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Research Article

Immediate and Acute Effect of Self Myofascial Release vs Instrument Assisted Soft Tissue Mobilization on Flexibility, Strength and Sport-Specific Performance in Young Male Soccer Players

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ABSTRACT

Background: Regular exercise and performance can result in microtrauma, which is minor damage to the muscle. The resulting inflammatory response may lead to fascia scar tissue over time, which in turn may lead to muscular dysfunction.

Purpose: The purpose of our study was to compare the immediate and acute effects of SMR and IASTM on flexibility, strength and sport-specific performance in young male soccer players.

Method: Twenty-seven young male soccer players were randomly assigned to receive either SMR via plain foam roller or IASTM via M2T blade. To compare the effect of interventions, subjects were assessed on measures of flexibility via sit and reach test, power through vertical jump test, agility by Illinois agility test, 20m sprint test and strength test by a dynamometer.

Results: A one-way ANOVA was used to analyze differences. To test for the difference between interventions and across 3 assessments, a 3X3 split plot ANOVA with a group (control, SMR, IASTM), time (0 min, 10 mins, 20 mins) and interaction effect (Group X Time) was employed. There was a significant difference in strength during performance without intervention vs. immediately after SMR and IASTM (p=0.03).

Conclusion: The findings of the study suggest that SMR and IASTM did not improve physical performance in young male soccer players, but they did not hinder performance either. Even if performance does not improve, there does not seem to be any adverse effect by using either SMR or IASTM before physical activity, athletes need not be discouraged from using these tools.

Keywords: Soccer, Self-Myofascial Release, Instrument Assisted Soft-Tissue Mobilization, Physical Performance, Vertec

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Introduction

Regular exercise and performance can result in microtrauma, which is minor damage to the muscle .[1] The resulting inflammatory response may lead to fascia scar tissue over time [1]. When injured, fascia can adhere to the muscles and other body structures to produce restrictions, which can lead to decreased flexibility, muscle spasms, neuromuscular changes, and pain.[2]

Lately, manual therapy interventions are being increasingly used to prevent these dysfunctions and enhance muscle relaxation, reduce muscle tension and soreness and improve athletic performance.[3,4]

Soccer is one of the most widely played sports in the world.[5] These game-related demanding activities such as change of direction, sprinting, dribbling, tackling, kicking the ball and heading require high rates of force production mainly by the muscles of the lower limbs.[6] Thus, a soccer player must not only manage technical and tactical tasks but must also have -well-developed conditioning in terms of physical strength, power and speed to yield a high performance during a match.[7,8]

Self-Myofascial Release (SMR) and Instrument-Assisted Soft-Tissue Mobilization (IASTM) are two popular, manual therapy interventions used by rehabilitation and exercise science specialists. Both interventions are believed to work directly on fascial restrictions and adhesions that occur as a result of, or in response to, tissue injury .[9] Some research indicates that SMR and IASTM treatment are used to improve Range of Motion (ROM), decrease the incidence of injury before exercise, and aid in post-exercise recovery.[10]

Foam rolling is a type of SMR that requires the person to use a dense foam cylinder to roll back and forth over the muscle and fascia. The use of Foam Rolling (FR) has gained popularity in recent years within the general population. Although its precise mechanism of action is unknown, the conventional theory states that the friction created during FR breaks apart fascia adhesion.[2] By removing these mechanical restrictions from the myofascial tissue, ROM can be restored.

IASTM is typically used for myofascial relaxation and, as a new form of treatment for myofascial pain syndrome, to detect and eliminate adhesion within scar tissues and myofascial limitations.[11] In addition, IASTM is also used as a method for stimulating nerves in muscles,[12] which can affect muscle strength through the activation of the muscular and nervous systems. IASTM not only improves flexibility but may also affect muscle strength, endurance, and recovery from muscle fatigue and fitness.[13]

SMR is marketed to enhance flexibility and boost performance. Current research has suggested that SMR has a positive effect on flexibility, power, strength, speed and agility.[9,12,14,17] However, Janot et al,[15] reported a detrimental effect on maximal anaerobic performance. Despite variability in the type, intensity, duration, and area of the body to which SMR was applied, most studies which evaluated the acute effect of SMR found an improvement in joint ROM.

