Original Article

Effect of self-myofascial release on muscle strength in female soccer athletes: randomized clinical trial

Efeito da auto liberação miofascial na força muscular em atletas de futebol feminino: ensaio clínico randomizado

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ABSTRACT | INTRODUCTION: The variable muscle strength (MS) in sports practice, especially in football, is extremely important in activities such as kicks, ball disputes, sprints and jumps. In addition, it allows identifying individuals who are at risk groups for injuries. Thus, techniques, such as self-myofascial release (SMF), have been used to improve sports performance and to prevent injuries. **OBJECTIVE:** To verify the chronic effect of SMF on MS in female soccer athletes. **METHODOLOGY:** This study is a randomized clinical trial. 14 female soccer athletes participated in the study. Initially, evaluations were performed on the isokinetic dynamometer device of knee extensors and flexors. The participants were divided into two groups, an intervention group (IG) and a control group (CG). IG participants performed a warm-up associated with SMF with a foam roller. CG participants, on the other hand, performed the same warm-up, but without the association of SMF. 48 hours after the last intervention, a reassessment was performed on the isokinetic dynamometer device. **RESULTS:** There were no significant effects between groups in the post-test. In the pre- and post-test comparison between the groups, there was a significant worsening in the peak torque variable of the dominant lower limb extension in the group that did not perform SMF (p = 0.013). **CONCLUSION:** It is concluded that a chronic SMF approach was not able to generate significant changes in the MS of knee extensors and flexors. Further studies are needed to support these findings. ReBEC Registration: RBR-7qnxty.

KEYWORDS: Self-myofascial release. Fascia. Strength muscle. Soccer. Athletes.

RESUMO | INTRODUÇÃO: A variável força muscular (FM) na prática esportiva, sobretudo no futebol, é de extrema importância em atividades como chutes, disputas de bola, arrancadas e saltos. Além disso, permite identificar indivíduos que estão em grupos de risco para lesões. Assim, técnicas, como a auto liberação miofascial (ALM), vêm sendo utilizadas para o aprimoramento do desempenho esportivo e para prevenir lesões. **OBJETIVO:** Verificar o efeito crônico da ALM na FM em atletas de futebol feminino. **METODOLOGIA:** Este estudo trata-se de um ensaio clínico randomizado. Participaram do estudo 14 atletas de futebol feminino. Inicialmente foram realizadas avaliações no aparelho dinamômetro isocinético dos extensores e flexores de joelho. As participantes foram divididas em dois grupos, um grupo intervenção (GI) e um grupo controle (GC). As participantes do GI realizaram um aquecimento associado à ALM com um *foam roller*. Já as participantes do GC, realizaram o mesmo aquecimento, porém sem a associação da ALM. Após 48 horas da última intervenção, foi realizada uma reavaliação no aparelho dinamômetro isocinético. **RESULTADOS:** Não foram verificados efeitos significativos entre os grupos no pós-teste. Na comparação pré e pós-teste entre os grupos, houve uma piora significativa na variável pico de torque de extensão do membro inferior dominante no grupo que não fez a ALM (p = 0,013). **CONCLUSÃO:** Conclui-se que uma abordagem crônica de ALM não foi capaz de gerar mudanças significativas na FM dos extensores e flexores de joelho. Mais estudos são necessários para apoiar esses achados. Registro ReBEC: RBR-7qnxty.

PALAVRAS-CHAVE: Auto liberação miofascial. Fáscia. Força muscular. Futebol. Atletas.

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Introduction

The practice of soccer asks for a variety of physical requirements to a good performance, demanding basic attributes such as flexibility, mobility, agility[1] and muscle strength (MS)[1,2]. It is known, specially in soccer, that the variable MS in sports practice is extremely important in activities like kicking, ball disputes, sprinting and jumping[2]. Furthermore, it allows to identify the individuals in the risk group for injuries[3]. It is believed that the capacity of MS transmission can be influenced by the integrity of the myofascial system (muscle and fascia) among several factors[4,5].

The myofascial system plays an important role in the transmission of mechanical forces between muscles and it can often present changes such as the loss of elasticity and viscosity, which can usually lead to densifications associated with pain, muscle mechanic alterations, decrease in flexibility and MS[5]. Thus, some techniques such as self-myofascial release (SMF) has been used to enhance the sports performance and to prevent injuries recently[6].

