carried out and analyzed using the Interpretative Phenomenological Analysis (IPA) approach. Manual coding was conducted using NVivo software.

Results: Findings suggest the presence of distinct dimensions for each form of capital described in the ECGM. Social and cultural capital emerged as particularly relevant, highlighting the interplay between athletes' academic, professional, and athletic trajectories. Psychological and market value capital were also evident, particularly in relation to DC program practices such as psychological and organizational support provided by tutors.

Conclusions: This study offers an innovative perspective on dual career experiences, framing them within the employability capital model. It highlights how these experiences can be valuable for student-athletes' employability development and suggests directions for DC providers. The ECGM also shows potential as a tool for career counseling and guidance in this population.

Acknowledgments: The authors would like to thank all participants for sharing their experiences and the university staff involved in the DC program for their collaboration.

References: (non obbligatorio).

SC021 - THE IMPACT OF A GAMIFIED APPROACH ON PHYSICAL ACTIVITY AND FITNESS IN HIGH SCHOOL STUDENTS

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Purpose: Gamification works wonders at putting self-determination theory into practice, enhancing intrinsic motivation and making learning enjoyable rather than fear-driven. Gamified interventions appear to be a promising avenue for promoting Physical Activity (PA) across various populations. By primarily influencing participants' daily step counts, gamification represents an intriguing approach to enhancing everyday physical activity levels. A reduction in PA is often associated with decreased Physical Fitness (PF), which can contribute to current and future health issues. The aim of this project was to investigate the effect of a gamified approach on PA and PF during physical education classes in secondary schools, focusing on adolescent students.

Methods: A total of 202 students (mean age 16.7 ± 0.7) from two secondary schools in Lombardy, Italy, took part in the study. The research compared a gamified teaching approach (Experimental Group, EG), implemented via ClassCraft, with traditional teaching methods (Control Group, CG) over an academic year. EG participants engaged in gamified tasks in and outside school, with the teacher applying game mechanics to structure rules, rewards, and real-life consequences to promote desired behaviors. PF assessments were conducted pre- and post-intervention using validated field tests. The health-related fitness components measured included Cardiorespiratory Fitness, muscular strength, and speed-agility. Additionally, longitudinal PA evaluation was based on the monthly average daily step count recorded using a validated mobile application.

Results: PA levels significantly increased throughout the year ($p < 0.01$). PF analysis revealed a significant interaction between variables ($p = 0.026$) in the 4×10 m SRT test, indicating that the EG improved more than the CG.

Conclusions: While the gamified approach may effectively enhance specific motor skills, additional strategies might be necessary to promote a more comprehensive and sustained increase in PA among high school students.

SC022 - PHYSICAL FITNESS, PHYSICAL ACTIVITY LEVELS AND PERCEIVED SELF-EFFICACY. WHAT RELATIONSHIPS EXIST IN ADOLESCENCE?

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Sedentary lifestyles are among the main causes of the decline in motor performance associated with health-related physical fitness (PF). PF is a key predictor of health, including weight control and cardiovascular, musculoskeletal, and mental well-being. Moreover, it has been hypothesized that physical activity (PA) and PF may influence psychological self-perception and, consequently, the quality of life in adolescents.

The aim of this study is to analyze the relationship between PA, motor performance, and self-perception in a sample of 148 students (104 females, 44 males; mean age 15.31 ± 0.93). The sample was divided by gender and by BMI group (Normal weight and Overweight). PF was assessed through the Standing Long Jump (SLF), Sit-up test, 10×5 shuttle run, and the 6-minute walking test (6MWT), while PA and self-efficacy were measured through self-report questionnaires. Relationships between variables were analyzed using correlation and linear regression analyses.

The results show that motor performance tests are correlated with each other ($p < .001$), and that in the total sample, PA is correlated with all tests ($p < .001$). Additionally, SLF and 6MWT are correlated with self-efficacy ($p < .05$). In normal-weight males, PA is correlated

with the 10 × 5 test ($r \geq 0.42$, $p < .05$); in overweight males, PA is correlated with SLF ($r \geq 0.71$, $p < .05$), and a lower BMI is associated with higher academic self-perception ($r \geq -0.91$, $p < .01$). In normal-weight females, PA is correlated with all motor performance tests ($p < .001$), and 6MWT is associated with higher social self-efficacy ($r \geq 0.28$, $p < .05$). Finally, in overweight females, PA is correlated with better performance on the 10 × 5 test ($r \geq -0.45$, $p < .05$) and with emotional self-perception ($r \geq 0.40$, $p < .05$).

The results highlight strong links between motor performance and PA, confirming that more active adolescents show better levels of PF. Moreover, both PA and PF may influence self-efficacy perception. Differences across gender and BMI groups are also evident. These findings suggest targeted interventions, especially in schools. Specifically, physical education represents a key environment to improve PF levels and raise awareness of the importance of healthy lifestyles, while also enhancing self-perception. Promoting active lifestyles and improving PF may have positive effects not only on physical health but also on psychological well-being, especially in the emotional and social domains.

SC023 - GENERALIST TEACHERS' PROMOTION OF BASIC MOTOR COMPETENCE IN PRIMARY PHYSICAL EDUCATION: AN IMPLEMENTATION STUDY

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Purpose: Although Italy formally allows specialist physical education (PE) teachers in primary schools, PE is still often delivered by generalist teachers—especially in early grades. This can limit instructional quality and hinder students' motor competence development (e.g., Truelove et al., 2021), highlighting the need to both investigate and support generalist teachers' PE instruction. To address this issue, an eight-week competence-oriented PE program was developed and implemented by generalist teachers to enhance motor competence among 3rd and 4th graders. The program included four thematic modules (e.g., “balancing and rolling”), each featuring movement games and learning tasks offering a wide range of difficulty levels and requiring completion of peer- and self-assessment worksheets. This study investigated how the PE program was implemented by generalist teachers in their regular classroom settings.

Methods: The PE program was implemented by eight female primary teachers in Alto Adige/Südtirol. Six implementation outcomes—adoption, acceptability, fidelity, feasibility, implementation cost, appropriateness, and potential sustainability (Proctor et al., 2011)—were assessed through semi-structured interviews. Thematic analysis (Braun & Clarke, 2006) was used to analyze the data.

Results: Preliminary analysis showed that most teachers joined the project to enhance their PE teaching competence (*adoption*). The PE program met their expectations and was generally perceived as meaningful due to the relevant content and structured design (*acceptability*). Teachers largely adhered to core program components (*fidelity*). Implementation was partially supported by the research team and peer collaboration, though additional guidance would have been beneficial; school facilities and equipment were mostly sufficient, while time constraints often led to higher effort and selective use of learning tasks (*feasibility*). No additional financial costs were reported (*implementation cost*). Teachers found the program appropriate for supporting students' motor competence and self-awareness, and aligned with curriculum requirements and their teaching practices; peer-assessment, however, was often challenging for students

(*appropriateness*). Teachers showed strong interest in using key program components over longer periods in the future, though many noted that full implementation would require simplifying assessment formats (*potential sustainability*).

Conclusions: This study showed that generalist teachers were able to implement competence-oriented PE in their classroom settings, while also highlighting challenges in the process. The findings point to causal mechanism through which program-based support may enhance generalist teachers' instructional quality. Further research is needed to examine the PE program's impact on students' motor competence.

SC024 - LOOKING FOR ECOLOGICAL VALIDITY OF MOTOR COMPETENCE ASSESSMENT USING THE TGMD-3 IN PRESCHOOL-AGED CHILDREN

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Purpose: Assessing fundamental motor skills (FMS) in preschool children is essential to support their motor development. While standardized tests are often administered in artificial settings they may not reflect children's real-world abilities. According to Gibson's theory of affordances, motor behavior emerges from the dynamic interaction between the individual and the environment. Based on this approach, the aim of this study is to verify if the Test of Gross Motor Development - 3rd edition (TGMD-3) a reliable protocol to assess children's MC in ecological setting.

Methods: A total of 110 kindergarten children were included in this study, having respectively 3, 4 and 5 years on average (divided into youngest, middle, and oldest groups). All participants were first assessed using the TGMD-3 (Ulrich, 2018), which evaluates FMS through two subtests: locomotor skills and object control skills. Afterwards, the same children took part in structured, play-based activities, each designed to correspond to one of the specific skills assessed by the TGMD-3 (e.g., a running game, a galloping game, a hopping game, etc.). The children's performances in these games were evaluated using the same criteria as the standardized test.

Results: No significant differences were found between the ecological and traditional testing environments in which the assessments were conducted.

A significant difference was observed in the raw scores of FMS across all age groups ($p < 0.001$). Furthermore, the analysis revealed a significant difference between the scores of females and males ($p < 0.001$): Females = 45.65 ± 10.61 raw score traditional; 53.5 ± 4.95 raw score FMS ecological setting. Males = 73.5 ± 6.36 raw score FMS traditional; 75.5 ± 6.36 raw score FMS ecological.

Conclusions: The findings suggest that the TGMD-3 is a validity tool for assessing FMS in preschool children across different age groups and genders. Moreover, the absence of significant differences between ecological and traditional testing settings supports the ecological validity of the TGMD-3, indicating that it can effectively measure motor competence in more naturalistic environments. These results highlight the potential for using play-based, ecological assessments to better understand children's motor development in real-world contexts.

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References: (non obbligatorio).

