

NEUROPSYCHOMOTRICITY IN WATER: A NEW REHABILITATIVE TOOL FOR NEURODEVELOPMENTAL DISORDERS

MARIA RUBERTO¹, BEATRICE GALLAI², GABRIELE TRIPI^{3,4}, FRANCESCO LAVANO⁵, MARGHERITA SALERNO⁶, SERENA MARIANNA LAVANO⁵, PALMIRA ROMANO⁷, DANIELA RUSSO⁸, ROSA MAROTTA⁵, SABRINA FRANCO¹⁰, ELISABETTA PICCIOCCHI^{11,12}, DIEGO GERACI¹⁰, MARIO GIUSEPPE CHISARI¹³, GABRIELLA MARSALA¹⁴, ANNA NUNZIA POLITO¹⁵, MICHELE SORRENTINO¹⁶, ROSARIA MARTINA MAGLIULO¹⁷, LUCREZIA D'ORO¹⁸, ANNABELLA DI FOLCO⁹, LUCIA PARISI⁹, DAVIDE TESTA⁹, PAOLO MURABITO¹⁹, FRANCESCO CERRONI²⁰

¹CDR Santa Maria del Pozzo, Somma Vesuviana, Italy - ²Department of Surgical and Biomedical Sciences, University of Perugia, Perugia, Italy - ³Department PROSAMI, University of Palermo, Italy - ⁴Childhood Psychiatric Service for Neurodevelopmental Disorders, CH Chinon, France - ⁵Department of Health Sciences, University "Magna Graecia", Catanzaro, Italy - ⁶Sciences for Mother and Child Health Promotion, University of Palermo, Italy - ⁷Centro di Riabilitazione LARS, Sarno, Italy - ⁸Centro di Riabilitazione La Filanda LARS; Sarno, Italy - ⁹Department of Psychology, Educational Science and Human Movement, University of Palermo, Italy - ¹⁰Department of Medical, Surgical and Advanced Technology Sciences G.F. Ingrassia, University of Catania, Catania, I-95123, Italy - ¹¹Department of Clinical and Experimental Medicine, University of Foggia, Foggia, Italy - ¹²Casa di Cura Villa dei Fiori Acerra, Napoli, Italy - ¹³Istituto nazionale della previdenza sociale (INPS), Catania, Italy - ¹⁴Struttura Complessa di Farmacia, Azienda Ospedaliero-Universitaria, Ospedali Riuniti di Foggia, Foggia, Italy - ¹⁵Complex Structure of Neuropsychiatry Childhood-Adolescence of Ospedali Riuniti di Foggia, Foggia, Italy - ¹⁶NICU -Preterm and High Risk Newborn Neurodevelopmental Follow-up Service; Pineta Grande Hospital Castel Volturno (CE), Italy - ¹⁷Centro Studi Della Scoliosi S.R.L, Italy - ¹⁸Centro Ambulatoriale Santo Stefano, Pesaro, Italy - ¹⁹Università degli Studi di Catania, Catania, Italy - ²⁰Centro Manzoni s.r.l., Napoli, Italy

ABSTRACT

Neuropsychomotricity in water is a rehabilitative practice that avails itself just of the liquid element, as a mediator of relationships: in water yes they upset all dynamics, be they relational, of equilibrium, of movement and perception, due to the fact that proprioceptive sensations, created by bodily contact with water, they are different than those generated by contact with air.

Keywords: neuropsychomotricity, pediatric rehabilitation, water.

DOI: 10.19193/0393-6384_2018_4s_330

Received July 17, 2018; Accepted September 20, 2018

Introduction

Neuropsychomotricity in water is a rehabilitative practice that avails itself just of the liquid element, as a mediator of relationships: in water yes they upset all dynamics, be they relational, of equilibrium, of movement and perception, due to the fact that proprioceptive sensations, created by bodily contact with water, they are different than those generated by contact with air.

The psychodynamic characteristics of water Water, in addition to having physical characteristics, also has characteristics psychodynamic; just think of what it evokes, creates, stimulates and induces, for find psychodynamic contents. In fact, water is a mediator, it adheres, touches, envelops and brings out the emotional need.

It combines relaxation, abandonment, promoting bodily contact, intimacy. It allows the perception of the ego, the harmonization of processes psy-

chics with bodily emotions and regression, on an imaginary level, of the primary relationship in the arms of someone who contains you and cradles you. Being a feminine and maternal symbol as it welcomes, it fills the spaces, it fills the gaps, it is one of the most important aspects of psychological life of the child, since it favors union, separation, identity, through the evolution that goes from the dependence of body to body, to autonomy, passing from progressive separation.

Water with its characteristics, with its symbols, with the fantasies that can stimulate, bring out situations removed and / or forgotten, becoming, therefore, as emotion, that is, it gives the possibility to free oneself from emotions. It can provoke shouts of affirmation and aggression, when yes beats and dominates, but, having the power not to break, free from the sense of fault when it is hit with enthusiasm, since it returns perfectly intact. On the other hand, water can also scare, as it is immersed in it metaphor of a journey, which is therapy, is the discovery of a new world, é sail to the unknown; in these cases it is necessary to use rituals reassuring, including playing on the edge of the pool, which recalls the rituals greeting to get away from what is certain. Diving (detaching from the ground), requires a lot of physical energy, it is a gesture that it needs a coordination that is the result of experience, but it is also an act impulsive, an illusion, a challenge; it means eliminating what inhibits e blocks, overcome fear, because, for as long as you are in the air, yes they defy the laws of gravity, they deceive themselves of being able to detach themselves from the ground.

The sketch takes on the connotation of liberation, provocation, joy, recall and catharsis, then prevails the affective connotation of the gesture and the relational dimension.

In wallowing the pleasure of the sensory-motor experience is found, for example, in a puddle, considered a reassuring transgression, in how much you touch the bottom and there is no danger of getting lost; its boundaries are extremely limited, sketches invite you to experience the violation of customs.

Floating means facing the different physicality of water, requires one act of trust, because everything that is new or different scares. It is an act of trust first of all towards oneself, that is, in one's positive part, that it can do it, but also towards the therapist, as a guide in which surrender; it is therefore to let oneself go to the tonic dialogue with one's own body, to lose oneself in the equilibrium of the relaxation, to annul the resistances and the tensions.

