

# Lactate level and handgrip test in migraine and fibromyalgia after self-myofascial release treatment

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### ABSTRACT

The Aim of the study was to determine the effect of self-myofascial release (SMFR) treatment on handgrip test score in patients with fibromyalgia and migraine, investigating also if the lactate levels influenced the result. Twenty-five subjects affected by migraine (age  $49.7 \pm 12.5$ ; height  $164.9 \pm 6.62$  cm; weight  $68.6 \pm 16.9$  kg) and ten subjects affected by fibromyalgia (age  $43.7 \pm 21.2$ ; height  $158 \pm 5.65$  cm; weight  $70 \pm 28.9$  kg) were enrolled in the study. The assessments included a handgrip test, in order to evaluate isometric strength of both hands and forearm muscles and the lactate levels evaluation. The treatment was performed in the three most painful trigger points indicated from subjects as to concern fibromyalgic and on the suboccipital muscles for the migraineurs subjects. The handgrip test score, at T0, showed respectively in fibromyalgia and migraine groups a result of  $22,82 \pm 10,58$  and  $24,74 \pm 9,13$  (kg) for the right hand and  $23 \pm 8,59$  and  $22 \pm 9,13$  (kg) for the left hand without any statistical significance difference. At T1 the handgrip test score showed a positive trend in increase in migraineurs ( $23,23 \pm 8,18$  (kg) and  $21,03 \pm 8,57$  left hand (kg)) but without a statistical significance difference; vice versa in fibromyalgic subjects ( $24,95 \pm 8,65$  (kg)  $22,29 \pm 10,90$  right hand (kg)). Given the interesting preliminary results it needs further studies to confirm the trend, increasing the number of the subjects and extends the treatment for a longer time. **Keywords:** Disabling disorder; Isometric contraction; Relaxing muscle technique.

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## INTRODUCTION

It has been amply demonstrated that physical activity improves quality of life both by increasing physical and mental well-being (Di Liegro, 2019). However, the role of muscle release techniques on increasing flexibility (Bradbury-Squires, 2015; Grieve, 2015; Škarabot, 2015), range of movement (ROM) (Mohr, 2014), improving quality of life (Amato, 2018) and delayed onset muscle pain (DOMS) caused by excessive physical activity (MacDonald, 2014; Pearcey, 2014) has recently been demonstrated too. Many scientists have studied the effects of self-myofascial release treatments (SMFR) in subjects with various pathologies, to understand if this treatment can improve their quality of life. It is a manual therapy technique in which pressure is applied to muscles in a specific point (McKenney, 2013) defined “*trigger points*” (Wilke, 2018); it is performed by the individual himself often using a tool such as rollers or simple balls (Peacock, 2015, Bradbury-Squires, 2015). SMFR has several effects such as increased flexibility (Bradbury-Squires, 2015; Grieve, 2015; Škarabot, 2015) and range of movement (ROM) (Mohr, 2014); it has also been used to reduce delayed onset muscle pain (DOMS) (MacDonald, 2014; Pearcey, 2014). Fibromyalgia (FM) is a common and chronic syndrome that causes joint stiffness, physical pain and mental suffering; this pathology is a rheumatic condition that causes pain in the soft tissues or myofascial pain probably due to abnormal amplification of pain signals in the spinal cord (Muto, 2015). FM is also characterized by an increase in lactate concentration basal level (Proia, 2019); even if it is abnormal, we already know that could have a positive effect since it plays a role in homeostasis and in the nourishment of nervous tissue as recently demonstrated from Proia et al. (2016).

Migraine (M) is one of the most common forms of headache; it is a chronic neurological disorder characterized by pain localized to the unilateral head, often associated with a multitude of symptoms. Autonomic nervous systems correlate (Amery, 1982). SMFR program could improve the quality of life of people with FM, in particular in pain intensity, fatigue, stiffness and ROM as shown in a recent study carried out from Ceca et al. (2017). Also, the same treatment in migraine subjects, seems to reduce headaches frequency and intensity, drug consumption, nociceptive triggers, improve cervical ROM and consequently quality of life (Gandolfi, 2018).