The SMF consists of a self-massage technique in which the individual uses his own body mass to generate pressure in a specific region of the body with a specific instrument. The technique has become widely used in sports as an additional component for warm-up, gaining attention in the fitness field[7]. At soccer, SMF can be applied to prevent restriction in range of movement in lower limbs which can contribute to prevention of injuries[6].

Recent studies show positive effects of SMF as a pre[8,9,10] and post exercise[11,12,13] approach strategy in athletes. Overall, literature suggests that SMF is capable of improving flexibility without impairing muscle performance during sports practice in pre exercise and it is capable of improving muscle recovery post exercise[14,15]. Regarding the effect of SMF on MS, the majority of the studies has not found relation of cause and effect[10,16,17], however all of them evaluated the acute effects of the technique. Acute effects are understood as studies that performed the protocol in less than a week[15]. Therefore, the goal of this study is to verify the chronic effect of SMF over the MS on female soccer athletes.

Methodology

This study is a randomized clinical trial with sample defined by convenience. The research included 14 female soccer athletes, members of Esporte Clube Vitória (ECV), in the city of Salvador - Bahia, where data collection was carried out. Female soccer athletes from ECV were included in the research. Athletes that were in the process of recovering from lower limb injuries, underwent surgery in the last eight months prior to the collection period and presented a condition that prevented them from performing the practices were excluded from the research. The instruments used to perform this research were a sociodemographic and clinical questionnaire, a Biodex isokinetic dynamometer device and massage rollers Foam Roller Brasil ® Original - 30 X 15 cm.

The participants were randomly divided into two equivalent groups, featuring an intervention group and a control group. The randomization was performed by the club's physical trainer without the participation of the researchers and it was done through a numbered list from 1 to 14 of the participating athletes and then a lottery through a mobile application responsible for generating random numbers. First, the draw allocated the participants in the intervention group, composed of seven participants. The remaining seven participants were automatically allocated in the control group.

Initially, evaluations of knee extensors and flexors were performed on the isokinetic dynamometer device. After 48 hours of the isokinetic evaluation, interventions begun which followed a two-week protocol being performed three times during the week. Participants in the intervention group performed a routine warm-up of the club associated with SMF using the foam roller. The participants in the control group performed the same warm-up, however without SMF. The SMF protocol was applied by the study collaborator and club fitness trainer, who did not participate in the assessments, and it was performed on the quadriceps, hamstrings and sural triceps muscle groups, with three sets of 1 minute for each muscle group and 30 seconds rest between them. In total, six interventions were carried out with an interval of 48 hours between each one. 48 hours after the last intervention, a reassessment was performed with the isokinetic dynamometer device. For this study, the variable analyzed from the evaluation result, both pre-test and post-test,

was the peak torque of knee extension and flexion at an angular speed of 60°/s of the dominant and non-dominant limbs. The protocol used in this study regarding the number of series, SMF time and rest time was based on the previous literature[10,11,12,17].

For the descriptive analysis of the sample, data were presented with mean, standard deviation, absolute frequency and relative frequency. To verify the existence of significant results before and after the intervention, the t-Student test for paired samples was performed and to compare the effects between the groups the t-independent test was performed. All statistical analyzes were performed using the program IBM SPSS Statistics 20.0. The level of significance assigned was $p < 0,05$.

This study was approved by the Ethics and Research Committee of Universidade Católica do Salvador (CAAE 07858819.1.0000.5628) and registered with the Brazilian Registry of Clinical Trials (ReBEC: RBR-7qnxty). The procedures were executed within the ethical rules provided in Resolution No. 466/12 of the National Health Council in research involving human beings. All participants signed an informed consent form.

Results

After analyzing the sociodemographic and clinical questionnaire answered by the participating athletes, none of them met the exclusion criteria established in the methodology of this research, totaling a sample of 15 participants initially. However, one of the athletes in the population did not participate in the protocol during the intervention phase, thus being excluded from the study. Therefore, the sample of this study was composed of 14 participants randomly divided into two groups, intervention group (n = 7) and control group (n = 7).