SC025 - EFFECTS OF ACTIVE BREAKS ON MOTOR DEVELOPMENT AND RELATED FACTORS

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Purpose: Physical education plays a crucial role in motor development and health promotion in developmental age, contributing to the acquisition of fundamental competencies and active lifestyles (Cale, 2023). Regular physical activity, supported by appropriate methodologies, is associated with improvements on an emotional, social and cognitive level, in particular in executive functions, such as selective attention, inhibition and working memory (Best, 2010; Diamond & Ling, 2016). In this context, short and structured interventions such as Active Breaks are effective tools to integrate movement and learning, with positive effects on motor and cognitive skills and school success (Donnelly et al., 2016). Active Breaks are part of multi-component and systemic approaches such as the "Schools that Promote Health" model, which enhances the integration between education, health and active community participation (WHO, 2007). The effects of 21 active breaks on motor development, physical activity levels and selective attention are presented.

Methods: The sample consists of 139 children aged between 8 and 10 years, divided by gender and between control group (CG) and experimental group (EG). Physical fitness was assessed through motor tests, including the standing long jump (SLJ), the 1 kg frontal medicine ball throw (LF2 kg), the 4 × 10 m shuttle run, and the 6-min walk test. Motor skills, through the TGMD-2 protocol. LAFs were assessed using a validated questionnaire (PAQ-C) and selective attention via the modified bell test. All motor tests and self-reports were proposed to participants at two distinct times: pre-intervention (T0) and post-intervention (T1). In addition to the descriptive statistics ($M \pm Ds$), the analysis of the variance ANOVA 2 (GC vs GS) was carried out, to highlight significant differences in relation to the dependent variables considered.

Results: All comparisons were statistically significant ($p < 0.05$). The experimental group (EG) showed significant improvements compared to the control group (CG), suggesting the effectiveness of the intervention. In particular, motor skills (endurance and strength) increased in EG for both males and females, while progress in CG was more contained. Motor skills (TGMD-2) also improved in EG, especially among males. Physical activity levels increased in EG, with a significant improvement among females. An enhancement of selective attention also emerged, in terms of speed and accuracy.

Conclusions: The didactic intervention proposed to the experimental group produced statistically significant differences on motor and cognitive parameters, highlighting the effects of active pauses compared to the control group.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC026 - COGNITIVE-MOTOR IMPACT OF COVID-19: REACTION TIME IMPAIRMENTS BUT PRESERVED IMPLICIT LEARNING IN YOUNG ADULTS

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Purpose: Long COVID has been associated with cognitive dysfunctions such as slowed processing speed, attentional deficits, and

executive dysfunction (Houben & Bonnechère, 2022). These impairments may affect motor learning processes, particularly implicit motor learning, which depends on executive and sensorimotor integration (Deng et al., 2022). This study investigated the effects of prior COVID-19 infection on reaction time and implicit motor learning in healthy young adults, while considering physical activity as a potential protective factor (Bailly et al., 2022).

Methods: A total of 84 participants (24 COVID-recovered, 60 controls) completed the Serial Reaction Time Task (SRTT) remotely. The task assessed both general reaction time and implicit motor learning through repeated random and sequence trials. Demographic, physical activity, and health-related data were collected. Group comparisons and regression models tested whether COVID-19 history predicted task performance, accounting for sex, age, BMI, and weekly physical activity.

Results: Participants with a history of COVID-19 exhibited significantly slower reaction times compared to controls ($p = .024$), aligning with prior findings on post-COVID cognitive slowing (Zhao et al., 2024). However, no significant group differences emerged in implicit motor learning performance, suggesting preserved procedural learning capacity. Regression analyses confirmed that COVID-19 status predicted reaction time independently of other variables, but not skill learning performance. Physical activity, which was high across the sample, may have mitigated potential deficits.

Conclusions: These findings indicate that while reaction time may remain impaired post-COVID, implicit motor learning appears resilient in young, physically active individuals. This dissociation supports the hypothesis that procedural learning is less vulnerable to post-viral cognitive effects and highlights physical activity as a possible neuroprotective factor. Further studies are needed to explore long-term cognitive-motor recovery and identify effective rehabilitation strategies.

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Houben & Bonnechère, 2022.

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SC027 - PHYSICAL EXERCISE TRAINING AND MENOPAUSE: IMPACTS ON BODY COMPOSITION AND QUALITY OF LIFE

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Purpose: Menopause is a natural phase in women's lives, characterized by physiological changes that can impact both physical and mental health. In this context, the physical exercise may be a potential tool to minimize menopause symptoms and improve the quality of life of women. This pilot study, part of a larger project, aimed to examine the effects of a 12-week supervised physical exercise program on body composition, body image perception, and quality of life in menopausal women.

Methods: 17 healthy menopausal women (59.5 ± 4.9 years) were recruited and engaged in a physical exercise protocol, divided into a part aerobic exercise and a part resistance exercise, 2 days per week for 3 months.

At baseline and after 12 weeks, anthropometric measurements (stature, weight, circumferences, diameters, and skinfold thicknesses), bioelectrical impedance analysis, and body plethysmography (BOD

POD) were performed. An ultrasound bone densitometry instrument (OsteoSys – SONOST 3000) was used to assess bone density. Thompson & Gray's (1995) silhouettes were administered to examine the perception of body image. To assess the quality of life and the perception of the symptoms, the participants were administered the MENQOL (Menopause specific quality of life questionnaire). The handgrip strength test and the treadmill stress test were performed to assess the subjects' functional parameters. Differences between pre- and post-intervention data of physical activity were assessed by the t-test for dependent samples.

Results: A trend towards the amelioration of body composition parameters was observed with a decrease in body mass, fat mass, and body fat percentage. Statistically significant differences ($p < 0.05$) were noted in biceps and medial calf skinfolds, right handgrip strength, reactance, phase angle, and oxygen consumption peak. Significant improvements were recorded in most menopause symptoms and psycho-physical well-being, indicating the positive effect of physical activity.

Conclusions: Menopause is a crucial period for promoting physical activity and an active lifestyle, as women often become less active, the effects of aging become more evident, and health threats and chronic diseases begin to emerge. Both initiating and maintaining active behaviours pose significant challenges, highlighting the need for targeted interventions that address the psychosocial factors determining short- and long-term adherence.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC028 - EFFECTS OF A 6-WEEK ONLINE ADAPTED PHYSICAL ACTIVITY PROGRAM ON PHYSICAL FITNESS, SLEEP QUALITY AND PHYSICAL ACTIVITY LEVELS IN ADULTS WITH FIBROMYALGIA

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Purpose: Fibromyalgia (FM) is a chronic syndrome characterized by widespread musculoskeletal pain, fatigue, sleep disturbances and reduced physical function. Adapted physical activity (APA) has emerged as an effective non-pharmacological intervention to manage FM symptoms. Online, home-based delivery of APA could improve accessibility and adherence, yet limited evidence is available regarding its medium-term effects. This study aimed to evaluate the effects of a 6-week online APA program on cardiorespiratory fitness (CRF), sleep quality and physical activity (PA) levels in adults diagnosed with FM.

Methods: Nine participants (age = 49.7 ± 7.6 years) voluntarily enrolled in a 6-week APA intervention, consisting of two supervised online circuit training sessions per week. Each 60-min session included a 10-min warm-up, a functional circuit training comprising 8 stations, with a 1:1 work-rest ratio (30 s) repeated for 3 rounds, and a 10-min cool-down phase. Physical fitness assessments included the 2-Minute Step test (2MST) to evaluate cardiorespiratory fitness, the 30-s chair stand test and arm curl test to measure lower and upper body strength, chair sit-and-reach and back scratch test to assess lower and upper body mobility, and the 8-foot up-and-go test to evaluate agility and dynamic balance. Sleep quality was measured through the Pittsburgh Sleep Quality Index (PSQI), while physical

activity levels were self-reported via the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Assessments were conducted at baseline (T0) and post-intervention (T1).

Results: Statistically significant improvements were observed in CRF, as measured by the 2MST ($p = 0.04$), and in sleep quality, with a reduction in PSQI scores ($p = 0.03$). A trend toward increased self-reported physical activity levels was noted in the IPAQ-SF scores ($p = 0.06$).

Conclusions: A 6-week home-based APA program represents a feasible and effective approach to enhance cardiorespiratory fitness and sleep quality in adults with FM, with promising indications for increasing PA levels. These preliminary results support the integration of structured, remotely supervised APA into FM management strategies.

SC029 - RESIDUAL EFFECTS OF WEARING REBOUND SHOES ON GAIT KINEMATICS

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Purpose: Rebound shoes (RB) have become increasingly popular in the last decades, especially due to their impact absorbing properties during jumping or running. Although recent studies questioned the impact absorbing properties of these footwear (Polat et al. 2020), this footwear remains largely used. This study aims to explore the potential residual effects of wearing RB on subsequent gait kinematics wearing habitual shoes (HS).

Methods: A waist-worn tri-axial inertial measurement unit (IMU – G-SENSOR 2, BTS S.p.A, Padova, Italy; Full scale: accelerometer ± 2 g) was used to record gait kinematics from thirty-one females (Age: 28.16 ± 3.82 years; Body Mass: 65.3 ± 12.7 kg; Height: 1.60 ± 0.05 m; BMI: 23.7 ± 4.7 kg/m²). Gait kinematics was recorded while participants walked on a motorized treadmill for 120 s at 1.25 m/s speed wearing their HS. Gait kinematics was recorded before (HSPRE) and after (HSPOST) wearing and walking in RB on a motorized treadmill for 10 min. To compare CoM kinematics between HSPRE and HSPOST, the Root Mean Square (RMS) of the linear acceleration on the vertical (CC), medio-lateral (ML) and antero-posterior (AP) axes were computed (RMSCC; RMSML; RMSAP). The linear acceleration on the CC axis was used to calculate Vertical Stiffness (Kv), and the mean across the peak linear accelerations of all steps (MPeakCC). RM-ANOVA was used to test differences between conditions.

Results: The RM-Anova showed a significant effect of condition with the HSPOST condition showing higher RMSCC ($p < 0.001$) than the HSPRE. Similarly, higher Kv was observed in the HSPOST condition compared to the HSPRE condition ($p = 0.039$). The other statistical tests yielded no significant differences.