Sinking, is considered as a point of arrival of security in the help relationship and it means abandoning completely to the other, that is ready to intervene for you.

Diving (as mentioned earlier) means losing control, let yourself go to the unknown; through this one experiences the estrangement, isolation from ordinary life, which is seen differently, with greater mental flexibility. It is therefore possible to experiment with the use of immersion as an experience of overcoming fear, loss of boundaries and seeking well-being absolute.

Under water the children, even if suffering from very serious pathologies, get better, they spread their arms, smile and let go and, when the adult intervenes to make them return to the surface, oppose, agitate and try to disengage. Not all of them are predisposed to immerse themselves, in fact, the claustrophobic and the agoraphobics do not want to immerse because, being surrounded from the water without reference points, it does not allow them to adapt.

Neuropsychomotricity is a discipline that proposes the harmonious development of the motor, sensory, perceptive and praxic attitudes of the child and promotes, through the methods and the global exercise of motor skills, not only muscular and articular activity, but also the integration of the corporeity in spatial and temporal terms, as well as the construction of thought through the mental representation of the completed motor action and of the communication processes, proposing the unitary concept of a person⁽¹⁻¹⁰⁾.

Neuropsychomotricity in water is a rehabilitative practice that avails itself just of the liquid element, as a mediator of relationships: in water yes they upset all dynamics, be they relational, of equilibrium, of movement and perception, due to the fact that proprioceptive sensations, created by bodily contact with water, they are different than those generated by contact with air.

Water promotes in particular the integration of the disabled child, in how much on earth the difference from normality is evident with others children, while in the water, finding themselves in a new environment for everyone, a hostile environment to dominate and win, these experience moments of equality, fostering their trust, security and mental serenity⁽¹¹⁻²⁰⁾. Moreover the water, thanks to its density and its heat, supports, envelops, contains, massages and models how the air cannot do and, thanks to his buoyancy, offers a feeling of lightness, which

allows the child to recover perceptive plans, impossible in a therapy room with children weighing more than 10 kg and taking on new positions, never tested first, thus perceiving activity as a pleasure, not as a therapy. The aquatic environment creates resistance to movement and gesture, giving way to the child to reflect on patterns that he perceives outside automatism. Activate unconscious elaborations on the tonic plane, which are translated on the postural plan and that of the investment of space. Indeed, water it acts as a total intermediary between oneself and others, without intervening necessarily touch and / or contact. It redraws the body schema, giving a perception of its boundaries and brings into play the consciousness of the body unity, in the relationship between the inside and outside, inside and outside, just think of children with problems integration (shattered), to the sensations they could experience and theirs way of being in the water.

In it, they are altered: the perception of one's own body immersed, still and in motion, and there is greater stimulation of sensitivity exteroceptive of the cutaneous and muscular sensations, or of signals that allow you to be aware of the continuous variations, respectively: of the posture, that is the position in the space of some segments of one's body compared to others, and balance, position that deals with space. It can therefore be inferred that everything that happens in water is neuropsychomotor, since there is movement, relationship, emotion.

His practice can be considered a physical dance, given that helps to facilitate any movement of the immersed parts, gives the body agility and grace, facilitates rounded movements, harmonic, rhythmic, allowing the child to find himself in a situation that induces pleasure, well-being, playful moments.

The pool becomes a place for creativity and research, which allows the child to experiment, explore, find, find, be welcomed and see and represent reality in a different way, even outside of it. For all these reasons, practice in water will positively influence everything the psychomotor development of the child, with a positive interest, not only of motor skills, but also of the emotional, cognitive and relational area, (given that the child finds infinite stimulation effects in the aquatic, information suitable to favor and regulate cognitive processes and rebalances emotional-affective)⁽²¹⁻³⁵⁾.

Obviously, in order to obtain these benefits, it is necessary to make the practice a pleasant experi-

ence for the child and focus on the emotional relationship, to give the chance to get in touch with his own unconscious, putting in place a relationship of sharing, which takes therapeutic value. In fact, until recently, it was widely believed that water favored the onset of diseases mainly by cooling and, when used in rehabilitation, it had only an assistance purpose: yes he intervened on the pathology and not on the individual as a whole. At present, the scientific and pedagogical presupposition on which this practice is based is that of investing in resources and residual capacities, even if minimal, that these subjects possess and, through an incessant reinforcement action, allow the achievement of objectives both in the sphere of autonomy in other areas of personality, given the correlation between the different aspects of it⁽³⁶⁻⁵⁰⁾.

So the final objective of this practice is no longer aimed only at recovering the damage, when possible, but at the complete development of the child's capabilities and potential through the use of the game: the psychomotorist must have the awareness that, on the one hand, a physical deficit compromises the body's ability, both motor and mental, on the other, the psychic deficit affects cognitive, affective, relational and, consequently, functional functions.

With whom to practice it?

Neuropsychomotor therapy in water is particularly indicated for:

1) Children who can not assimilate experiences, or so-called children: "unstable", those who spend their lives without being able to stop, those for which listening is impossible, watching does not become see, for they work in the water is: find a place where "to be", in which to express themselves, in which to design, construct a gesture, a movement linked to an action. Here the feedback is immediate, the act takes shape and the dive, the swim, the spraying or avoiding spraying allows you to move to levels of consciousness, where you can direct the experience, assimilate it and then access one thought structure.

2) All children with relational distortions that, through the recovery of an aquatic dimension, an archaic relationship can be played with the other, where the functional level can be mediated by a reality plane objective represented by the pool space, by the use of time, in the metaphysical reconstruction of a self-identification. Here presence / absence, proximity / distance, self-centeredness and omnipotence yes they play on deep symbolic planes, in a transpar-

ent universe but visible, which cushions and enhances both experiences.

3) That category of children who have difficulty entrusting themselves to others and to the pleasure of the game. Here the water dimension favors the opening to the sense-motor pleasure, where the peculiarity of the element in its slowing down, soften, accompany, emphasize movement, allows the child to feel without emotion is pervasive, intrusive, overwhelming. And the pleasure that motivates motivation; it is the desire that sustains it. Therefore in the water those children learn to grow through an experience unthinkable outside it.