To detect physical health often it is used to evaluate the strength of the hands that represents a fundamental characteristic for performing daily activities (Mat Jais, 2018; Ribom, 2010). It is well known that decreases in hands strength are present in physiological conditions throughout normal aging as well as in pathological conditions (Rijk, 2016; Spruit, 2013). For instance patients affected by multiple sclerosis show lower levels of hand strength (Jorgensen, 2017) and, although no studies have investigated the peak of force during handgrip task; moreover people who suffer by migraine, manifest impairments in maximal isometric voluntary contraction (Florescio, 2015). Therefore, handgrip strength assessments may be essential for assessing fitness levels in these subjects to predict and estimate the consequent effects on daily life.

However, the aim of our study was to investigate if SMFR treatment could have a positive effect on isometric strength in fibromyalgic and migraineurs subjects and if there was some influence from the basal lactate levels.

## MATERIAL AND METHODS

On the basis of the diagnosis previously made and certified by neurologist, 10 subjects with fibromyalgia (FG) (age  $43.7 \pm 21.2$ ; height  $158 \pm 5.65$  cm; weight  $70 \pm 28.9$  Kg) and 25 subjects with migraine (MG) (age  $49.7 \pm 12.5$ ; height  $164.9 \pm 6.62$  cm; weight  $68.6 \pm 16.9$  Kg) were recruited. Participants provided informed consent before to start the study. At the beginning of the study (T0) all the information regarding personal

data and anthropometric measurements were collected (Table 1). Furthermore, before myofascial treatment, all subjects familiarized with the handgrip test and the evaluation of blood lactate baseline was evaluated.

Table 1. Means $\pm$ SEM of personal data and anthropometric measurements.

Subjects Group	Subjects number	Age	Weight (Kg)	Height (cm)	BMI
FG	10	43.7 $\pm$ 21.2	70 $\pm$ 28.9	158 $\pm$ 5.65	25,1
MG	25	49.7 $\pm$ 12.5	68.6 $\pm$ 16.9	164.9 $\pm$ 6.62	25,08

### **Handgrip test**

Each participant was tested before (T0) and after (T1) SMFR treatment characterized by 90 seconds/session for time.

For the handgrip testing assessments was followed the standardized procedure of the American Society of Hand Therapists (Spijkerman, 1991) in which participants, maintaining a seated position with backs at 90-degree angles resting on the backrest with feet flat on the floor and elbow joint positioned at 90-degree angles, were required to apply the maximum grip strength for 3 seconds on an isometric mechanical dynamometer (Kern Map model 80K1 - Kern®, Kern & Sohn GmbH, Balingen, Germany) both for dominant and non-dominant hands. Each participant was subjected to repeat the test for three times with a 3-minute rest between trials considering the best of the 3 performed for data analysis.

### **Lactate evaluation**

The blood lactate was taken in the morning and the subjects had not carried out physical activity the day before the evaluation. To perform the test, we used "Accutrend® Plus Cobas" instrument taking the blood sample from the fingertip.

### **Self-myofascial release treatment (SMFR)**

The SMFR consisted of a static myofascial release, carried out with the subject supine, using special medium-density sponge balls, laid with the only gravity pressure, for 90 seconds in a specific body areas: the three most painful spots reported from fibromyalgic subjects according to the VAS scale (Spruit, 2013), while for the migraineurs patients, was applied in the suboccipital muscles. The protocol was performed only once for patient.

### **Statistical analysis**

Changes in handgrip test score between T0 and T1, were evaluated using t Student test for paired data. Pearson correlation test was used when appropriate. An alpha value  $P < 0.05$  was considered statistically significant. The SPSS statistical package version 16.0 for Windows (SPSS, Inc., Chicago, IL, USA) was used to perform all statistical evaluations.

## **RESULTS**

As regards the results of the handgrip test, subjects with migraineurs and fibromyalgics had at T0 score respectively 24,74  $\pm$  9,13 (kg) and 22,82  $\pm$  10,58 (kg) ( $P > 0,05$ ) for the right hand ( $P > 0,05$ ), 23  $\pm$  8,59 (kg) and 22  $\pm$  9,13 (kg) ( $P > 0,05$ ) for the left hand ( $P > 0,05$ ). Instead, at T1 handgrip test score were for migraineurs and fibromyalgics were respectively 24,95  $\pm$  8,65 (kg) and 22,29  $\pm$  10,90 (kg) ( $P > 0,05$ ) for the right hand (kg) ( $P > 0,05$ ) and 23,23  $\pm$  8,18 (kg) and 21,03  $\pm$  8,57 (kg) ( $P > 0,05$ ) for the left hand (kg) ( $P > 0,05$ ) (Tab 2). Noteworthy, a statistical significant difference was found when we compared the results obtained before and after treatment but only for the left hand in fibromyalgics (22  $\pm$  9,13 vs 21,03  $\pm$  8,57,  $P < 0,05$ ).