Conclusions: Due to increased Kv and RMSCC when walking in habitual shoes after wearing RB for a brief period of time, the participation in fitness courses using the RB shall be carefully considered in individuals suffering from lower limb and lower back pathologies.

Reference:

Polat B, et al. Evaluation of the Knees of Asymptomatic Kangaroo Jumpers with MR Imaging. Magn Reson Med Sci. 2020 Feb 10;19(1):7–13. <https://doi.org/10.2463/mrms.mp.2018-0094>.

SC030 - COMPARATIVE ANALYSIS OF GAIT AND METABOLIC EQUIVALENTS DURING THE SIX-MINUTE WALK TEST IN ELDERLY SUBJECTS WITH PARKINSON'S DISEASE

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Purpose: Parkinson's Disease (PD) significantly impairs gait and functional capacity. The Six-Minute Walk Test (6MWT) is a validated tool to measure walking endurance and exercise capacity. This pilot study aimed to compare gait parameters from the 6MWT between elderly individuals with PD (N = 10) and healthy elderly controls (N = 10), controlling for age, gender, weight, and height. Additionally, it aimed to correlate these parameters in the PD group with disease severity (Hoehn and Yahr scale, H&Y) and motor impairment (UPDRS Part III).

Methods: Participants were recruited based on clinical and mobility criteria. Assessments included demographic data, anthropometrics, H&Y scale, UPDRS III (PD only), and the 6MWT. ANCOVA was used to compare groups (adjusting for covariates), and Spearman correlations were computed within the PD group. Gait analysis was conducted during the 6MWT on a treadmill using the En-Motion system (Enraf-Nonius, Germany). Parameters assessed included walking distance, average speed, and cadence. MET was calculated to evaluate exercise intensity.

Results: PD patients walked significantly shorter distances (mean = 279.5 ± 112.9 m) than controls (mean = 522.0 ± 81.9 m; $p < 0.001$). MET values were also lower in the PD group (mean = 2.33 ± 0.64) compared to controls (mean = 3.17 ± 1.43; $p < 0.05$). Significant group differences emerged for walking distance and speed, but not for predicted normative distance ($p = 0.572$), suggesting impairments were disease-related. Linear regression showed PD diagnosis ($p = 0.001$) and age ($p = 0.015$) significantly predicted MET (adjusted $R^2 = 0.469$). Within the PD group, MET negatively correlated with H&Y score ($r = -0.475$, $p = 0.017$), and regression confirmed H&Y as a predictor ($\beta = -0.475$, $p = 0.034$; adjusted $R^2 = 0.183$).

Conclusions: This pilot study supports the use of the 6MWT in elderly individuals with PD and provides preliminary data for estimating sample sizes in future studies. Despite the small sample, findings highlight the value of objective gait assessment in PD management.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC031 - BEYOND THE NIGHT: INCREASED ENERGY EXPENDITURE IN CHILDREN WITH SLEEP APNEA SYNDROME

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Purpose: Obstructive Sleep Apnea Syndrome (OSAS) in pediatric populations is known to affect not only cognitive and behavioral domains but may also influence energy metabolism, although findings in literature remain inconclusive. This study aimed to objectively assess and compare physical activity levels and energy expenditure in children diagnosed with OSAS versus typically developing children (TDC).

Methods: This observational study enrolled 100 non-obese children aged 6–11 years: 50 with OSAS and 50 age-matched TDCs. All participants underwent overnight polysomnography. Physical activity was monitored using the multi-sensor BodyMedia SenseWear Pro Armband (SWA), worn continuously for one week during hospitalization, excluding aquatic activities. The SWA provided measures of total energy expenditure (Joules), active energy expenditure (Joules), and average metabolic rate (METs).

Results: Children with OSAS demonstrated significantly higher total energy expenditure (median 7051 J, IQR 7037–7068 J) compared to controls (median 6103 J, IQR 6100–6105 J; $p < 0.0001$). Similarly, active energy expenditure (median 3507 J vs. 3149 J; $p < 0.0001$) and MET values (median 5296 J vs. 4947 J; $p < 0.0001$) were elevated in the OSAS group.

Conclusions: Children with OSAS exhibit increased energy expenditure and metabolic activity despite comparable BMI and daily routines. These findings suggest altered energy metabolism in pediatric OSAS, warranting further investigation into its physiological and clinical implications.

Acknowledgments: N/A.

References: N/A.

SC032 - DIGITAL CONTENT TO PROMOTE PHYSICAL ACTIVITY IN URBAN GREEN SPACES IN HARMONY WITH NATURE: AN INTEGRATED PROJECT OF THE NATIONAL BIODIVERSITY FUTURE CENTER IN THE CITY OF PAVIA

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Purpose: Sedentary behavior is a growing public health concern. Regular physical activity reduces the risk of chronic diseases and supports physical and mental well-being. Urban green spaces are ideal for promoting exercise in contact with nature. This project, developed within the National Biodiversity Future Center (NBFC), aimed to create digital content to promote physical activity and biodiversity awareness in the urban context of Pavia.

Methods: The Laboratory of Adapted Motor Activity (LAMA) at the University of Pavia coordinated the design and selection of physical exercises, while the Laboratory of Dietetics and Clinical Nutrition from the same university oversaw the scientific framework. The Zoo

Plant Laboratory at the University of Milano-Bicocca developed biodiversity content, and Officine Creative managed the audiovisual production. Sixteen exercises were presented in two instructional videos, adapted for beginner and advanced levels. Each video includes an introduction on local biodiversity and simple instructions on exercise execution. Three urban green areas were chosen, *each focusing on a specific motor skill*. Balance training (tandem stance, walking tandem, single-leg balance, Y position): in the Ticino Riverbank, near the “Ponte Coperto”. Strength exercises (squats, bridges, hip abduction, adduction and extension, calf raises, modified push-ups): in the University courtyards. Flexibility and mobility (limb stretching, spine/neck mobility): in the gardens of the Visconti Castle. In each area there are also walking routes to improve aerobic capacity.

Results: The project produced video-based educational and exercise content for direct use in urban spaces, with no need for a centralized digital platform. Materials will be accessible via QR codes at each training station. Different difficulty levels are designed to engage both physically active individuals and sedentary populations.

Conclusions: The project aims to promote an active urban lifestyle and raise awareness of local biodiversity. Integrating digital exercise content with urban biodiversity education represents an effective and sustainable strategy to promote public health and ecological awareness. The model developed in Pavia within the NBFC framework can be exported to other urban contexts and may contribute to transform green spaces into inclusive, nature-centered areas for physical activity.

SC033 - THE ROLE OF KINESIOLOGIST IN THE MULTIMODAL PREHABILITATION APPROACH: IMPACT OF EXERCISE PRESCRIPTION ON POST-SURGERY FUNCTIONAL RECOVERY THROUGH A.O.U. CAREGGI PREHABILITATION UNIT PERSPECTIVE

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Purpose: Multimodal prehabilitation programs including nutritional counselling, psychological support and structured physical exercise, optimize preoperative physiological reserve, reduce complications and boost patient postoperative functional recovery. The present investigation aimed to evaluate the preoperative characteristics of high-risk patients undergoing major surgery and to assess the impact of a multimodal prehabilitation program (MPP), peculiarly addressing the kinesiological component.

Methods: One-hundred-eighty-four patients referred to the A.O.U. Careggi Multimodal Prehabilitation Unit underwent baseline evaluation and were administered either a supervised (SP) (n = 94) or a home-based/mixed program (HBP) (n = 90). Exercise intervention

included resistance and aerobic training applied through high-intensity interval training (HIIT) or moderate-intensity continuous training (MICT), according to individual patient profiles. Functional capacity was assessed using the Duke Activity Status Index (DASI), 6-min walk distance (6MWD), Fried Frailty Score, and sarcopenia criteria. Evaluation was performed preoperatively, at 30- and 90-days post-surgery.

Results: Patients enrolled in the SP group were older, more frequently frail, sarcopenic, and had a lower baseline functional status (DASI 30.7, 6MWD 417.6 m) compared to the group performing HBP (DASI 45.5, 6MWD 499 m). Both groups showed comparable post-intervention functional improvements at 30 (SP 61% vs HBP 54%, p = 0.382) and 90 (SP 64% vs HBP 71%, p = 0.373) days post surgery; despite a better preoperative functional improvement in the SP group (preoperative 6MWD $\geq$ 20 m from baseline: SP 60% vs HBP 44%, p = 0.033). However, among patients experiencing post-operative complications, functional recovery at 30 days (6MWD $\geq$ 20 m from baseline) resulted better in the SP group (21.2% vs 10% in HBP, p = 0.049).

Conclusions: MPP, incorporating RT and both HIIT and MICT, appears particularly beneficial for frail and functionally limited surgical patients. Moreover, in case of postoperative complications, supervised tailored exercise seems to be more effective in promoting functional recovery than home-based program.

SC034 - ENHANCING PHYSICAL PERFORMANCE THROUGH MODULATION OF THE GUT-LIVER-MUSCLE AXIS: THE ROLE OF PROBIOTICS

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Purpose: This study aims to investigate the interaction between gut, liver and muscle, paying particular attention to role of intestinal microbiota and the impact of probiotics on physical performance. Previous studies have demonstrated that these three organs communicate with each other via hormonal, inflammatory and metabolic signals. During physical activity, muscles release myokines, including IL-6, which improve the liver's insulin sensitivity, stimulate controlled glucose production and promote lipid oxidation. In turn, the liver receives and integrates signals from the muscles and intestines. It responds adaptively to maintain energy homeostasis, reduce lipid accumulation and improve cholesterol management by directing it towards bile acid synthesis. At the same time, the gut contributes to liver regulation by releasing hormones such as FGF19, which has hepatoprotective effects and modulates energy metabolism. Gut microbiota, which are positively influenced by probiotic intake, play a central role in this axis by promoting better intestinal barrier integrity, reducing systemic inflammation and regulating bile acid composition. This study aims to clarify how strengthening the gut-liver-muscle axis can optimise metabolic health and physical performance.