4) Those who, outside a sensory-motor experimentation, live the symbolic game in the static state of the creative states, in the immobility of the body, where the imagination creates and transforms, enhancing the fantasmatic connotations, preventing the transition to more mature thought strategies. The work in water enhances the reality plan, creating unusual levels of body use, where nothing is taken for granted by favoring that use of space, of time and of the object in a symbolic key, which allow a representation mental more consistent and adherent.

5) Children who find difficulty and develop a coherent tone e functional, regardless of the cause, because through a mediator more dense air can make themselves aware of the gesture, of its direction, force, speed and the effects it produces on the sensitive plane.

In addition to the effects on movement, this work, through recognition of a causal relationship, allows the children in question to enter the time parameter. Thanks to the tonic, mediated dialogue, from the body of the therapist, in one element uniformly felt on the kinesthetic plane, allows to recover the dimension of a corporeal self as whole in its parts⁽⁵¹⁻⁶⁰⁾.

When and for how long to practice it?

Neuropsychomotor therapy in water can be practiced:

1) At the beginning of neuropsychomotor therapy, to eliminate the automatisms or restructure a body.

2) In the course of therapy in a therapeutic situation too long time, to find new incentives.

3) At the end of therapy, to mark a separation from the room and begin to establish a separation process.

In any case, it certainly starts after a good observation in room and there are no fixed rules,

almost all the motivations are linked to the history of the child, its therapeutic history, the validity of the project, ai times and the objective to be achieved.

The duration of the practice in water will be decided by the team, based on the comparison between the prefixed objectives and those achieved by the child and will be, always the latter, to decide whether to carry out all the sessions in the water or to keep some of them in the hall. Even if you usually prefer to combine them, unless it is proposed only at the end of the path.

The fun activity in the water

The game is a means of symbolic expression, of profound thoughts, which it does emerge emotions, frustrations, fears, uncertainties and gives voice to those disturbances that fail to translate into words and can not be heard in the world of adults. Hence its therapeutic value.

During the practice in water it is important not to ask in a directive way, but give ample space to the spontaneous activity of children as an exchange relational, allowing them to experiment in relation to the material without too many verbal explanations, to facilitate the discovery and self-awareness. In this way the swimming pool becomes a privileged space for games and games relationship: symbolic space of affective and emotional representations, where gesture, action, act become expressions of the imaginary that it takes the form of free and spontaneous play⁽⁶⁰⁻⁹⁹⁾.

The beginning of the meeting, in fact, is always based on spontaneous play, so that the child can experience the use of the material and invest it symbolically, for example: the tube becomes a horse, a sword, a shotgun; the mattress a boat and a bathrobe a transformation machine.

You can also practice symbolic games, representing some

“Symbolic characters” such as:

1) The sailor: simple and courageous man who faces the sea, often solitary sailor who takes care of himself alone in any circumstance. He rarely stops in a port and vice versa is led to constantly change the direction of his life.

2) Pirates: negative heroes, but fascinating adventurers, they live a life without rules, or rather they build new and transgressive rules. I'm brave, throw themselves into the boarding, live in the employ of a boss, but they also have a marked aptitude for identification in the group.

They are often marginalized and rejected looking for social redemption.

3) The pearl fisherman: challenges the fear of diving and the dangers that ad it is connected, receiving a treasure as a reward. His short trip and repeated it evokes the need to live in another world.

You can also represent “places”, for example:

- The island (the houseboats): confined place, well defined and often isolated from the rest of the inhabited world. Associated with adjectives like lost, mysterious, savage, it is also not a place like in the tale of Peter Pan. It is the place to hide or search for the treasure, it is also the shipwreck’s landing.

Or again you can represent marine animals such as:

1) The seal: belonging to both the aquatic and terrestrial world, is emblematic of laziness and indolence, alternates the elegance of movement when it is in water with awkward movements when it is on dry land.

2) The dolphin: an animal with a strong social life that lives in a couple and breeds its own little ones. Defends the comrades attacked by predators and assists the weak or the sick. It appears frequently in the symbolism of the savior.

3) The whale: significant for its size, comes from the Greek “ketos” which means big fish. It takes on a meaning similar to that of the ark in different cultures.

4) The octopus: symbol of nonsense, but also as opposed to cunning, lives on the bottom and is camouflaged and then jump on the prey with his tentacles. It therefore evokes images of ambiguity and opportunism, of vulnerability and subtlety.

5) The shark: unpredictable and terrifying, its ferocity goes beyond what happens. His mouth full of sharp teeth is enough to evoke the anguish and the fears of the monstrosity that is inside each of us.

We continue with the structured game through functional paths, comparisons, dog or horse races, even coming to stage a story, a movie, various fantasies or inventions.

Water allows you to make games different from those on earth, as it is reassuring because, despite being manipulated and fragmented, it is not it never breaks. The separations that the child induces in the liquid element si cancel alone, the water always returns whole and united. In addition to be drunk, it can be collected, poured, poured, sent away and then returned.

Conclusions

The child with his games in the water expresses symbolic contents, for example, he slips into a machine with various materials, beats the water with the tube, launches objects in all directions, etc. It is important to understand their meaning from these acts, as it allows us to know what and how the child is responding to the adult. Instead if you stop these games, you lose the chance to understand what is going on inside and how you feel at that moment. Some games represent an attempt to overcome and overcome fear, or a way to express rejection and distance yourself from the other. By observing we can get carried away by games, get involved with children: participate through emotions, feelings, reflections, ideas, questions and even memories, entering an empathic state with them.