As for the descriptive data of the sample, the intervention group had mean age of 22.3 ± 2.3 years old, weight of 64 ± 10 kg, height of 1.7 ± 0.1 cm, BMI of 22.4 ± 2.4 kg/m2 and average professional practice time in soccer of 7 ± 1.4 years. The control group had a mean age of 22.7 ± 4.3 years old, weight of 62 ± 7.6 kg, height of 1.7 ± 0.1 cm, BMI of 21 ± 1.5 kg/m2 and the average time of professional practice in soccer of 5.3 ± 5.8 years (data described in table 1).

Table 1. Descriptive data of the sample (age, weight, height, body mass index and length of professional experience) of the intervention group and the control group

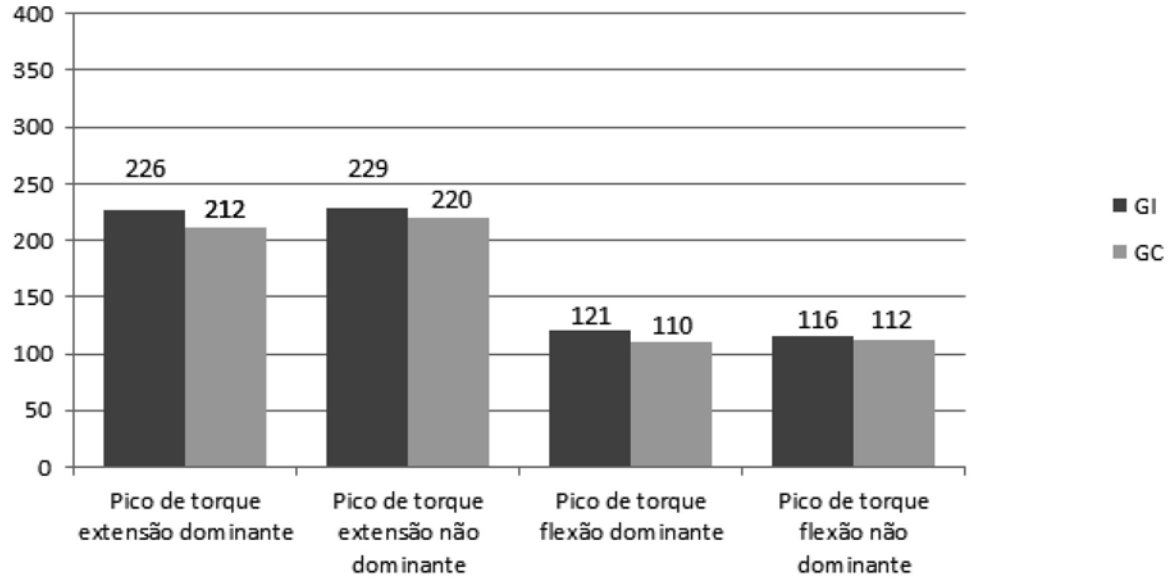
Variable (N = 7)	Intervention Group (N = 7)	Control Group
	mean ± SD	mean ± SD
Age (years)	22,3 ± 2,3	28,8 ± 4,3
Weight (kg)	64 ± 10	62 ± 7,6
Height (cm)	1,7 ± 0,1	1,7 ± 0,1
BMI (Kg/m2)	22,4 ± 2,4	21 ± 1,5
Length of professional experience (years)	7 ± 1,4	5,3 ± 5,8

BMI = Body mass index.

Of the 14 participating athletes, 12 (85.7%) were right-handed and 02 (14.3%) were left-handed. As for the game position, 03 (21.4%) were goalkeepers, 02 (14.3%) defenders, 01 (7.1%) lateral and defender, 04 (28.6%) midfielders and 04 (28, 6%) attackers.