Table 2 Means±SEM of the Handgrip test score in both groups before and after treatment.

	Migraine			Fibromyalgia		
	T0	T1	P-VALUE	T0	T1	P-VALUE
(HG) Right	24,74 ± 9,13	24,95± 8,65	t=0,36 P>0,05	22,82 ± 10,58	22,29 ± 10,90	t=0,31 P>0.05
(HG) Left	23 ± 8,59	23,23 ± 8,18	t=0,34 P>0,05	22 ± 9,13	21,03 ± 8,57	t=0,04*P<0,05

\* Significant differences at the 0.05 level

As regard basal lactate levels, the migraine group had a blood lactate concentration (on average) of 1,45± 1,01 mmol/L, whilst fibromyalgics group 1,8 ± 0,94 mmol/L (P>0,05).

Running the Pearson's correlation between lactate and handgrip test score both hands, we observed a low positive correlation only between right hand performance before the treatment and lactate values, but only in the migraine group (Table 3).

Table 3 Means±SEM basal lactate level and Pearson's correlation

	Right hand			Left hand		
	Lactate	Handgrip	Pearson Correlation	Lactate	Handgrip	Pearson Correlation
Migraine	1,45± 1,01 (mmol/L)	24,74 ± 9,13 (Kg)	r= 0,3*	1,45± 1,01 (mmol/L)	23 ± 8,59 (Kg)	r= 0,2
Fibromyalgic	1,8 ± 0,94 (mmol/L)	22,82 ± 10,58 (Kg)	r= -0,1	1,8 ± 0,94 (mmol/L)	22 ± 9,13 (Kg)	r= -0,1

\* Pearson Correlation between 0.3 and 0.5 indicate a low correlation.

\*\* Pearson Correlation between 0.5 and 0.7 indicate a moderate correlation.

## DISCUSSION

The aim of the study was to determine the effect of Self MyoFascial Release treatment on the handgrip test score in a group of subjects with migraine and fibromyalgia, analysing whether basal lactate levels could have influenced the test's result.

In fact, as recent and numerous studies showed, the handgrip test turns out to be a predictor of various diseases (Mgbemena, 2019; Kyomoto, 2019).

However, we didn't find any differences when we compared the T0 score in handgrip test in fibromyalgic and migraine subjects (P> 0.05). As regards the handgrip test score before and after SMFR treatment, we found a statistically significant difference (P <0.05) only between T0 and T1 left hand in fibromyalgics, with a decrement in the performance. This data indicated that myofascial treatment is not effective in improve the isometric strength performance; moreover, this led a worsening in fibromyalgic subjects. This can be explained from the fact that clearly the SMFR treatment in the pain points indicated by fibromyalgics, probably induced an increase in pain and therefore a decrease in the performance of the handgrip test.

However, migraine group did not show significant differences in the handgrip test before and after treatment but only a slight increase; maybe is due on the matter that migraineurs had not a migraine attack during the treatment. Probably compare with fibromyalgics, in migraineurs subjects in whom we treated a single and specific point, the same in all subjects as described from Wilke et al. (2018), there were a positive effect on strength, albeit slight.

The correlation's analysis between lactate and handgrip, showed a low positive correlation particularly between hand grip right hand score before treatment and basal lactate values, but only in the migraine group ( $r=0,3$ ). Notwithstanding Pearson's correlation analysis not showed significant correlations in fibromyalgic subjects, it is highlighted a negative trend of correlation opposite to the situation found in migraineurs. Therefore, higher lactate values could be associated with a worse performance in the handgrip test; this condition was already pointed out in Proia et al., 2019 as harmful condition in fibromyalgic patients as to concern postural stability and balance disorders. The relationship between strength and lactate concentration in pathological subjects is yet to be clarified.

However, to confirm these preliminary results, further studies are needed in a larger number of subjects, maybe increase either the time or changing the point of the treatment.

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