References

- 1) Buhr M. (Adjustment disorders with developmental risk in children after inpatient treatment). *Kinderarztl Prax.* 1992 Aug; 60(6): 168-72
- 2) Bergès J. (Motoricity and psychomotricity). *Rev Neuropsychiatr Infant.* 1966 Apr-May;14(4):239-45
- 3) DE FRANCO F, SACCO F. (Studies on stuttering. (The psychomotricity of stutterers)). *G Psichiatri Neuropatol.* 1960; 88: 1049-65
- 4) Cappellini AC, Mancini S, Zuffellato S, Bini F, Polcaro P, Conti AA, et al. Environmental effects on school age child psychomotricity. *Minerva Pediatr* 2008; 60: 277-84.
- 5) Loranger N. Play intervention strategies for the Hispanic toddler with separation anxiety. *Pediatr Nurs* 1992; 18: 571-5.
- 6) Chieffi S, Messina G, Villano I, Messina A, Esposito M, Monda V, Valenzano A, Moscatelli F, Esposito T, Carotenuto M, Viggiano A, Cibelli G, Monda M. (2017) Exercise Influence on Hippocampal Function: Possible Involvement of Orexin-A. *Front Physiol.* Feb 14; 8: 85. doi: 10.3389/fphys.2017.00085
- 7) Esposito M, Carotenuto M. (2010) Borderline intellectual functioning and sleep: the role of cyclic alternating pattern. *Neurosci Lett.* Nov 19; 485(2): 89-93. doi: 10.1016/j.neulet.2010.08.062
- 8) Esposito M, Ruberto M, Pascotto A, Carotenuto M. (2012) Nutraceutical preparations in childhood migraine prophylaxis: effects on headache outcomes including disability and behaviour. *Neurol Sci.* Dec; 33(6): 1365-8. doi: 10.1007/s10072-012-1019-8
- 9) Esposito M, Verrotti A, Gimigliano F, Ruberto M, Agostinelli S, Scuccimarra G, Pascotto A, Carotenuto M. (2012) Motor coordination impairment and migraine in children: a new comorbidity? *Eur J Pediatr.* Nov;171(11): 1599-604. doi: 10.1007/s00431-012-1759-8

- 10) Carotenuto M, Santoro N, Grandone A, Santoro E, Pascotto C, Pascotto A, Perrone L, del Giudice EM. (2009) The insulin gene variable number of tandem repeats (INS VNTR) genotype and sleep disordered breathing in childhood obesity. *J Endocrinol Invest.* Oct; 32(9): 752-5. doi: 10.3275/6398.
- 11) Carotenuto M, Guidetti V, Ruju F, Galli F, Tagliente FR, Pascotto A. (2005) Headache disorders as risk factors for sleep disturbances in school aged children. *J Headache Pain.* Sep; 6(4): 268-70
- 12) Carotenuto M, Esposito M, Cortese S, Laino D, Verrotti A. (2016) Children with developmental dyslexia showed greater sleep disturbances than controls, including problems initiating and maintaining sleep. *Acta Paediatr.* Sep; 105(9): 1079-82. doi: 10.1111/apa.13472
- 13) Carotenuto M, Esposito M, D'Aniello A, Ripa CD, Precenzano F, Pascotto A, Bravaccio C, Elia M. (2013) Polysomnographic findings in Rett syndrome: a case-control study. *Sleep Breath.* Mar; 17(1):93-8. doi: 10.1007/s11325-012-0654-x. Epub 2012 Mar 7. Erratum in: *Sleep Breath.* 2013 May; 17(2): 877-8
- 14) Verrotti A, Agostinelli S, D'Egidio C, Di Fonzo A, Carotenuto M, Parisi P, Esposito M, Tozzi E, Belcastro V, Mohn A, Battistella PA. (2013) Impact of a weight loss program on migraine in obese adolescents. *Eur J Neurol.* Feb; 20(2): 394-7. doi: 10.1111/j.1468-1331.2012.03771.x
- 15) Esposito M, Carotenuto M. (2014) Intellectual disabilities and power spectra analysis during sleep: a new perspective on borderline intellectual functioning. *J Intellect Disabil Res.* May; 58(5): 421-9. doi: 10.1111/jir.12036
- 16) Esposito M, Roccella M, Gallai B, Parisi L, Lavano SM, Marotta R, Carotenuto M. (2013) Maternal personality profile of children affected by migraine. *Neuropsychiatr Dis Treat.* 9: 1351-8. doi: 10.2147/NDT.S51554
- 17) Carotenuto M, Esposito M, Precenzano F, Castaldo L, Roccella M. (2011) Cosleeping in childhood migraine. *Minerva Pediatr.* Apr; 63(2): 105-9
- 18) Esposito M, Marotta R, Gallai B, Parisi L, Patriciello G, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Temperamental characteristics in childhood migraine without aura: a multicenter study. *Neuropsychiatr Dis Treat.* 9: 1187-92. doi: 10.2147/NDT.S50458