Methods: The study involved 10 subjects, who were divided into two groups: an experimental group (n = 5) who were treated with a multi-strain mix of probiotics containing *Lactobacillus reuteri*, *Bifidobacterium longum*, *Bifidobacterium lactis* and *Lactobacillus fermentum*,

and a control group ($n = 5$), who received no treatment. The intervention lasted 16 weeks. Blood samples were taken to assess the following biomarkers: IL-6, irisin, TSK, FGF19, bile acids and short-chain fatty acids (SCFAs).

Results: The results showed a trend of variation in the probiotic-treated group compared to the control group. In particular, changes were observed in the plasma levels of IL-6 and irisin, accompanied by modulations in FGF19, bile acids, and short-chain fatty acids (SCFAs).

Conclusions: The results suggest that modulating the microbiota through probiotics can influence the gut-liver-muscle axis, optimising energy metabolism, reducing systemic inflammation, and improving physical performance. However, further research need to confirm this finding, involving larger sample sizes, longer follow-ups and more in-depth molecular investigations.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC035 - DIET AND PHYSICAL ACTIVITY FOR MENSTRUAL HEALTH: TOWARDS SUSTAINABLE WORKPLACE INTERVENTIONS

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Purpose: The menstrual cycle has a relevant impact on women's daily activities, affecting their health, well-being, and performance across psychophysical and cognitive dimensions [1]. The extent of this impact varies depending on women's lifestyle and environment. While the influence of diet and physical activity on sports performance and menstrual symptoms is well-documented, there is a notable lack of research examining these effects in workplace settings. This narrative review presents current diet and exercise guidelines supporting women during menses, aiming to develop evidence-based welfare strategies and provide future research directions.

Methods: A literature search was performed in PubMed, Scopus, and EBSCO databases for open-access studies in English from May 2015 to May 2025, involving adult women. 78 studies, including meta-analyses, systematic reviews, observational studies, and RCTs, were analysed. Keywords included: diet, nutrition, physical activity, exercise, menstrual cycle, symptoms, dysmenorrhea, premenstrual syndrome, hormonal contraceptive, workplace, productivity.

Results: Consuming regular meals and following an anti-inflammatory diet [2], such as the Mediterranean Diet, which is rich in minimally processed foods (vegetables, fruits, whole grains, dairy, fish, legumes), along with supplements containing omega-3 fatty acids, vitamin D, iron, magnesium, ginger, and vitex agnus-castus,

were linked to reduced symptoms, improved mood, and cognition. Similar benefits were noted with aerobic and strength exercise, yoga, and stretching. Protocols lasting at least 8 weeks with a minimum frequency of three sessions per week, each longer than 30 minutes, showed significant reductions in pain severity [3]. No RCTs integrating dietary and physical activity interventions were found.

Conclusions: Current evidence supports the positive impact of anti-inflammatory dietary patterns and regular exercise on menstrual symptoms, mood, and cognitive function, indicating the necessity for increased awareness among women of the interaction between menstruation and lifestyle. Since these strategies are rarely applied in workplace contexts, future research should focus on integrated interventions including menstrual health education, adherence to the Mediterranean Diet, and multimodal exercise programs to promote women's well-being and productivity in occupational settings.

References:

1. Hardy et al., 2021.
2. Ciolek et al., 2024.
3. Xiang et al., 2025.

SC036 - ASSOCIATION BETWEEN COGNITIVE PARAMETERS AND PHYSICAL PERFORMANCE IN OLDER ADULTS: BASELINE PRELIMINARY RESULTS OF MOTOR AND COGNITIVE ENHANCEMENT IN AGING (MOVE) STUDY

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Purpose: The aging global population has led to a rising prevalence of falls among older adults, a major cause of morbidity and loss of independence. While muscle strength and balance are established fall risk factors, cognitive impairment remains under-recognized. This study reports baseline data from a 12-week exercise program, exploring pre-intervention associations between cognitive and physical performance in older adults.

Methods: This randomized-controlled study enrolled older adults aged over 60 years. Thirty-four subjects (22 men and 12 women; age: 70 ± 7 years) were enrolled. Subjects with any medical conditioning preventing safe participations in physical activity were excluded. Cognitive assessments included Trail Making Part A (TMA), Trail Making Part B (TMB), and Digit Symbol Substitution Test (DSST). Physical assessments included right and left handgrip strength test (HGS), arm curl test (ACT), maximal isometric quadriceps strength (MQS) of both legs, chair stand test (CST). Timed Up and Go test with single task (TUG_ST) and with dual task (TUG_DT), Y balance test (YBT), and 6 min walking test (6MWT).

Results: Pre-intervention associations between cognitive and physical performance showed that TMA was significantly correlated with ACT ($R = -0.366$, $P = 0.034$), TUG_DT ($R = -0.414$, $P = 0.015$), right postero-medial ($R = -0.450$, $P = 0.015$) and postero-lateral ($R = -0.469$, $P = 0.005$) YBT, and left postero-lateral YBT ($R = -0.375$, $P = 0.029$). Moreover, TMB showed significant correlations with ACT ($R = -0.365$, $P = 0.034$), right ($R = -0.351$, $P = 0.042$) and left ($R = -0.346$, $P = 0.045$) MQS, 6MWT ($R = -0.345$, $P = 0.046$), TUG_ST ($R = 0.429$, $P = 0.011$),

TUG_DT ($R = 0.666$, $P < 0.0001$), right postero-medial ($R = -0.349$, $P = 0.045$) and postero-lateral ($R = -0.407$, $P = 0.017$) YBT. DSST was significantly correlated with 6MWT ($R = 0.346$, $P = 0.045$), TUG_DT ($R = -0.562$, $P = 0.0005$), right postero-medial ($R = 0.579$, $P = 0.003$) and postero-lateral ($R = 0.558$, $P = 0.0006$) YBT, left anterior ($R = 0.369$, $P = 0.032$), postero-medial ($R = 0.458$, $P = 0.0064$), and postero-lateral ($R = 0.502$, $P = 0.0025$) YBT. Finally, TUG_DT showed significant correlations with right ($R = -0.456$, $P = 0.007$) and left ($R = -0.420$, $P = 0.013$) HGS, right MQS ($R = -0.424$, $P = 0.013$), 6MWT ($R = -0.374$, $P = 0.029$), right ($R = -0.382$, $P = 0.026$) and left ($R = -0.049$, $P = 0.049$) postero-lateral YBT.

Conclusions: These preliminary results highlight significant cognitive–physical correlations, suggesting that combined assessments may enhance fall risk identification in older adults.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC037 - ECCENTRIC EXERCISE IN CARDIOVASCULAR DISEASE REHABILITATION: A NARRATIVE REVIEW OF PHYSIOLOGICAL IMPACTS ON ADULTS AND OLDER ADULTS

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Purpose: Eccentric (ECC) exercise is a distinctive approach in rehabilitation, recognized for its lower metabolic demands and higher power output. It is regarded as a safe and effective option, particularly for individuals with low exercise tolerance. Cardiovascular disease (CVD), one of the leading causes of death worldwide, continues to rise in prevalence. During rehabilitation, ECC exercise may offer particular advantages for CVD patients due to its reduced strain on the cardiorespiratory system. This narrative review aims to evaluate the physiological effects of ECC exercise in adults and older adults with CVD and to explore which ECC modalities are feasible and safe for this population.

Methods: A literature search was conducted using PubMed, Web of Science, and Scopus databases to identify relevant studies examining the acute and chronic effects of ECC exercise interventions in patients with CVD.

Results: This review evaluated 13 studies comprising 362 participants, predominantly male, with CVD. The studies primarily focused on ECC exercise, particularly ECC cycling, applied at varying intensities and in different settings. The findings indicate that ECC exercise is generally safe, eliciting low heart rate (HR) and perceived exertion even as workload increases. Chronic ECC training was associated with improvements in cardiac function, reductions in HR, and enhanced functional capacity, including better performance in the 6-min walk test and stair descent, despite lower oxygen consumption. Although some studies reported no significant changes in VO_2peak or vascular function, the overall evidence supports ECC exercise as a feasible and effective modality for cardiovascular rehabilitation.

Conclusions: ECC exercise has shown notable advantages for individuals with CVD, offering higher power output with reduced cardiovascular strain compared to concentric (CON) training. Despite some variability in HR responses—likely due to differences in training intensity and adaptation over time—ECC consistently results in lower VO_2 consumption, making it metabolically efficient and well-suited for CVD patients. Studies also highlight ECC's positive impact on functional capacity, strength, and mobility, particularly in

frail older adults, without increasing thrombotic risk. These findings support ECC as a safe and effective rehabilitation modality for improving both cardiovascular tolerance and physical function in at-risk populations.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC038 - WHAT DO ITALIAN FEMALE TRACK AND FIELD ATHLETES REALLY KNOW ABOUT THE MENSTRUAL CYCLE AND ORAL CONTRACEPTIVES?

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Purpose: Despite the widespread use of oral contraceptives and their known physiological effects (1), little is known about athletes understanding on reproductive health. This study aims to assess Italian female track and field athletes' understanding menstrual cycle, oral contraceptives, and key aspects of female reproductive and endocrine physiology to identify gaps to inform future educational strategies.