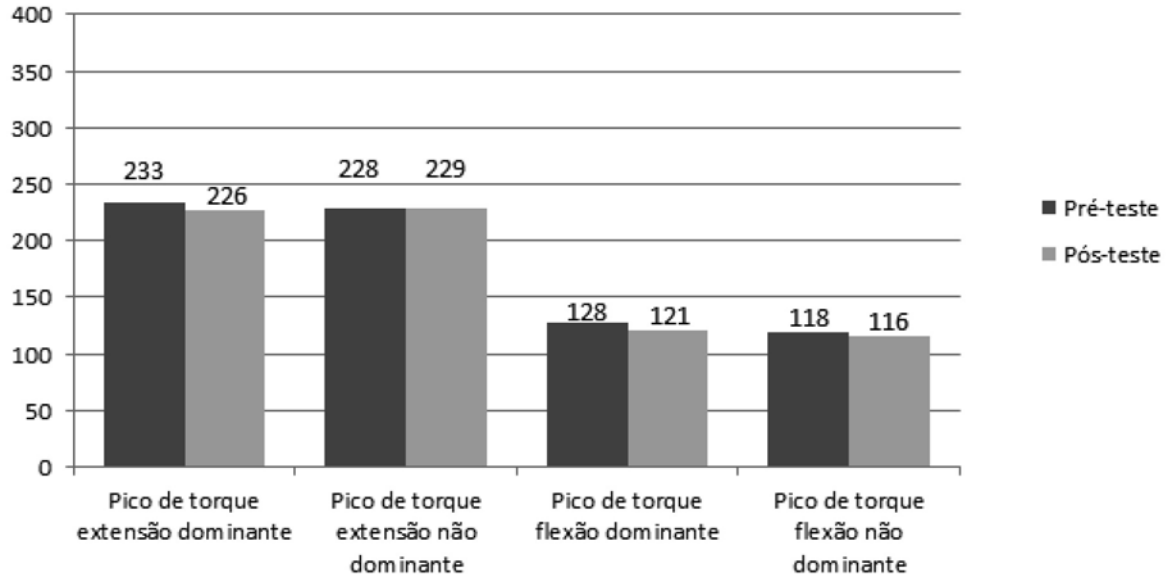
After analyzing the post-test results of the groups (control and intervention), it was possible to identify that the intervention group had higher means for all the variables analyzed when compared to the control group. However, it did not present statistical significance when analyzing the P values for none of the variables. P values: peak torque of extension of the dominant limb = 0.399; non-dominant limb extension = 0.681; dominant limb flexion = 0.184; non-dominant limb flexion = 0.588 (data described in graph 1).

Graph 1. Peak torque values post-test of the intervention and control groups

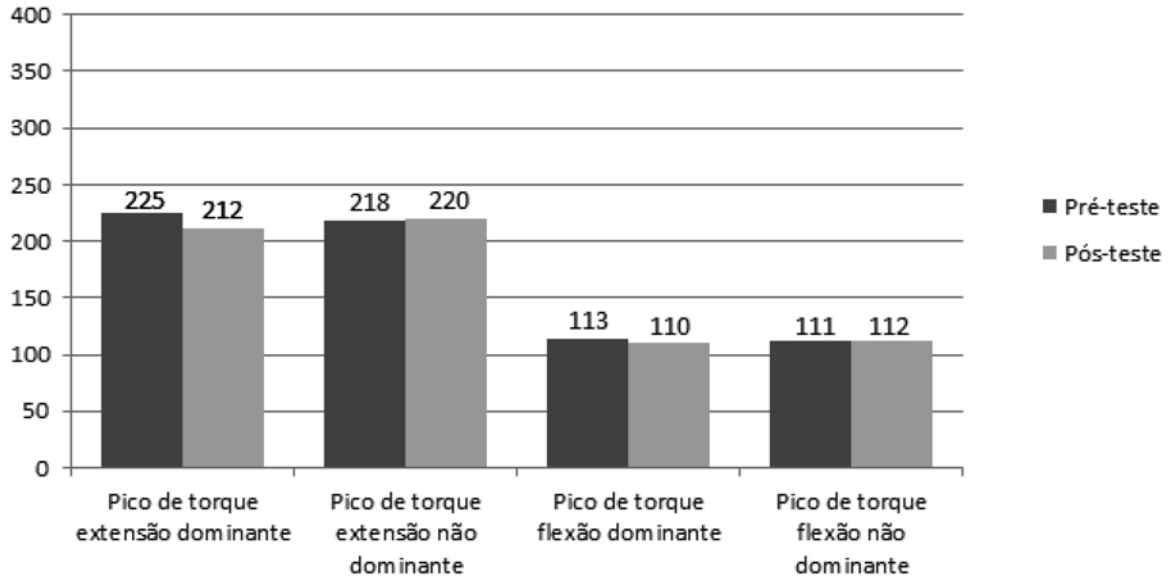


After analyzing the results of the intervention group and the control group pre and post-test, it was found that there was significant worsening in the peak torque variable of the dominant lower limb in the group that did not perform SMF (p = 0,013). In the other variables, there were no significant effects. Peak torque of the non-dominant limb for extension = 0.672; dominant limb for flexion = 0.331; non-dominant limb for flexion = 0.928 (data described in graph 2 and graph 3).