- 19) Esposito M, Gallai B, Parisi L, Castaldo L, Marotta R, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Self-concept evaluation and migraine without aura in childhood. *Neuropsychiatr Dis Treat.* 9: 1061-6. doi: 10.2147/NDT.S49364
- 20) Esposito M, Parisi L, Gallai B, Marotta R, Di Dona A, Lavano SM, Roccella M, Carotenuto M. (2013) Attachment styles in children affected by migraine without aura. *Neuropsychiatr Dis Treat.* 9: 1513-9. doi: 10.2147/NDT.S52716
- 21) Carotenuto M, Gallai B, Parisi L, Roccella M, Esposito M. (2013) Acupressure therapy for insomnia in adolescents: a polysomnographic study. *Neuropsychiatr Dis Treat.* 9: 157-62. doi: 10.2147/NDT.S41892
- 22) Carotenuto M, Gimigliano F, Fiordelisi G, Ruberto M, Esposito M. (2013) Positional abnormalities during sleep in children affected by obstructive sleep apnea syndrome: the putative role of kinetic muscular chains. *Med Hypotheses.* Aug; 81(2): 306-8. doi: 10.1016/j.mehy.2013.04.023
- 23) Coppola G, Licciardi F, Sciscio N, Russo F, Carotenuto M, Pascotto A. (2004) Lamotrigine as first-line drug in childhood absence epilepsy: a clinical and neurophysiological study. *Brain Dev.* Jan; 26(1): 26-9
- 24) Esposito M, Pascotto A, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Gritti A, Mazzotta G, Carotenuto M. (2012) Can headache impair intellectual abilities in children? An observational study. *Neuropsychiatr Dis Treat.* 8: 509-13. doi: 10.2147/NDT.S36863.
- 25) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Gritti A, Mazzotta G, Carotenuto M. (2013) Maternal stress and childhood migraine: a new perspective on management. *Neuropsychiatr Dis Treat.* 9: 351-5. doi: 10.2147/NDT.S42818.
- 26) Esposito M, Parisi P, Miano S, Carotenuto M. (2013) Migraine and periodic limb movement disorders in sleep in children: a preliminary case-control study. *J Headache Pain.* Jul 1; 14: 57. doi: 10.1186/1129-2377-14-57
- 27) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Patriciello G, Precenzano F, Carotenuto M. (2013) Visuomotor competencies and primary monosymptomatic nocturnal enuresis in prepubertal aged children. *Neuropsychiatr Dis Treat.* 9: 921-6. doi: 10.2147/NDT.S46772
- 28) Esposito M, Carotenuto M. (2011) Ginkgolide B complex efficacy for brief prophylaxis of migraine in school-aged children: an open-label study. *Neurol Sci.* Feb; 32(1): 79-81. doi: 10.1007/s10072-010-0411-5
- 29) Smirni D, Beadle JN, Paradiso S. An Initial Study of Alexithymia and Its Relationship With Cognitive Abilities Among Mild Cognitive Impairment, Mild Alzheimer's Disease, and Healthy Volunteers. *J Nerv Ment Dis* 2018, 206 (8): 628-636. doi: 10.1097/NMD.0000000000000853
- 30) Esposito M, Roccella M, Parisi L, Gallai B, Carotenuto M. (2013) Hypersomnia in children affected by migraine without aura: a questionnaire-based case-control study. *Neuropsychiatr Dis Treat.* 9: 289-94. doi: 10.2147/NDT.S42182
- 31) Carotenuto M, Esposito M, Pascotto A. (2011) Facial patterns and primary nocturnal enuresis in children. *Sleep Breath.* May; 15(2): 221-7. doi: 10.1007/s11325-010-0388-6
- 32) Smirni D, Oliveri M, Turriziani P, Di Martino G, Smirni P. Benton Visual Form Discrimination Test in healthy children: normative data and qualitative analysis. *Neurological Sciences.* May 2018, Volume 39 (5): 885-892. doi: 10.1007/s10072-018-3297-2
- 33) Carotenuto M, Esposito M. (2013) Nutraceuticals safety and efficacy in migraine without aura in a population of children affected by neurofibromatosis type I. *Neurol Sci.* Nov; 34(11):1905-9. doi: 10.1007/s10072-013-1403-z
- 34) Carotenuto M, Esposito M, Parisi L, Gallai B, Marotta R, Pascotto A, Roccella M. (2012) Depressive symptoms and childhood sleep apnea syndrome. *Neuropsychiatr Dis Treat.* 8:369-73. doi: 10.2147/NDT.S35974
- 35) Carotenuto M, Bruni O, Santoro N, Del Giudice EM,