IASTM is a popular tool used by physiotherapists, which is purported to increase ROM and enhance performance.[16,17] Recent research has suggested that IASTM has an effect on flexibility, power, and strength and little effect on speed and agility performance.[12] A systematic review of IASTM showed only two studies that reviewed IASTM treatment on joint ROM.[17] Both studies found that ROM outcomes increased after the intervention. The reviewers suggested that there was a lack of IASTM standardized protocols that were followed by the initial researchers.[17] However, Stroiney reported a standardized protocol for the IASTM technique procedure.[18]

Previously, Goran Markovic (2015)[12] compared the effect of SMR and IASTM on joint ROM and found that IASTM has a greater effect on joint ROM than SMR, while Stroiney (2018)[18] compared their effects on vertical and horizontal power on recreational athletes and found that SMR has a greater effect on VJ performance, however, IASTM does not improve VJ performance and it was also found that SMR and IASTM do not improve sprint performance. However, to the best of our knowledge, no study has compared the efficacy of SMR and IASTM techniques on athletic performance. Therefore, the purpose of this research study is to determine whether there is a difference between SMR and IASTM techniques on physical performance in young male soccer players.

Methodology

Subjects: 27 young male soccer players ranging in ages from 14 to 18 years, without any known neuromuscular, orthopaedic or cardiovascular conditions, volunteered to participate in the study. Subjects were recruited from those who reported voluntarily.

This study consisted of a randomized crossover design in which subjects participated in both manual therapy treatments. On which, the very first day the baseline measurement of one subject was taken, and after 24 hours he took one manual therapy treatment. After five days of that treatment, he took another manual therapy treatment.

Variables

In our study, two independent variables and five dependent variables were taken. For SMR treatment VPK plain foam roller was used, and for IASTM an M2T blade was taken. Independent variables, flexibility was measured by sit and reach test, power by the vertical jump test, agility by

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the Illinois agility test, speed by the 20m sprint test, and strength by a dynamometer.

Procedures

The potential voluntary candidates were made aware of the nature and purpose of the study. Eligible candidates underwent assent-taking and received familiarization trials specific for each subject.

Descriptive variables of all subjects, such as age, height, weight, BMI were recorded. After the familiarization trial the base line measurement of dependent variables was taken.

Interventions

On the very first-day baseline data was taken, and after 24 hours any one of two interventions was given that could be SMR or IASTM. For SMR, we used VPK plain foam roller and the muscles taken were the quadriceps, hamstring and tricep sure muscles of both lower limbs. The foam roller rolled 3 sets for 60 seconds and a 60-second interval was given between two sets for each muscle group.

On the other hand, for IASTM the M2T blade was used and the same muscles were taken similar to SMR. IASTM was given for 90 seconds for each muscle in 3 different muscle lengths i.e in a muscle relaxed position, muscle contracted position and a muscle lengthening position. After giving treatment all 5 dependent variables were measured 3 times i.e immediately after treatment (at 0 min), 10 min after treatment, 20 min after treatment. Three trials were taken for each variable and best of the three was selected.

Data Analysis

The data was SPSS 21 version software. The descriptive analysis was used to determine the mean and standard deviation of the variables. The physical characteristics data of subjects including age, height and weight were descriptively summarized.

Twenty-seven participants (n=27) were assessed during the experiment for performance measures, under 3 test conditions (Control, SMR, IASTM), in a random order. The criterion measures immediately after SMR vs. IASTM vs. no intervention, were compared by one-way ANOVA. To test for the difference between interventions and across 3 assessments, a 3X3 split plot ANOVA with group (control, SMR, IASTM), time (0 min, 10 mins, 20 mins) and interaction effect (Group X Time) was employed. When the main effect was found to be significant, a Bonferroni test was employed as post hoc analysis to locate the pairs having significant difference. Significance level was set at $p < 0.05$.

Results

Physical characteristics of participants:

The mean (SD) of age, height, weight and BMI of the participants was 16.63 (1.445) yrs, 169.33 (5.6) cm, 57.19 (4.4) kg and 19.96 (1.6) kg/m2 respectively Table 1.

Using ANOVA, a statistically significant difference was found only in strength test among the interventions and without intervention, where the strength increased after SMR and IASTM interventions than the control group and no such significant difference was seen in other dependent variables Table 2.