Graph 2. Peak torque values pre and post-test of the intervention group



Graph 3. Peak torque values pre and post-test of the control group



Discussion

The present study demonstrated that a two-week protocol of SMF did not show significant effects on MS and that the group that did not perform SMF showed a significant worsening in the peak of torque for extension of the dominant limb. Although this research has adopted a greater number of SMF interventions for the participating athletes when compared to other studies, the technique has not shown significant changes in muscle strength, which is consistent with most studies that sought to analyze this condition[9,10,17,18].

This study and the one of Su et al., 2016 are the only ones that used the isokinetic dynamometer device to evaluate the effects of SMF on MS and were identified during the research. No other study was found that sought to verify the chronic effects of SMF on MS and that took into account the assessment of MS according to the dominance of the lower limb. The literature suggests that studies with a chronic approach are the ones that carried out a follow-up of at least one week[15].

In agreement with the findings of this study, MacDonald et al.[10] conducted a survey of 11 male recreational athletes and found an increase in the range of motion of the knee, without altering the MS of the quadriceps and it was assessed in an isometric test of maximum voluntary contraction two and ten minutes after the intervention. Su et al.[17] confirmed this result after conducting a study with 30 volunteers (15 men and 15 women) and verified that there was an increase in quadriceps and hamstrings flexibility, but it did not show significant differences in MS assessed in the isokinetic. What may explain the failure to observe significant changes in MS in the present study and in the ones cited is the duration of each series of SMF. Studies performed aiming to evaluate the effects of massage have shown that a short-term massage is not able to impair the MS[19,20]. However, studies that evaluated the effects of massage with a longer duration showed an acute decrease in MS[21,22], which indicates that a longer duration of SMF can lead to a reduction in MS in the first moments after intervention. The duration time for each SMF series in the present study and the studies of Su et al.[17] and of MacDonald et al.[10] was 30 seconds to 1 minute.

Contrasting with the results of the present study, Peacock et al.[7] conducted a survey of 11 male volunteers, in which the SMF protocol was performed in the pectoral, thoracic, lumbar, gluteal, hamstrings, quadriceps and calf regions. The results showed that the approach was able to improve the results in the power performance tests evaluated with the vertical and horizontal jump test, of MS evaluated in the indirect 1RM test, and also in the speed and agility tests of the evaluated individuals. It is unclear why MS improved. Perhaps the performance of SMF in other regions, such as the trunk, may explain the increase in strength discovered as it is seen that approaches performed on the trunk lead to improved performance in both lower and upper limbs[23].

Another finding of the present study was the significant worsening in the peak torque of extension of the dominant lower limb in the group that did not perform SMF (control group). It is not clear why the group that did not have SMF worsened in the results. But what can explain this finding is a greater volume of training performed by athletes during the period that followed the first isokinetic evaluation, since they were in pre-season period. Pre-season is commonly described as a period in which there is greater intensity and volume of training[24]. Although the increase in training requirements generates positive adaptations in athletes, when training exceeds the capacity for individual regeneration it can lead to losses in their performance[25]. SMF probably minimized these losses in the intervention group as studies show that the technique has positive effects on muscle recovery[12,14].

The limitations of this study include the failure to perform a sample calculation, the low number of research participants and the failure to investigate some variables that may have generated some bias in the results. However, the performance of a chronic SMF approach, the use of a gold standard assessment instrument and the categorization for lower limb dominance are advantages identified in this study.

Conclusion

Based on the results of the present study, it is concluded that a chronic approach of SMF was not able to generate significant changes in the MS of knee extensors and flexors. Although the group that did not have SMF showed a significant worsening in the peak torque of extension of the dominant limb, it is not possible to state that SMF can contribute in any way to reduce the losses on MS. This study, as far as we know, is the first to carry out a chronic approach of SMF on MS. Therefore, further studies are needed to support these findings.

Author contributions

Souza SM participated in the conception, design, search, data collection, statistical analysis and research data interpretation and writing of the scientific article. Costa Neto JFP participated in the conception, design, research data collection and critical review of the article. Santos JET participated in the design, statistical analysis and research data interpretation and critical review of the article.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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