- Perrone L, Pascotto A. (2006) Waist circumference predicts the occurrence of sleep-disordered breathing in obese children and adolescents: a questionnaire-based study. *Sleep Med. Jun*; 7(4): 357-61
- 36) Esposito M, Carotenuto M, Roccella M. (2011) Primary nocturnal enuresis and learning disability. *Minerva Pediatr. Apr*; 63(2): 99-104
- 37) Perillo L, Esposito M, Contiello M, Lucchese A, Santini AC, Carotenuto M. (2013) Occlusal traits in developmental dyslexia: a preliminary study. *Neuropsychiatr Dis Treat. 9*: 1231-7. doi: 10.2147/NDT.S49985
- 38) Esposito M, Marotta R, Roccella M, Gallai B, Parisi L, Lavano SM, Carotenuto M. (2014) Pediatric neurofibromatosis 1 and parental stress: a multicenter study. *Neuropsychiatr Dis Treat. Jan 22*; 10: 141-6. doi: 10.2147/NDT.S55518.
- 39) Carotenuto M, Esposito M, Pascotto A. (2010) Migraine and enuresis in children: An unusual correlation? *Med Hypotheses. Jul*; 75(1):120-2. doi: 10.1016/j.mehy.2010.02.004
- 40) Verrotti A, Carotenuto M, Altieri L, Parisi P, Tozzi E, Belcastro V, Esposito M, Guastaferrò N, Ciuti A, Mohn A, Chiarelli F, Agostinelli S. (2015) Migraine and obesity: metabolic parameters and response to a weight loss programme. *Pediatr Obes. Jun*; 10(3): 220-5. doi: 10.1111/ijpo.245
- 41) Esposito M, Precenzano F, Sorrentino M, Avolio D, Carotenuto M. (2015) A Medical Food Formulation of Griffonia simplicifolia/Magnesium for Childhood Periodic Syndrome Therapy: An Open-Label Study on Motion Sickness. *J Med Food. Aug*; 18(8): 916-20. doi: 10.1089/jmf.2014.0113
- 42) Esposito M, Ruberto M, Gimigliano F, Marotta R, Gallai B, Parisi L, Lavano SM, Roccella M, Carotenuto M. (2013) Effectiveness and safety of Nintendo Wii Fit Plus™ training in children with migraine without aura: a preliminary study. *Neuropsychiatr Dis Treat. 9*: 1803-10. doi: 10.2147/NDT.S53853
- 43) Di Filippo T, Orlando MF, Concialdi G, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Parisi L, Roccella M. (2013) The quality of life in developing age children with celiac disease. *Minerva Pediatr. Dec*; 65(6): 599-608.
- 44) Carotenuto M, Parisi P, Esposito M, Cortese S, Elia M. (2014) Sleep alterations in children with refractory epileptic encephalopathies: a polysomnographic study. *Epilepsy Behav. Jun*; 35: 50-3. doi: 10.1016/j.yebeh.2014.03.009
- 45) Esposito M, Gimigliano F, Ruberto M, Marotta R, Gallai B, Parisi L, Lavano SM, Mazzotta G, Roccella M, Carotenuto M. (2013) Psychomotor approach in children affected by nonretentive fecal soiling (FNRFS): a new rehabilitative purpose. *Neuropsychiatr Dis Treat. 9*: 1433-41. doi: 10.2147/NDT.S51257
- 46) Parisi L, Di Filippo T, La Grutta S, Lo Baido R, Epifanio MS, Esposito M, Carotenuto M, Roccella M. (2013) Sturge-weber syndrome: a report of 14 cases. *Ment Illn. Jun 3*; 5(1): e7. doi: 10.4081/mi.2013.e7
- 47) Coppola G, Auricchio G, Federico R, Carotenuto M, Pascotto A. (2004) Lamotrigine versus valproic acid as first-line monotherapy in newly diagnosed typical absence seizures: an open-label, randomized, parallel-group study. *Epilepsia. Sep*; 45(9): 1049-53
- 48) Esposito M, Gallai B, Roccella M, Marotta R, Lavano F, Lavano SM, Mazzotta G, Bove D, Sorrentino M, Precenzano F, Carotenuto M. (2014) Anxiety and depression levels in prepubertal obese children: a case-control study. *Neuropsychiatr Dis Treat. Oct 3*; 10: 1897-902. doi: 10.2147/NDT.S69795
- 49) Perillo L, Esposito M, Caprioglio A, Attanasio S, Santini AC, Carotenuto M. (2014) Orthodontic treatment need for adolescents in the Campania region: the malocclusion impact on self-concept. *Patient Prefer Adherence. Mar 19*; 8:353-9. doi: 10.2147/PPA.S58971
- 50) Esposito M, Antinolfi L, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Precenzano F, Carotenuto M. (2013) Executive dysfunction in children affected by obstructive sleep apnea syndrome: an observational study. *Neuropsychiatr Dis Treat. 9*: 1087-94. doi: 10.2147/NDT.S47287
- 51) Villano I, Messina A, Valenzano A, Moscatelli F, Esposito T, Monda V, Esposito M, Precenzano F, Carotenuto M, Viggiano A, Chieffi S, Cibelli G, Monda M, Messina G. (2017) Basal Forebrain Cholinergic System and Orexin Neurons: Effects on Attention. *Front Behav Neurosci. Jan 31*; 11: 10. doi: 10.3389/fnbeh.2017.00010
- 52) Verrotti A, Greco M, Varriale G, Tamborino A, Savasta S, Carotenuto M, Elia M, Operto F, Margari L, Belcastro V, Selicorni A, Freri E, Matricardi S, Granata T, Ragona F, Capovilla G, Spalice A, Coppola G, Striano P. (2018) Electroclinical features of epilepsy monosomy 1p36 syndrome and their implications. *Acta Neurol Scand. Aug 14*. doi: 10.1111/ane.13006
- 53) Gallelli L, Cione E, Caroleo MC, Carotenuto M, Lagana P, Siniscalchi A, Guidetti V. (2017) microRNAs to Monitor Pain-migraine and Drug Treatment. *Microna. Dec 6*; 6(3): 152-156. doi: 10.2174/2211536606666170913152821
- 54) Matricardi S, Darra F, Spalice A, Basti C, Fontana E, Dalla Bernardina B, Elia M, Giordano L, Accorsi P, Cusmai R, De Liso P, Romeo A, Ragona F, Granata T, Concolino D, Carotenuto M, Pavone P, Pruna D, Striano P, Savasta S, Verrotti A. (2018) Electroclinical findings and long-term outcomes in epileptic patients with inv dup (15). *Acta Neurol Scand. Jun*; 137(6): 575-581. doi: 10.1111/ane.12902
- 55) Esposito M, Messina A, Monda V, Bitetti I, Salerno F, Precenzano F, Pisano S, Salvati T, Gritti A, Marotta R, Lavano SM, Lavano F, Maltese A, Parisi L, Salerno M, Tripi G, Gallai B, Roccella M, Bove D, Ruberto M, Toraldo R, Messina G, Carotenuto M. (2017) The Rorschach Test Evaluation in Chronic Childhood Migraine: A Preliminary Multicenter Case-Control Study. *Front Neurol. Dec 12*; 8: 680. doi: 10.3389/fneur.2017.00680
- 56) Messina A, Monda V, Sessa F, Valenzano A, Salerno M, Bitetti I, Precenzano F, Marotta R, Lavano F, Lavano SM, Salerno M, Maltese A, Roccella M, Parisi L, Ferrentino RI, Tripi G, Gallai B, Cibelli G, Monda M, Messina G, Carotenuto M. (2018) Sympathetic, Metabolic Adaptations, and Oxidative Stress in Autism Spectrum Disorders: How Far From Physiology? *Front Physiol. Mar 22*; 9:261. doi: 10.3389/fphys.2018.00261
- 57) Sperandeo R, Monda V, Messina G, Carotenuto M, Maldonato NM, Moretto E, Leone E, De Luca V, Monda M, Messina A. (2017) Brain functional integra-