Methods: A total of 149 Italian female track and field athletes (mean age 25 ± 8 years), across all events and competitive levels, completed a 12-item questionnaire including multiple-choice and short-answer questions on menstrual cycle and oral contraceptives use. Participants could report more than one event, and were clustered as follows: sprints ($n = 82$), middle- and long-distance running ($n = 39$), jumps ($n = 12$), throws ($n = 12$), and combined events ($n = 8$). A 'knowledge score' was calculated based on the number of correct answers. Linear regression analysis was used to identify variables independently associated with the 'knowledge score' of the menstrual cycle and oral contraceptives.

Results: Seventy-six percent of athletes reported current use of hormonal contraceptives, with the oral contraceptive pill being the most common method. The mean 'knowledge score' was 6.1 ± 3.1 out of 12, with only 26% of athletes scoring 9 or higher. Current use of oral contraceptive was significantly associated with higher 'knowledge score' ($\beta = 1.03$, $p < 0.001$). No significant associations were found for other variables including age, education level, coach gender, diet, and event.

Conclusions: Although the use of oral contraceptives is common among Italian female track and field athletes, their overall knowledge of oral contraceptives and related-reproductive physiology remains limited. Only current use of oral contraceptives demonstrated greater awareness. These findings highlight the need for targeted educational interventions to bridge existing knowledge gaps.

Acknowledgments: (non obbligatorio).

Reference:

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SC039 - SAFETY PROFILE OF L-CARNITINE SUPPLEMENTATION

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Purpose: L-carnitine is generally well tolerated, with mild gastrointestinal discomfort being the most common side effect. Despite the widespread use of carnitine in sport, data on its safety comes mainly from clinical reports. The aim of the work was to improve the knowledge of the safety profile of carnitine, by analysis of real-world spontaneous reporting data of suspected adverse reactions to this supplement, performed by searching the EudraVigilance database.

Methods: The data obtained were extrapolated from the Eudravigilance database. EudraVigilance, managed by the European Medicines Agency (EMA), is a system for monitoring the safety of medicines within the European Economic Area (EEA). It collects and analyzes reports of suspected adverse reactions to authorized medicines.

Results: The results show that there are approximately 277 adverse reactions, reported mainly in Italy (n = 168). 107 concern those aged between 18 and 64, 58 for those over 65. 145 concerned women and 88 concerned men.

Among the adverse reactions reported, 67 concerned skin reactions, 55 gastrointestinal reactions, 56 general disorders and administration type; 51 the nervous system and 31 psychiatric pathologies.

Conclusions: Carnitine remains a popular supplement among endurance athletes, while side effects are generally mild, population should consider dosage, individual tolerance, and dietary habits before supplementation, further research is needed to clarify its long-term effects.

SC040 - AI IN MOTION: A SYSTEMATIC REVIEW OF ARTIFICIAL INTELLIGENCE—DRIVEN TOOLS FOR PHYSICAL ACTIVITY PROMOTION AND THEIR COMPARISON WITH TRADITIONAL STRATEGIES

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Purpose: Physical inactivity remains a major public health issue globally, highlighting the need for effective, scalable, and cost-efficient interventions. In recent years, artificial intelligence (AI)-powered tools, such as chatbots and virtual coaches, have emerged as innovative approaches to support physical activity (PA) practice. However, their effectiveness compared to traditional strategies is still not well investigated. This systematic review aimed at exploring the characteristics, behavioural strategies, and effectiveness of AI-based conversational agents in promoting PA and to compare their outcomes with traditional interventions.

Methods: A systematic search was conducted in Scopus, Web of Science, PubMed, and Cochrane databases up to May 2025. Eight interventional studies were included, all of which used AI-powered chatbots or virtual agents with the goal of increasing PA levels. Risk of bias was assessed using ROBINS-I and RoB 2 tools. For each study, intervention characteristics, applied behavioural techniques, PA-related outcomes, and user engagement were extracted and

synthesized, and then compared with those of traditional face-to-face interventions.

Results: AI-mediated interventions commonly integrated evidence-based behaviour change techniques including goal setting, feedback, and motivational support. Several studies reported positive effects on PA indicators such as step count and minutes of moderate-to-vigorous physical activity, although findings varied considerably.

Overall, user engagement and system usability were rated positively, especially in interventions that included relational or empathic features (e.g., social dialogue and humour). Compared to traditional PA interventions, AI-driven solutions offered advantages in terms of scalability and user autonomy, but often lacked methodological rigor and long-term outcome assessments.

Conclusions: AI-powered conversational agents and chatbots appear to be promising tools for promoting PA, particularly in reducing dependence on human resources and enabling broader, more accessible implementation. Nevertheless, future research should focus on methodologically robust extended follow-up periods, and the development of hybrid models that combine human support and AI-driven components to enhance effectiveness and user experience.

SC041 - PHYSICAL ACTIVITY AND DEPRESSION: A SYSTEMATIC REVIEW OF BARRIERS AND FACILITATORS USING THE SOCIO-ECOLOGICAL MODEL

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Purpose: Mental health disorders affect about one in eight people globally and are often linked to limited care, isolation, and stigma (WHO, 2011). Depression is a major cause of disability with significant personal and social impacts. Physical activity (PA) is recognized as an effective, non-medical approach to reduce depressive symptoms and improve well-being. However, individuals with depression often face barriers to PA, reinforcing inactivity and health inequalities (Firth et al., 2016). This review examines evidence on the key barriers and facilitators to PA in clinically diagnosed individuals with depression.

Methods: A systematic search of six electronic databases (PubMed, ProQuest, Web of Science, Scopus, Cochrane Library, and PsycINFO) was conducted to identify peer-reviewed studies exploring PA-related factors in individuals diagnosed with depression, as defined by DSM criteria (APA, 2013). Both qualitative and quantitative studies were included, yielding 14 studies with a total sample size of 25,375 participants. Data were categorized using Bauman's socio-ecological framework (Bauman et al., 2012) to identify determinants at individual, interpersonal, environmental, and policy/cultural levels.

Results: The review found that participation in PA among individuals with depression is influenced by multiple interrelated factors. Key barriers include depressive symptoms, low motivation, and fatigue, while social support acts as a major facilitator. Environmental aspects like access and cost, along with cultural and educational factors, also play a significant role.

Conclusions: The findings highlight the need for multi-level, customized interventions that address the diverse and complex challenges people with depression face in becoming physically active. The review offers practical recommendations for developing

inclusive, context-aware approaches that support mental health through PA.

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SC042 - A REVIEW OF THE ROLE OF PHYSICAL EXERCISE IN MANAGING POLYCYSTIC OVARY SYNDROME SYMPTOMS

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Purpose: Polycystic ovary syndrome, also known as PCOS, is the most common endocrine disorder in women during reproductive age. It is characterized by changes in hormone levels, associated with severe clinical problems such as infertility, insulin resistance (IR), hypertension, obesity, diabetes mellitus, dyslipidemia, depression, anxiety and increased cardiovascular risk. Treatment methods vary due to the heterogeneity of patients and include both the pharmacological approach and, more recently, a nutraceutical treatment with inositol. However, the main way PCOS is addressed is by changing one's lifestyle, with the introduction of a healthy diet, low in fat and sugar, combined with regular physical exercise. The aim of the work was to discuss the main elements revealed from the up-to-date literature which addressed the effect of regular physical exercise on women affected by PCOS.

Methods: A literature search was conducted on relevant databases such as PubMed and Google Scholar. The keywords used were: polycystic ovary syndrome, physical exercise, symptom management and treatment. The choice of articles fell only on articles in English, in a time frame ranging from the year 2000 to 2024.

Results: Exercise is recommended for PCOS, but the prescription of the most effective type of exercise is unclear. There are many variables, and these may concern the characteristics of the physical exercise or the characteristics of the woman.

According to the relevant results emerged from the literature, the relationship between the different types of physical exercises (i.e., moderate-intensity aerobic, continuous aerobic exercise training, high-intensity interval training or moderate-intensity aerobic, combined with strength training) and their effects on subjects, affected by PCOS and with different body compositions (i.e., overweight or normal-weight) remained unclear in some aspects. However, some of these results can provide basic indications on which physical exercise protocols can be used.

Conclusions: Polycystic ovary syndrome is a disorder that is not easy to manage. It can certainly be said that physical exercise is a strong ally in therapy to improve its symptoms. However, further studies are needed to establish more precisely which aspects of physical exercise provide the greatest benefit.

SC043 - THE SILENT DIALOGUE: MICROBIOTA, INFLAMMATORY MARKERS AND PSYCHOPHYSICAL WELL-BEING IN MOVEMENT MEDITATION PRACTITIONERS

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Purpose: Movement meditation practices such as Aikido and Tai Chi represent accessible, sustainable forms of physical activity suitable for all age groups. By integrating moderate exercise with mindful awareness, these disciplines offer a valuable strategy for promoting physical and mental well-being and advancing equity in health promotion. Emerging evidence suggests that such practices may positively influence the gut and oral microbiota, and contribute to the regulation of systemic inflammation, with potential benefits along the gut–brain–immune axis.

This study aims to investigate the potential effects of Aikido and Taichi practice on the composition of gut and oral microbiota and its relationship with inflammatory biomarkers, in order to explore the role of movement meditation in modulating systemic inflammation and supporting the gut–brain–immune axis.

Methods: We conducted an observational study on adult Aikido practitioners. A total of approximately 42 samples were collected. Biological samples (stool and saliva), anthropometric data, and information on physical activity, dietary habits, and perceived meditation levels were collected using validated questionnaires (IPAQ, MEDI). 16S rRNA sequencing was used for microbiota analysis, and selected plasma inflammatory biomarkers were assessed.