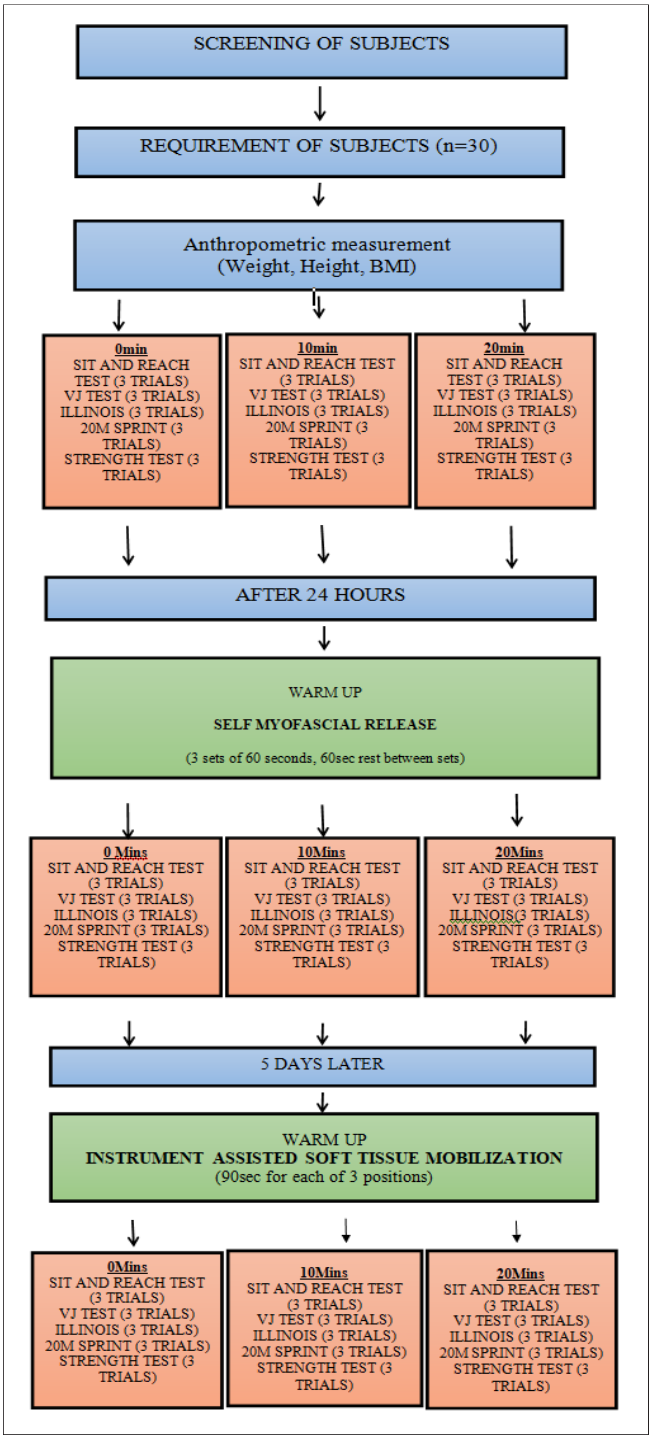

Figure 1.Flow Chart of Procedure

Table 1.Descriptive Statistics of Physical Characteristics of whole Sample

Subjects	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m²)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total (n=27)	16.63 (1.445)	169.33 (5.6)	57.19 (4.4)	19.96 (1.6)
BMI: Body Mass index; W: weight; H: height; data are presented as Mean (SD).				

Table 2.Performance without Intervention vs. Immediately after SMR and IASTM

Variable	Control Mean (SD)	SMR Mean (SD)	IASTM Mean (SD)	P-value Mean (SD)
SR	35.35 (6.9)	36.79 (6.7)	36.83 (6.7)	.662
VJT	17.75 (2.2)	18.61 (2.2)	18.59 (2.4)	.314
IAT	17.44 (.67)	17.05 (.69)	17.08 (.65)	.067
SpT	3.36 (.15)	3.30 (.16)	3.3 (.16)	.248
ST	109.22 (15.1)	120.46 (16.9)	117.4 (15.3)	.031*

Table 3.Mixed Model ANOVA for Temporal Changes in Performance Following SMR vs. IASTM vs. Control