- tion: an epidemiologic study on stress-producing dissociative phenomena. *Neuropsychiatr Dis Treat*. Dec 19; 14: 11-19. doi: 10.2147/NDT.S146250
- 58) Messina A, Bitetti I, Precenzano F, Iacono D, Messina G, Roccella M, Parisi L, Salerno M, Valenzano A, Maltese A, Salerno M, Sessa F, Albano GD, Marotta R, Villano I, Marsala G, Zammit C, Lavano F, Monda M, Cibelli G, Lavano SM, Gallai B, Toraldo R, Monda V, Carotenuto M. (2018) Non-Rapid Eye Movement Sleep Parasomnias and Migraine: A Role of Orexinergic Projections. *Front Neurol*. Feb 28; 9: 95. doi: 10.3389/fneur.2018.00095
- 59) Esposito M, Gimigliano F, Barillari MR, Precenzano F, Ruberto M, Sepe J, Barillari U, Gimigliano R, Militerni R, Messina G, Carotenuto M. (2017) Pediatric selective mutism therapy: a randomized controlled trial. *Eur J Phys Rehabil Med*. Oct 53(5): 643-650. doi: 10.23736/S1973-9087.16.04037-5
- 60) Bellini B, Arruda M, Cescut A, Saulle C, Persico A, Carotenuto M, Gatta M, Nacinovich R, Piazza FP, Termine C, Tozzi E, Lucchese F, Guidetti V. (2013) Headache and comorbidity in children and adolescents. *J Headache Pain*. Sep 24; 14: 79. doi: 10.1186/1129-2377-14-79
- 61) Esposito M, Gallai B, Parisi L, Roccella M, Marotta R, Lavano SM, Mazzotta G, Carotenuto M. (2013) Primary nocturnal enuresis as a risk factor for sleep disorders: an observational questionnaire-based multicenter study. *Neuropsychiatr Dis Treat*. 9: 437-43. doi: 10.2147/NDT.S43673
- 62) Monda V, La Marra M, Perrella R, Caviglia G, Iavarone A, Chieffi S, Messina G, Carotenuto M, Monda M, Messina A. (2017) Obesity and brain illness: from cognitive and psychological evidences to obesity paradox. *Diabetes Metab Syndr Obes*. Nov 21;10:473-479. doi: 10.2147/DMSO.S148392
- 63) Parisi P, Vanacore N, Belcastro V, Carotenuto M, Del Giudice E, Mariani R, Papetti L, Pavone P, Savasta S, Striano P, Toldo I, Tozzi E, Verrotti A, Raucci U; "Pediatric Headache Commission" of Società Italiana di Neurologia Pediatrica (SINP). (2014) Clinical guidelines in pediatric headache: evaluation of quality using the AGREE II instrument. *J Headache Pain*. Sep 1; 15: 57. doi: 10.1186/1129-2377-15-57
- 64) Toldo I, Rattin M, Perissinotto E, De Carlo D, Bolzonella B, Nosadini M, Rossi LN, Vecchio A, Simonati A, Carotenuto M, Scalas C, Scirucchio V, Raieli V, Mazzotta G, Tozzi E, Valeriani M, Cianchetti C, Balottin U, Guidetti V, Sartori S, Battistella PA. (2017) Survey on treatments for primary headaches in 13 specialized juvenile Headache Centers: The first multicenter Italian study. *Eur J Paediatr Neurol*. May;21(3):507-521. doi: 10.1016/j.ejpn.2016.12.009
- 65) Verrotti A, Casciato S, Spalice A, Carotenuto M, Striano P, Parisi P, Zamponi N, Savasta S, Rinaldi VE, D'Alonzo R, Mearini F, Ritaccio AJ, Di Gennaro G. (2017) Coexistence of childhood absence epilepsy and benign epilepsy with centrotemporal spikes: A case series. *Eur J Paediatr Neurol*. May; 21(3): 570-575. doi: 10.1016/j.ejpn.2017.02.002
- 66) Matricardi S, Spalice A, Salpietro V, Di Rosa G, Balistreri MC, Grosso S, Parisi P, Elia M, Striano P, Accorsi P, Cusmai R, Specchio N, Coppola G, Savasta S, Carotenuto M, Tozzi E, Ferrara P, Ruggieri M, Verrotti A. (2016) Epilepsy in the setting of full trisomy 18: A multicenter study on 18 affected children with and without structural brain abnormalities. *Am J Med Genet C Semin Med Genet*. Sep; 172(3): 288-95. doi: 10.1002/ajmg.c.31513
- 67) Gallelli L, Avenoso T, Falcone D, Palleria C, Peltrone F, Esposito M, De Sarro G, Carotenuto M, Guidetti V. (2014) Effects of acetaminophen and ibuprofen in children with migraine receiving preventive treatment with magnesium. *Headache*. Feb; 54(2): 313-24. doi: 10.1111/head.12162
- 68) Elia M, Amato C, Bottitta M, Grillo L, Calabrese G, Esposito M, Carotenuto M. (2012) An atypical patient with Cowden syndrome and PTEN gene mutation presenting with cortical malformation and focal epilepsy. *Brain Dev*. Nov; 34(10): 873-6. doi: 10.1016/j.braindev.2012.03.005
- 69) Li Volti G, Ientile R, Abraham NG, Vanella A, Cannavò G, Mazza F, Currò M, Raciti G, Avola R, Campisi A. Immunocytochemical localization and expression of heme oxygenase-1 in primary astroglial cell cultures during differentiation: effect of glutamate. *Biochem Biophys Res Commun*. 2004 Mar 5; 315(2): 517-24
- 70) Rizzo M, Abate N, Chandalia M, Rizvi AA, Giglio RV, Nikolic D, Marino Gammazza A, Barbagallo I, Isenovic ER, Banach M, Montalto G, Li Volti G. Liraglutide reduces oxidative stress and restores heme oxygenase-1 and ghrelin levels in patients with type 2 diabetes: a prospective pilot study. *J Clin Endocrinol Metab*. 2015 Feb; 100(2): 603-6. doi: 10.1210/jc.2014-2291
- 71) Salamone F, Li Volti G, Titta L, Puzzo L, Barbagallo I, La Delia F, Zelber-Sagi S, Malaguarnera M, Pelicci PG, Giorgio M, Galvano F. Moro orange juice prevents fatty liver in mice. *World J Gastroenterol*. 2012 Aug 7; 18(29): 3862-8. doi: 10.3748/wjg.v18.i29.3862
- 72) Viggiano E, Mollica MP, Lionetti L, Cavaliere G, Trinchese G, De Filippo C, Chieffi S, Gaita M, Barletta A, De Luca B, Crispino M, Monda M. Effects of an High-Fat Diet Enriched in Lard or in Fish Oil on the Hypothalamic Amp-Activated Protein Kinase and Inflammatory Mediators. *Front Cell Neurosci*. 2016 Jun9; 10: 150. doi: 10.3389/fncel.2016.00150
- 73) Albenzio M, Santillo A, Caroprese M, Ruggieri D, Napolitano F, Sevi A. Physicochemical properties of Scamorza ovine cheese manufactured with different probiotic cultures. *Journal of Dairy Science*. 2013, 96; 2781-2791
- 74) Caroprese M, Albenzio M, Bruno A, Annicchiarico G, Marino R, Sevi A. Effects of shade and flaxseed supplementation on the welfare of lactating ewes under high ambient temperatures. *Small Ruminant Research*, 2012, 102: 177-185.
- 75) Caroprese M, Albenzio M, Marzano A, Schena L, Annicchiarico G, Sevi A. Relationship between Cortisol Response to Stress and Behavior, Immune Profile, and Production Performances of Dairy Ewes. *Journal of Dairy Science* 2010 93: 2395-2403
- 76) Santillo A, Kelly AL, Palermo C, Sevi A, Albenzio M. Role of indigenous enzymes in proteolysis of casein in caprine milk. *International Dairy Journal*. 2009 19: 655-660.
- 77) Santillo A, Albenzio M, Quinto M, Caroprese M, Marino RM Sevi. A. Probiotic in Lamb Rennet Paste