Results: Preliminary results suggest that participants reporting higher levels of meditation and regular Aikido practice exhibit beneficial modulations of their microbiota. Specifically, an increased relative abundance of *Bacteroides*, *Faecalibacterium*, and *Prevotella* was observed, along with a favorable Bacteroidetes-to-Firmicutes ratio—an indicator of intestinal eubiosis. In parallel, salivary microbiota profiles appeared consistent with a lower inflammatory status. Moreover, emerging trends point toward a modulation of the immune system compatible with systemic anti-inflammatory effects.

Conclusions: Aikido and Tai Chi appear to be effective, low-cost, and sustainable non-pharmacological strategies for improving psychophysical health. The integration of movement science, microbiome analysis, and immunological markers strengthens the hypothesis that movement meditation can serve as a preventive intervention against chronic stress and inflammation. Further interventional studies are recommended to validate these findings at a larger scale.

SC044 - TOWARDS IDENTIFYING A BIOMARKER OF THE FEELING OF POWER: PROPOSING A NEW EPISTEMOLOGY OF PERFORMANCE IN PARALYMPIC SPORT

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Purpose: In Paralympic sport, monitoring internal load is particularly complex due to the heterogeneity of impairment profiles, the impact of psychosocial factors, and individual perceptions of limitation and fatigue. These elements challenge the validity and generalizability of standardized physiological biomarkers. In response, this contribution proposes a theoretical model in which the *feeling of power* is conceived as a lived and situated indicator of performance efficacy. It hypothesizes that subjective states of readiness and self-alignment may correspond to coherent neurophysiological rhythmic patterns.

Methods: This study adopts a transdisciplinary conceptual approach that integrates:

- (1) the Nietzschean philosophical perspective of the feeling of power as an immanent transformative force;
- (2) neurophenomenology, which conceives of consciousness as emerging from patterns of coherence between neural and bodily systems;
- (3) neurodynamics, which describes ordered transitions in brain activity associated with stable intentional states.

Results: The proposed model, speculative in nature, hypothesizes that the feeling of power may function as a lived indicator of effective performance, potentially subject to future objectification through coherent neurophysiological patterns. It is suggested that coordinated rhythmic signals (e.g., HRV–EEG coherence, visceral-neural synchrony, and chronobiological rhythms) may correspond to states of embodied agency and intentional presence. This hypothesis opens the possibility that relevant subjective experiences related to internal load might, in perspective, be translatable into observable physiological markers.

Conclusions: This theoretical model frames the *feeling of power* as a lived biomarker, offering an alternative to standardized measures in the Paralympic sports context. By emphasizing embodied and situated experience, it opens new avenues for empirical research exploring whether affective states of readiness and agency may align with coherent neurophysiological patterns.

Acknowledgments: (non obbligatorio).

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SC045 - A 12-WEEK TRAINING PROGRAM IN A "PALESTRA DELLA SALUTE" EMPOWERED WITH A COGNITIVE TRAINING OR STIMULUS IN OLDER ADULTS: PROTOCOL FOR A RANDOMIZED-CONTROLLED TRIAL

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Purpose: Aging is associated with general physical deconditioning and cognitive decline. Structured Physical Exercise (SPE) programs combined with Cognitive Training (CT) in older adults with cognitive decline may improve cognitive performance compared to SPE alone. The purpose of this study is to evaluate different combinations of exercise training and cognitive stimulation to improve or maintain cognitive and functional outcomes in a large population of older adults attending a local "Palestra della Salute".

Methods: This study is a three-arm randomized controlled trial, aiming to enrol a sample of 150 participants aged greater than 70 years old and without visual impairment or dementia (Montreal Cognitive Assessment, MoCA score ≥ 13). After provision of the informed consent, participants will be randomised into 3 groups: A) SPE; B) SPE combined with CT in a dual-task version; C) SPE combined with home based Cognitive Stimulation (CS). The SPE consists of two supervised training sessions per week, each lasting 75 min, over a total duration of 3 months (24 training sessions). The exercise protocol includes aerobic, strength, balance, flexibility and stretching exercises and is performed under the supervision of an exercise physiologist. The CT will be performed either on a tablet or orally with the support of a member of the research team. The CS consists of a 10-min video followed by 10 true/false questions, administered twice per week (24 videos). The primary outcome is the quality of life measured with SF-36 questionnaire. Secondary outcomes include: MoCA, Trail Making Test (A and B), 6-Minute Walking Test, Timed Up and Go, Short Physical Performance Battery, Hand Grip strength, Pittsburgh sleep quality index.

Results: We expect that all three intervention programs will have a beneficial effects on both primary and secondary outcomes, with a superior effect for the SPE + CT group.

Conclusions: If proven effective, the intervention model combining SPE and cognitive training could be easily adapted and exported across all the "Palestre della Salute" network.

SC046 - 12-WEEK SENSORIMOTOR TRAINING REDUCES PAIN AND SYMPTOMS IN FIBROMYALGIA: A PILOT STUDY

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Purpose: Fibromyalgia (FM) is a complex and multifactorial condition characterized by chronic widespread pain, fatigue, and other somatic and psychological symptoms. While exercise is the only strongly recommended intervention by current EULAR guidelines,

research on modalities targeting body awareness and motor control remains limited. This pilot study aimed to evaluate the feasibility and the possible role of a 12-week sensorimotor training program on pain, symptoms, sleep quality, psychological aspects, and functional performance in individuals with FM.

Methods: Five participants diagnosed with FM (aged 56 ± 7.7 years) underwent a 12-week supervised sensorimotor training intervention (2 sessions/week). Assessments were conducted before and after the intervention, including validated questionnaires (BPI, FIQR, PSQI, SF-36, TSK) and physical tests (e.g., Sit-to-Stand, flexibility, balance). Non-parametric statistical analyses were performed due to the small sample size.

Results: The training was feasible and patients reported a high adherence to the protocol. Moreover, preliminary results showed improvements in perceived pain ($p = 0.043$), FIQR total and domain 3 scores ($p = 0.043$), and sleep quality (PSQI, $p = 0.042$). Functional performance also improved significantly in the Sit-to-Stand, Sit and Reach, and Trunk Rotation tests, as well as in static and dynamic balance ($p < 0.05$). No changes were found in quality of life or kinesiophobia, though a positive trend was noted.

Conclusions: Sensorimotor training appears to be a promising non-pharmacological intervention for individuals with FM, leading to reductions in pain and symptom burden, improved sleep, and enhanced physical function. These preliminary findings support further research through larger randomized controlled trials to validate its clinical applicability and long-term benefits.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC047 - PEAK VELOCITY IN YOUTH SOCCER: THE RELATIONSHIP BETWEEN TRANSITION GAME AND THE 30-M LINEAR SPRINT TEST

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Purpose: The measurement of peak velocity (PV) is key metric in the planning and evaluation of competition and training loads. These aspects could be paramount to optimize the training process and to manage the risk of injury in soccer players [1,2]. PV can be usually measured through various modality, including sprint test and maximum value observed during a training session or match [3]. However, few studies have investigated the relationship between small-sided games (SSGs) and sprint test on PV in young soccer players [4,5]. Therefore, the aim of this study is a) to compare the PV attained during transition game (TG) and in the 30-m linear sprint test; b) to understand if TG can be used to prepare players to withstand running at high speeds.

Methods: Twenty sub-elite male soccer players (age: 16.5 ± 0.71 years; height: 172.5 ± 7.69 cm; weight: 63.97 ± 11.93 kg) initially performed three trials of maximal running for 30-m linear sprint test. Subsequently, they performed 3 vs 2 TG on pitch measuring 50×40 m ($274 \text{ m}^2 \cdot \text{player}$), with 3×5 min followed by 2min30sec of passive recovery. The young soccer players were monitored using global positioning system (GPS) instrumentation at 18.18 Hz (GPEXE® SYSTEM, EXELIO srl, Udine, Italy). The Spearman's correlation test was applied for statistical analysis using Jasp software and significance level was set at $p < 0.05$. The coefficient of variation (%CV) and intraclass correlation coefficient (ICC) were calculated to detect the absolute and relative reliability of PV, respectively.

Results: The results revealed small correlation ($r = 0.250$; $p = 0.287$) on PV between TG and the 30-m linear sprint test. However, PV attained by young soccer players during TG was $83.44 \pm 4.55\%$ (ranged 73.97–89.42%). %CV and ICC observed during 30-m linear sprint test was 1.5% and 0.84, respectively; while TG produced %CV = 15.62 and ICC = 0.19.

Conclusions: The 30-m linear sprint test was considered the best method to measure PV than TG. Despite TG produced poor reliability, it could provide an interesting stimulus for the achievement of higher speeds, enabling to young soccer players to mitigate simultaneously non-contact injuries risk [5,6].

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SC048 - ANALYSIS OF TEAM SYNERGIES IN YOUTH SOCCER: A PILOT STUDY BASED ON AN ECOLOGICAL DYNAMICS APPROACH USING WEARABLE DEVICES

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Purpose: Understanding how team synergies emerge and are managed in football is essential for designing training sessions capable of transferring collective principles of play into matches. Through the lens of the ecological-dynamics approach, this pilot study analysed defensive organisation in the very first moments after a loss of possession, a decisive phase for rapid ball recovery and the application of collective pressing. We examined the evolution of directional synchrony ($r\beta$) during the first 10 s, assessing the quality of team-synergy patterns and how shared affordances, relative to individual action capabilities, reduce the system's degrees of freedom and support flexible, adaptive structures.

Methods: One national-level Under-17 team participated; ten league matches were analysed. Players wore K-AI Wearable Tech units that recorded GNSS positions at 50 Hz and, through sensor fusion, integrated tri-axial accelerometer, gyroscope and magnetometer data at 238 Hz. These measurements yielded trajectories, instantaneous velocities and external-load metrics. For every loss of possession, $r\beta$ was calculated: the angular offset between each player's heading and the direction to the defended goal was obtained and then transformed with the Kuramoto order parameter, yielding a synchrony index from 0 (disorganisation) to 1 (alignment) for the 0–10 s window. An exploratory analysis then finally considered pitch macro-zone (1–4) as an interaction factor.