Variable	Group	0 Mins Mean (SD)	10 Mins Mean (SD)	20 Mins Mean (SD)		df	F-value	P-value	Partial et al. Squared
Sit and Reach	Control	35.35 (6.9)	35.96 (6.9)	36.25 (6.9)	Time (T)	2	18.24	<.001*	.19
	SMR	36.79 (6.7)	37.2 (7.05)	37.25 (7.1)	Group (G)	2	.31	.73	.00
	IASTM	36.83 (6.7)	37.25 (7.1)	37.53 (7.0)	G X T	4	.64	.59	.01
Vertical Jump	Control	17.75 (2.2)	19.05 (2.6)	18.98 (2.2)	Time (T)	2	43.76	<.001*	.35
	SMR	18.61 (2.2)	19.31 (2.3)	19.33 (2.3)	Group (G)	2	.72	.48	.01
	IASTM	18.59 (2.4)	19.81 (2.2)	19.53 (2.1)	G×T	4	1.32	.27	.03
Illinois Agility Test	Control	17.44 (.67)	17.24 (.72)	17.27 (.71)	Time (T)	2	10.53	<.001*	.11
	SMR	17.05 (.69)	16.98 (.67)	17.05 (.71)	Group (G)	2	1.61	.20	.04
	IASTM	17.08 (.65)	17.003 (.65)	17.02 (.68)	G×T	4	2.47	.05	.06
Speed Test	Control	3.36 (.15)	3.36 (.13)	3.37 (.17)	Time (T)	2	.71	.48	.009
	SMR	3.3 (.16)	3.29 (.15)	3.31 (.13)	Group (G)	2	2.03	.13	.05
	IASTM	3.3 (.16)	3.29 (.15)	3.29 (.15)	G×T	4	.26	.89	.007
Strength Test	Control	109.22 (15.1)	114.85 (14.4)	111.61 (16.8)	Time (T)	2	7.69	<.001*	.09
	SMR	120.46 (15.9)	118.81 (14.4)	115.87 (16.5)	Group (G)	2	1.91	.154	.04
	IASTM	117.40 (15.3)	118 (16.4)	115.96 (13.5)	G×T	4	1.15	.335	.02

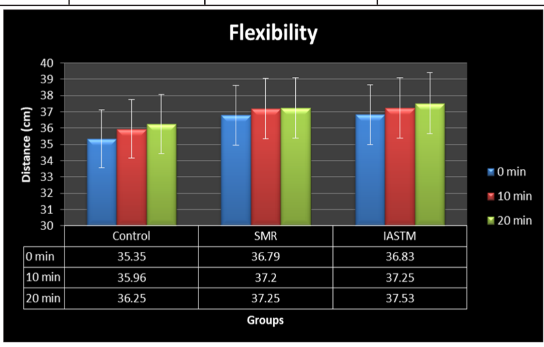

Figure 2.Comparison of Change in Flexibility Performance

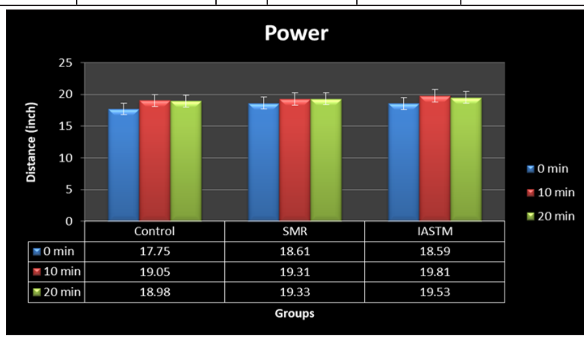

Figure 3.Comparison of Change in Power Performance

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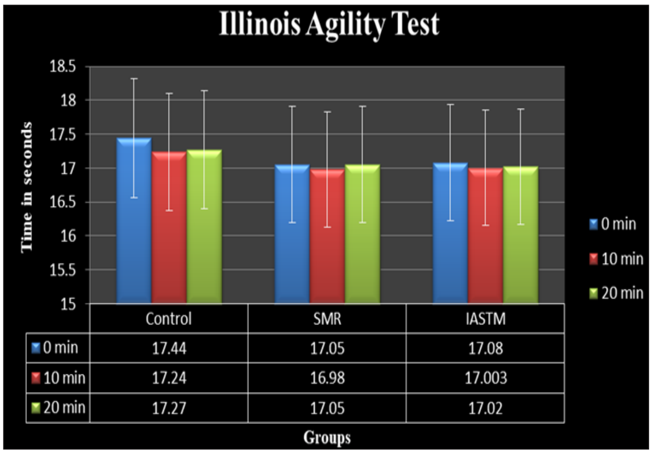