- Enhances Rennet Lipolytic Activity, and CLA and Linoleic Acid Content in Pecorino Cheese. *Journal of Dairy Science* 2009; 92: 1330-1337.
- 78) Messina G, Di Bernardo G, Viggiano A, De Luca V, Monda V, Messina A, et al. Exercise increases the level of plasma orexin A in humans. *J Basic Clin Physiol Pharmacol*. 2016; 27(6): 611-6;
- 79) Messina G, Palmieri F, Monda V, Messina A, Dalia C, Viggiano A, et al. Exercise causes muscle GLUT4 translocation in an insulin-independent manner. *Biol Med*. 2015; 7 (Special issue);
- 80) Messina G, Viggiano A, Tafuri D, Palmieri F, De Blasio S, Messina A, et al. Role of orexin in obese patients in the intensive care unit. *J Anesth Clin Res*. 2014; 5(3)
- 81) Monda M, Viggiano A, Viggiano A, Viggiano E, Messina G, Tafuri D, et al. Quetiapine lowers sympathetic and hyperthermic reactions due to cerebral injection of orexin A. *Neuropeptides*. 2006; 40(5): 357-63
- 82) Sperandeo R, Monda V, Messina G, Carotenuto M, Maldonato NM, Moretto E, Leone E, De Luca V, Monda M, Messina A. Brain functional integration: an epidemiologic study on stress-producing dissociative phenomena. *Neuropsychiatr Dis Treat*. 2017 Dec 19; 14: 11-19. doi: 10.2147/NDT.S146250
- 83) Valenzano A, Moscatelli F, Triggiani AI, Capranica L, De Ioannon G, Piacentini MF, et al. Heart-rate changes after an ultraendurance swim from Italy to Albania: A case report. *Int J Sports Physiol Perform*. 2016; 11(3): 407-9
- 84) Viggiano E, Monda V, Messina A, Moscatelli F, Valenzano A, Tafuri D, et al. Cortical spreading depression produces a neuroprotective effect activating mitochondrial uncoupling protein-5. *Neuropsychiatr Dis Treat*. 2016; 12: 1705-10
- 85) Rinaldi B, Guida F, Furiano A, Donniacuo M, Luongo L, Gritti G, et al. Effect of Prolonged Moderate Exercise on the Changes of Nonneuronal Cells in Early Myocardial Infarction. *Neural Plast*. 2015; 2015
- 86) Monda V, Valenzano A, Moscatelli F, Salerno M, Sessa F, Triggiani AI, et al. Primary motor cortex excitability in karate athletes: A transcranial magnetic stimulation study. *Front Physiol*. 2017; 8
- 87) Triggiani AI, Valenzano A, Ciliberti MAP, Moscatelli F, Villani S, Monda M, et al. Heart rate variability is reduced in underweight and overweight healthy adult women. *Clin Physiol Funct Imaging*. 2017; 37(2): 162-7
- 88) Albenzio M, Santillo A, Caroprese M, Polito AN. Role of milk from small ruminant species on human health. Nutrients in dairy and their implications for health and disease. 21 June 2017, Pages 435-440
- 89) De Luca V, Viggiano E, Messina G, Viggiano A, Borlido C, Viggiano A, et al. Peripheral amino acid levels in schizophrenia and antipsychotic treatment. *Psychiatry Investig*. 2008; 5(4): 203-8
- 90) Messina G, Dalia C, Tafuri D, Monda V, Palmieri F, Dato A, et al. Orexin-A controls sympathetic activity and eating behavior. *Front Psychol*. 2014; 8(5)997
- 91) Testa D, Marcuccio G, Panin G, Bianco A, Tafuri D, Thyron FZ, Nunziata M, Piombino P, Guerra G, Motta G. Nasal mucosa healing after endoscopic sinus surgery in chronic rhinosinusitis of elderly patients: role of topic alpha-tocopherol acetate. *Aging Clin Exp Res*. 2017 Feb; 29(Suppl 1): 191-195. doi: 10.1007/s40520-016-0647-x;
- 92) Testa D, Motta S, Marcuccio G, Paccone M, Rocca A, Iardi G, Tafuri D, Mesolella M, Motta G. Our experience in the treatment of Malignant Fibrous Histiocytoma of the larynx: clinical diagnosis, therapeutic approach and review of literature. *Open Med (Wars)*. 2016 Jun 23; 11(1): 208-214. doi: 10.1515/med-2016-0040
- 93) Monda M, Viggiano A, Viggiano E, Messina G, Tafuri D, et al. Sympathetic and hyperthermic reactions by orexin A: role of cerebral catecholaminergic neurons. *Regul Pept*. 2007; 139(1-3): 39-44
- 94) Monda M, Messina G, Scognamiglio I, Lombardi A, Martin GA, Sperlongano P, et al. Short term diet and moderate exercise in young overweight men modulate cardiocyte and hepatocarcinoma survival by oxidative stress. *Oxid Med Cell Longev*. 2014; 2014: 131024
- 95) Monda M, Messina G, Vicidomini C, Viggiano A, Mangoni C, De Luca B. Activity of autonomic nervous system is related to body weight in pre-menopausal, but not in post-menopausal women. *Nutr Neurosci*. 2006;9(3-4):141-5
- 96) Di Bernardo G, Messina G, Capasso S, Del Gaudio S, Cipollaro M, Peluso G, et al. Sera of overweight people promote in vitro adipocyte differentiation of bone marrow stromal cells. *Stem Cell Res Ther*. 2014; 5(1): 4
- 97) Chieffi S, Carotenuto M, Monda V, Valenzano A, Villano I, Precenzano F, et al. Orexin System: The Key for a Healthy Life. *Front Physiol*. 2017; 31(8): 357;
- 98) Turillazzi, E., Riezzo, I., Neri, M., Pomara, C., Cecchi, R., Fineschi, V. The diagnosis of fatal pulmonary fat embolism using quantitative morphometry and confocal laser scanning microscopy. (2008) *Pathology Research and Practice*, 204 (4), pp. 259-266. DOI: 10.1016/j.prp.2007.12.010
- 99) Turillazzi, E., Neri, M., Cerretani, D., Cantatore, S., Frati, P., Moltoni, L., Busardò, F.P., Pomara, C., Riezzo, I., Fineschi, V. Lipid peroxidation and apoptotic response in rat brain areas induced by long-term administration of nandrolone: The mutual crosstalk between ROS and NF-kB. (2016) *Journal of Cellular and Molecular Medicine*, 20 (4), pp. 601-612. DOI: 10.1111/jcmm.12748

Corresponding author

LUCIA PARISI

Department of Psychology, Educational Science
and Human Movement
University of Palermo
(Italy)