Results: Using $r\beta$ revealed marked dimensional compression: the collective dynamics could be summarised by a single variable reflecting directional coherence, showing differences in recovery patterns within 0–10 s. Individual profiles showed reciprocal compensations: players changed roles according to context, maintaining

functional continuity and closing space. The $r\beta \times$ pitch-zone interaction revealed different thresholds across zones.

Conclusions: In elite youth football, the quality and stability of collective synergies could constitute key descriptors of team effectiveness. Interactions among individual, task and environmental constraints would foster adaptive strategies that sustain performance despite tactical pressure and game-flow variability. Systematically integrating high-frequency GPS tracking data with synchrony metrics would provide coaching staff with real-time operational insights to monitor collective readiness, fine-tune targeted small-sided drills and tailor tactical load according to role and competitive context.

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SC049 - ENHANCING SELF-MONITORING IN FEMALE FOOTBALL PLAYERS: THE IMPACT OF FEEDBACK ON PERCEIVED VS. ACTUAL TRAINING LOAD

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Purpose: Accurately evaluating training intensity is essential for optimizing athletic performance. While modern technologies like GPS and accelerometers provide objective data on external load, understanding internal load (i.e., how athletes perceive their physical exertion) remains equally important.

This self-assessment relies on metacognitive abilities, which involve monitoring and regulating one's own mental and physical states. These cognitive processes become especially demanding during intense physical activity. Although metacognitive monitoring has been widely studied in cognitive domains, less is known about its application in physical performance contexts. This study investigates whether semi-professional female soccer players can accurately estimate their physical exertion and examines whether regular feedback can improve the accuracy of these self-assessments over time compared to limited feedback.

Methods: Twenty-five female football players (age range: 17–31) participated in the four phases of the experiment: (1) study presentation and familiarization; (2) measurement of monitoring abilities: the athletes were asked to estimate the parameters of Total Distance, Very High-Speed Running Distance and RPE without accessing their GPS data; (3) study of the evolution of monitoring abilities: at the experimental group, after each post-training parameter estimation, was shown the actual GPS data, while the control group was required to estimate the parameters without receiving the GPS data (60 training sessions); (4) final measurement of monitoring abilities.

Results: The results show that female football players in this study tended to underestimate the Total Distance covered during training sessions. However, the experimental group demonstrated a significant improvement in the accuracy of their distance estimations compared to the control group, suggesting that regular feedback appears to be an effective strategy for enhancing athletes' self-monitoring abilities.

Conclusions: This study serves as a starting point for exploring athletes' ability to assess their physical exertion, highlighting the need for further research into metacognitive skills in sports. It opens new avenues for studying how metacognitive processes and self-monitoring relate to athletic performance. Additionally, the findings aim to

inspire coaches to integrate performance data more systematically into their training routines and, importantly, to share this information with athletes.

SC050 - SMART TRAINING FOR FAST MOVES: A LIGHT-BASED APPROACH TO IMPROVING REACTION TIME AND QUICKNESS IN FEMALE VOLLEYBALL PLAYERS

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Purpose: This study explored the effectiveness of a 6-week perception–action training program using LED light systems on reaction time and movement quickness in elite female volleyball players.

Methods: Twenty-four national-level athletes were randomly allocated to an experimental group (EG; n = 12), which trained with LED-based devices, and a control group (CG; n = 12), which followed conventional training. Both groups underwent a 6-week protocol, with pre- and post-assessments of reaction time in upper and lower limbs (RTsUL, RTsLL) and tapping speed (TUL, TLL). Testing was conducted with validated tools including Fitlight light systems and Chronojump Boscosystem. Data were analyzed using paired and independent t-tests and effect sizes (Cohen's d).

Results: Although both groups showed performance improvements, the EG recorded significantly greater gains. RTsUL improved by −14.9% ($\Delta = -0.072$ s, $t = 23.2$, $p < 0.05$, $d = 6.7$), RTsLL by −14.9% ($\Delta = -0.091$ s, $t = 44.0$, $p < 0.05$, $d = 12.7$), TUL by −10.6% ($\Delta = -0.622$ s, $t = 42.0$, $p < 0.05$, $d = 12.1$), TLL by −10.7% ($\Delta = -0.983$ s, $t = 43.1$, $p < 0.05$, $d = 12.4$). CG gains ranged from −1.0% to −4.5%. No significant pre-intervention differences were found between groups.

Conclusions: Incorporating light-based perception–action systems into training can substantially improve neuromotor speed and reactivity in volleyball players. These findings highlight promising applications for pre-season preparation and performance enhancement strategies.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC051 - SUBSTANCE USE TRENDS (2010–2023) IN ITALIAN ELITE ATHLETES: A LONGITUDINAL ANALYSIS OF DOPING VIOLATIONS AND ANTI-DOPING EDUCATIONAL STRATEGIES

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The phenomenon of doping in sports represents a constant challenge for protecting athletes' health and ensuring the integrity of competitions. Over the past thirteen years, the evolution of international regulations, sociocultural changes, and the impact of the COVID-19 pandemic have significantly influenced patterns of doping substance use. This study aims to analyze the temporal trends of all prohibited substances detected in anti-doping tests conducted in Italy between 2010 and 2023, using official data extracted from the "Doping-Antidoping Reporting System" published by the Italian Ministry of Health.

Reports from over 14,000 athletes subjected to official testing were examined, considering, for each year, the total number of positive cases, the types of substances detected (including anabolic steroids, stimulants, narcotics, diuretics, cannabinoids, peptide hormones, etc.), and the percentage incidence relative to the number of tests performed. Particular attention was given to the impact of regulatory changes, such as the increase in the THC threshold in 2013 and the removal of CBD from the list of prohibited substances in 2018.

The data reveal a non-linear trend in the use of different pharmacological classes, with peaks associated with periods of heightened psychosocial stress, such as the pandemic crisis, and variations in athletes' risk perception. Furthermore, gender and sport-specific differences emerge, highlighting the need for more targeted anti-doping policies and educational programs involving athletes, coaches, medical professionals, and sports administrators.

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SC052 - THE EFFECT OF COMBINED SPRINT RESISTED AND RESISTANCE TRAINING VERSUS SPRINT RESISTED ALONE ON PERFORMANCE IN THE 20-METER SPRINT

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Purpose: The present study aims to compare the effectiveness of the combined approach of resisted sprinting and resistance training and resisted sprinting training alone in improving sprint speed over 20 m, the average distance traveled by a high-speed soccer player.

Methods: the sample involves 16 amateur soccer players randomly divided into 2 groups: combined training (resistance training + resisted sprints) and resisted sprints only group. All athletes were tested over 20 m, pre- and post-intervention.

Results: After 8 weeks, both groups showed improvement, but the combined group showed significantly higher progress. ANOVA (2×2 , $p < 0.05$) showed a positive link between time and group, supporting the hypothesis that combined training is more effective.

Conclusions: the combination of resistance training and resisted sprinting has been shown to be effective in improving 20-m sprint performance, compared with sprint training alone. This shows that a combined approach is the best solution to provide effective neuromuscular stimuli to improve the field performance of soccer players.

Acknowledgments: (non obbligatorio).

References: (non obbligatorio).

SC053 - TALENT IDENTIFICATION IN ATHLETICS: A MODEL FOR INTERPRETING PERFORMANCE IN YOUTH CATEGORIES

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Purpose: Is the young person who excels in a youth competition the one with the brightest future? (Boccia et al. 2017) Are there other factors independent of predisposition that can influence the result of budding athletes? In order to interpret the result in the youth categories of Athletics, biological age, exact age (a measure that allows to remove the effects of relative age), the age at the beginning of sport practice, the number of hours of weekly training, the percentage of general training and that of a special nature were considered (Balyi et al. 2013).

Methods: 173 athletes aged between 14 and 15 years (14.3 ± 0.58 for females and 14.4 ± 0.61 for males) were recruited, specifically 105 females and 68 males. Data were collected regarding standing height, sitting height, lower limb length and body weight useful for identifying biological age (Mirwald et al. 2002). The best performance in terms of the participants' tabular score was considered and the young athletes and their coaches were asked about their years of practice, hours of training per week and the percentage of general and specific work. A linear regression was performed with the tabular score as the dependent variable and all other parameters collected as independent variables.

Results: The results show that performance is significantly explained by biological age ($p < 0.01$) and by the number of hours of training per week ($p < 0.01$).

Conclusions: The analysis of the results shows that the performance in the under 16 category is strongly influenced by the biological age and the number of training hours of the young practitioners. Paying attention to these two parameters can allow professionals to see beyond the current result and to more effectively identify the future prospects of athletes during their training path.

Acknowledgments: (non obbligatorio).

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SC054 - IS 3D KINEMATICS SUFFICIENT TO DISCRIMINATE BETWEEN KARATE NATIONAL AND INTERNATIONAL LEVEL ATHLETES?

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Purpose: Karate focuses on quick and powerful actions while maintaining maximum technical proficiency, particularly in the competitive disciplines of *kata* and *kumite*. Movement technique and precision are crucial aspects and are evaluated during competitions. With the hypothesis that elite athletes should have better performance and technical execution closer to the ideal movement described by the greatest masters, the purpose of this study is to investigate biomechanical differences between international (élite) and national (non-élite) karateka.

Methods: 13 élite (Age: 22.4 ± 4.1) and 13 non-élite (Age: 24.2 ± 5.1) black belt karateka performed three kicks: *mae-geri* (front kick), *mawashi-geri* (roundhouse kick) and *ushiro-geri* (back kick) recorded by a 9-camera motion capture system analyzing trunk, hip, knee, ankle, center of mass kinematics, and kick height.