Figure 4.Comparison of Change in agility Performance

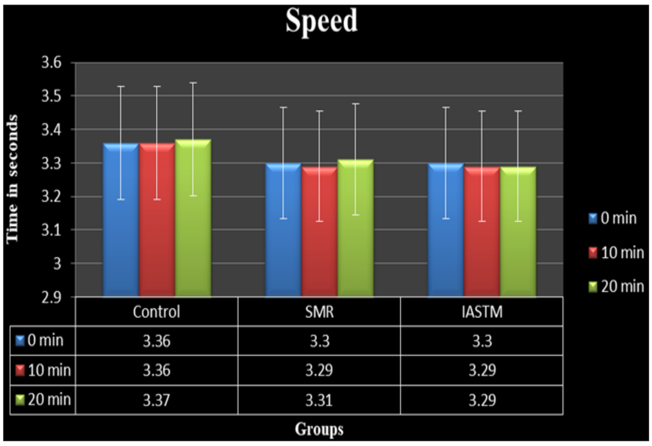

Figure 5.Comparison of Change in Speed Performance

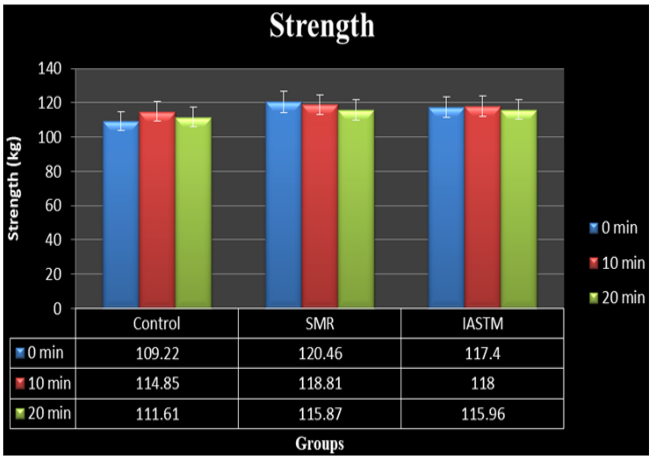

Figure 6.Comparison of Change in Strenght Performance

Discussion

The goal of the present investigation was to determine (a) whether there was any difference present between SMR and IASTM on various performances in terms of flexibility, power, agility, speed and strength of young male soccer players, and (b) the time course of these effects. The research that has been conducted is inconclusive.

To our knowledge, this is the first study to compare the differences in these various performances between SMR and IASTM. Previuosly Stroiney at al. 2018,[18] examined in the study of "Examination of Self-myofascial release vs Instrument assisted soft tissue mobilization techniques on vertical and horizontal power in recreational athletes" only on vertical jump and 40-yd sprint along with pain perception. It was hypothesized that there would be no difference when comparing SMR and IASTM on flexibility, strength and sport-specific performance.

Flexibility

Flexibility performance in the present study showed similar trends in both SMR and IASTM groups from the control group. Both groups demonstrated significant time effects, however, the main effects for group and interactions were non-significant.

Skarabot et al. 2015,[19] evaluated the time course of the effect of FR, static stretching, and the combination of FR and static stretching. They reported no change in passive ankle-dorsiflexion ROM after performing 3 sets of 30 seconds of FR using the GRID Foam Roller. Our study result followed this study which is non-significant.

Vertical Jump Performance

The present study showed that both groups demonstrated significant time effects, however, the main effects of group and interactions were non-significant. Immediately after interventions vertical jump performance was non-significantly increased.

MacDonald et al. 2016,[20] did not find any performance detriments when using IASTM and our results support this finding as well.

Illinois Agility Test

The present study showed that both groups demonstrated significant time effects, however, the main effects of group and interactions were non-significant.

To our knowledge, this is the first study in which the effect of agility performance was measured when comparing SMR and IASTM treatment.

20m Sprint Test

The present study showed that both groups demonstrated time effects (p= 0.48), however, the main effects of group (p =0.13) and interaction (p =0.89) were non-significant.

The study conducted by Mikesky et al. 2002,[21] specifically used The Stick for SMR application before sprinting and jumping assessments. They did not find any acute improvements in performance when treatment was given immediately before the assessment. Similar to this study, the present study showed not increase nor decrease in speed performanceStrength performance.

The present study showed that both groups demonstrated significant time effects (p=0.001), however, the main effects of group (p=0.154) and interaction (p=0.335) were non-significant.

Pincivero et al. 2006,[22] reported that increasing flexibility and range of motion improves strength and interactions among muscle groups. IASTM activates lower limb muscle fibres but not through the switching muscle fibre theory.[23] Our results are consistent with previous studies reporting that IASTM increases immediate strength. Healey et al. 2014,[24] reported that strength performance was maintained throughout the study.

Conclusion

The use of SMR and IASTM before exercise immediately improved strength performance in young male soccer players. However, it got dissipated after 10 minutes. The findings of this study suggest that SMR and IASTM did not improve physical performance in young male soccer players, but it did not hinder performance either. Even if performance has not improved, there does not seem to be any adverse effects in using either SMR and IASTM before physical activity, and athletes need not be discouraged from using these tools.

List of Abbreviations

SMR: Self Myofascial Release
IASTM: Instrument Assisted Soft Tissue Mobilization
SR: Sit and Reach
VT: Vertical Jump Test
IAT: Illinois Agility Test
SpT: Speed Test
ST: Strength Test
FR: Foam Rolling
G: Group
T: Time
G×T: Group × Time
Min: Minute

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Conflict of Interest: None

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