T-tests were used to investigate group differences in age, height, weight, and trainings/week. Six trials for each technique were collected and differences in kinematic variables were checked using two-way ANOVA via Statistical Parametric Mapping (SPM) for the entire movement, with group (élite vs non-élite) as the between-subjects factor and repetition as the within-subjects factor. A two-way ANOVA assessed differences in kick height.

Results: Most of the kinematic variables showed no statistically significant differences between élite and non-élite athletes. However, élite athletes exhibited significantly higher kick height ($p = 0.030$) in *mawashi-geri* and greater ankle inversion in *mae-geri* compared to non-élite athletes in the range of 40% to 49% ($p = 0.017$) and 52 to 58% ($p = 0.032$) of the movement.

Conclusions: Increased kick height suggests superior joint mobility and muscle elasticity, aligning with national team selection criteria, while enhanced ankle inversion indicates better efficacy and execution of techniques. Nonetheless, joint kinematics alone may not sufficiently distinguish performance in athletes of similar skill. Power, strength, acceleration, velocity, applied forces, limb coordination may be important elements that would help to differentiate better athletes' performance of this close level. Further research and integration with kinetics are recommended to develop an ideal biomechanical model for training improvement.

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SC055 - TRANSITION GAMES AND SPEED PEAK IN PROFESSIONAL SOCCER PLAYERS

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Purpose: Training and competition conditions often require the player to reach maximum levels of speed and acceleration: these data can be acquired with Global Position System (GPS) devices so the need for isolated tests to assess these physical characteristics may decrease. By looking at the acceleration-speed profile (ASP), it is possible to assess the peak speed reached by each player in training and in official matches [1]. Monitoring the peak speeds required by the soccer match performance is a considerable factor in both increasing performance and preventing non-contact muscle injuries in soccer [2]. The study aims (a) to compare the peak speed values in transitional game (TG) with those obtained in training or official match and (b) to analyze the reliability of TG in professional soccer players.

Methods: A sample ($n = 38$) professional male soccer players (25.4 ± 3.8 years, 74.9 ± 5.8 kg, 178.2 ± 4.2) participated in the investigation. PS in competition and training (last month before TG) was measured for all participants through GPS (GPXE, Exelio, Udine Italy): GPS software provides ASP. Then, a TG (3 vs 2) performed on a 50×40 m field, 2×8 min (rec. 1min30sec) was monitored. Spearman correlation test was applied for statistical analysis using Jasp software. Significance was defined at $p < 0.05$. The coefficient of variation (%CV) and intraclass correlation coefficient (ICC) were calculated to detect the absolute and relative reliability of PS, respectively.

Results: The ASP observed in the last month before the TG showed a peak speed of 33.11 ± 2.08 km/h; in the TG the observed sample showed a peak speed of 26.47 ± 1.86 km/h, corresponding to about $80.15 \pm 6.08\%$ of the speed peak reached in the last month. A small correlation was observed between speed peak given by ASP and speed peak in TG equal to $r = 0.246$, $p = 0.126$; the %CV was equal to 4.18% (range 0.76–9.19) while the ICC was equal to 0.45.

Conclusions: Monitoring the external loading parameters of soccer-specific drills is crucial to understanding whether the sessions meet the demands of official soccer match. The TG monitored has good CV and moderate ICC, but does not allow all soccer players to reach the speed peak exhibited in the last period of match and training. Further research needs to determine whether the same exercise performed on a larger field [3,4] can satisfy this parameter.

Acknowledgments: (non obbligatorio).

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SC056 - PHYSICAL PERFORMANCE LEVELS ACROSS BIOLOGICAL MATURATION STATUS IN YOUTH SOCCER PLAYERS

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Purpose: Soccer is a high-intensity sport requiring specific physical abilities such as power, speed, and aerobic fitness. During development, biological maturation significantly influences these physical abilities and consequently performance. Therefore, understanding how maturity status affects key physical performance in youth soccer players is essential for optimizing training and talent development. This study aimed to evaluate differences in performance such as countermovement jump (CMJ) height, sprint speed, and maximal oxygen uptake (VO₂max) in youth soccer players classified by maturity status based on their peak height velocity (PHV).

Methods: Thirty-six male youth soccer players from U16 (n = 10), U15 (n = 11), and U13 (n = 15) age groups were classified into pre-, circa-, and post-PHV groups estimated using the modified Mirwald equation. Maturity offset (i.e., years from PHV) was calculated for each player, and thresholds for group classification were set using a band of ± 1 year from the predicted maturity offset. Physical performance such as CMJ height (cm), 10- and 30-meters sprint times (s), and VO₂max (ml/kg/min) through the Yo-Yo Intermittent Recovery Test 1 (YYIR1) were measured. Statistical analysis was performed to evaluate any differences among the pre-, circa-, and post-PHV groups for all physical performance.

Results: One-way ANOVA showed significant group effects for CMJ height (p<.001), 10 m sprint time (p<.001), 30 m sprint time (p<.001), and VO₂max (p<.001). Post-PHV players showed higher performances in CMJ height (p<.001), and in 10- and 30-meters sprint times (p<.001 for both tests) compared to pre-PHV peers. VO₂max was also significantly higher in post-PHV players compared to both pre- and circa-PHV peers (p<.001 and p<.01, respectively).

Conclusion: These results showed that physical performance in youth soccer players improves progressively with advancing maturity status. These findings highlight the impact of biological maturation on key physical performance, regardless of chronological age. Thus, considering and monitoring maturation status is essential for optimizing individualized training programs and talent identification in young soccer players.

SC057 - THE EFFECTS OF MARTIAL ARTS TRAINING ON BALANCE AND FALL RISK IN OLDER ADULTS: A NARRATIVE REVIEW

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Purpose: Falls are a major concern in older adults, often leading to injury and loss of independence. Martial arts (MA) show promise for improving balance and mobility. This review examines existing evidence on MA's impact on fall risk in older adults, emphasizing long-term outcomes of sustained practice.

Methods: This narrative literature review explored the effects of MA training on balance and fall risk in older adults. Relevant keywords

(martial arts, balance, fall prevention, older adults, training) were used in a comprehensive search across major databases up to 2024. Certainty of evidence was assessed through the GRADE approach.

Results: Of the 543 articles retrieved, 25 were included: six systematic reviews and meta-analyses, three RCTs, one quasi-experimental study, and one evidence map. Evidence levels varied, from high-certainty in systematic reviews to low or very low-certainty in smaller RCTs and quasi-experimental designs. Several MA, including Tai Chi, Karate, and Judo, have been studied for their impact on balance and fall prevention in older adults. Tai Chi is frequently cited for its benefits, with studies showing it can improve balance, reduce fall risk factors, and enhance dual-task gait variability. A meta-analysis supports the positive effects of Tai Chi on balance in older adults. Studies also suggest Tai Chi training can improve balance and functional fitness in older adults, although which training program is more effective has not yet been clarified. Karate has shown potential in enhancing balance and fitness in older adults. Studies report that even brief Yuishinkai karate training can improve balance and neuromuscular function. Evidence also indicates improved balance control and dual-task performance following karate training, both relevant factors in fall prevention. Judo-based interventions positively impact fall-related outcomes, improving falling performance and reducing fall fear. Adapted judo programs also show potential in lowering fall risk factors in older adults.

Conclusions: Research on MA and fall prevention in older adults predominantly examines short-term interventions, with limited data on the sustainability of balance improvements and fall risk reduction over years. Therefore, a need emerges for studies comparing the long-term effectiveness of different MA styles and the optimal training dosage and frequency required to maintain lasting benefits in this population.

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SC058 - BEYOND EARLY SPECIALIZATION: DONOR SPORTS AND THE ATHLETIC SKILLS MODEL FOR TALENT DEVELOPMENT IN RHYTHMIC GYMNASTICS

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Purpose: Rhythmic gymnastics (RG) is a discipline that demands early specialization. It is essential to consider the potential impact of this specialization on talent development, and whether structured and unstructured motor experiences enrich athletes. Donor sports, defined as complementary activities to the main discipline that facilitate the transfer of motor skills to the target sport, may represent a strategic approach to addressing the challenges of early specialization. Drawing on the Athletic Skills Model (ASM) within the ecological dynamics framework, this study investigates whether engagement in other activities, either prior to or concurrent with RG, positively influences gymnasts' development and helps identify potential donor sports.

Methods: The sample included 42 participants (17 former RG gymnasts and 25 current gymnasts), competing in Gold or Silver

sectors (Italian Gymnastics Federation) or in promotional categories. Participants completed a structured questionnaire assessing prior motor experiences, involvement in other sports during their RG career, and details regarding their RG training.

Results: Findings indicated that 40% of current athletes began RG around ages 5–6, 28% between 3–4, and 24% between 7–8. Among former gymnasts, 47.1% started at ages 9–10, 29.4% at 5–6, and 11.8% at 3–4 and 7–8. Additionally, 60% of current and 64.7% of former athletes practiced other sports prior to RG, particularly dance (33.3%). None of the current athletes engaged in other activities concurrently with RG, whereas 29.4% of former athletes did, mainly dance. All current athletes and 94.1% of former athletes reported engaging in unstructured physical activity during childhood.

Conclusions: Findings highlight a tendency to practice RG at an early age, particularly among current athletes, consistent with the typical developmental path of this sport. However, evidence suggests that

participation in both unstructured activities and other sports, especially dance, may support talent development by acting as donor sports. In line with the ASM, motor enrichment through diverse experiences may enhance the acquisition of transferable skills and mitigate the effects of early specialization. In conclusion, this study offers a preliminary contribution to research on the role of prior motor experiences in supporting talent development in RG, aiming to identify potential donor sports and paving the way for more depth future investigations.

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