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ORIGINAL ARTICLE

The Effect of Self-Release Treatment of Myofascia on Improving the Performance of Futsal Players

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ABSTRACT

Background. Futsal may have problems with the condition due to injuries due to the nature of the game requiring high-intensity performance and may harm injuries and normal athletic performance. **Objectives**. This study aimed to measure the speed, agility, quickness, dynamic balance, active range of motion, and reaction time, which are factors affecting the performance of the self-myofascial release exercise program for 12 weeks before and after applying it to professional futsal players. **Methods.** This study was conducted in two groups: a group that applied general training and self-myofascial release exercise (EX) and a control group that applied only general training (CON). The self-myofascial release program in this study was constructed by referring to the National Academy of Sports Medicine policy using a foam roller. The exercise program was applied 3 times a week for 30 minutes for 12 weeks after general training. **Results.** The functions of all variables in the exercise group improved, and the functions of all variables in the control group decreased. As a result of the EX test, dynamic stability was most significantly improved (t=-8.165, p=0.001), and the variable that showed a significant difference according to the interaction effect between groups was dynamic stability (F=10.238, p=0.006)., the joint range (F=4.900, p=0.042). **Conclusion.** It can be seen that the effects on variables between groups differ sharply depending on whether or not self-myofascial release is performed.

KEYWORDS: ***Professional Futsal Players, Self-Myofascial Release, Performance, Speed, Agility, Quickness, Dynamic Balance, Reaction Time.***

INTRODUCTION

Regardless of age or ability, athletes have reduced exercise function and efficiency due to fatigue, such as delayed onset muscle soreness (DOMS) after regular or strenuous exercise (1-3). Among them, athletes performing High-Intensity Performance have a high fatigue rate, and the effect of fatigue can generate a compensated movement mechanism of the Neuromuscular System to create kinematic changes (4-8). Such changes decrease motor functions such as sprints and cause injuries, negatively affecting the athlete's career and performance (7, 9-11).

Futsal is a game of indoor soccer certified by FIFA (Federation International Football Association) (12), and the match is played on an indoor court of 40m X 20m, consisting of 4 field

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players and one goalkeeper (13), and the game is played without restrictions on substitutions. The scheduled time of each of the first and second half is 20 minutes, but the entire match can last more than 75 minutes (14), and due to the nature of the offense and defense proceeding continuously, a relatively larger amount of sprints and high-intensity performances must be performed (15). When performing sprints and high-intensity performances, it is performed for 20-30 seconds, 3-4 times per game at 85-90% of the maximum heart rate, and the total running distance is about 3,000-4,000 m (16, 17). If there is a problem in the game, it may cause problems with normal performance.

Futsal performs more high-intensity performance than team sports such as basketball, handball, and soccer (14). As such, the increase in fatigue due to high-intensity performance sprints is proportional to the injury (17), indicating the need for a recovery program for the leg muscles. Recovery is divided mainly into Active Resting and Passive Resting (18). Self-Myofascial Release (SMR), a form of active recovery that individuals can perform using tools, is characterized by muscle fiber adhesion and Minimizes DOMS to help reduce injuries and maintain exercise (1, 19, 20). The Foam Roller has the advantage of not requiring a therapist or being trained personally as it is inexpensive, time-consuming, and easily accessible to perform by oneself, and it has the advantage of a faster recovery process and reduced fatigue (21, 22). It is used as a Post-Exercise Strategy for exercise (23, 24), and many protocols have been proposed to prevent injuries based on strength, flexibility, and proprioception training (25-27).

However, domestic studies related to performance improvement are limited (28), and because they are only for amateurs, their value is insufficient to be used as a prior study. Therefore, it is necessary to check how the SMR program using the foam roller for Korean professional futsal players has an effect on the improvement of game performance, which will be valuable in improving the competitiveness of Korean futsal in future international competitions.

MATERIALS AND METHODS

Participants. This study included 18 adult male futsal players registered with the S professional futsal team in S city and 10 players from or from the Korea national futsal team. It was performed in two groups: a group that applied general training and SMR exercise (EX) and a control group that applied only general training (CON). They selected subjects suitable for the experiment with no medical restrictions and abnormalities in leg muscle function. Table 1 shows the specific physical characteristics of the study subjects.

Exercise programs. SMR exercise was conducted for 12 weeks, 3 times a week, 30 minutes SMR after general training, according to the National Academy of Sports Medicine (NASM) policy. When the foam roller was used, it was rolled slowly to find the most painful part, and if the painful part was found, it stayed for at least 30 seconds until the discomfort subsided. The foam roller (Tratac, Korea) used in this study has a diameter of 15 cm and a length of 91 cm. On the other hand, the control group conducted only the same general training as before participating in the experiment during the same period, such as warm-up, pass, shooting, and tactical training, and cooled down with light static stretching. Table 2 shows the specific contents of the exercise program.

Height & Body composition. A height scale (BSM330, Inbody Co., Korea) was used to measure height, and a body composition analyzer (Inbody 470, Inbody Co., Korea) was used to measure body composition.

Table 1. Characteristics of participants (Mean ± Standard deviation.**)**

	EX	CON
Age(years)	27.6 ± 5.5	26.1 ± 3.1
Height(cm)	173.9 ± 3.7	177.8 ± 5.7
Weight(kg)	74.9 ± 7.0	79.0 ± 8.0
%BF(%)	20.3 ± 4.6	19.1 ± 5.1
SMS(kg)	34.6 ± 2.6	37.0 ± 4.1
BMI(kg/㎡)	24.7 ± 1.7	25.0 ± 2.0

EX: Exercise Group. **CON:** Control Group. **%BF:** Percent Body Fat. **SMS:** Skeletal Muscle Mass. **BMI:** Body Mass Index.

Table 2. Self-Myofascial Release Exercise Program (Mean ± Standard deviation.)

Muscle	Sets	Frequency	Time
Gastrocnemius and Soleus m.	1	3Time / Week	30min
Adductors m.	1	3Time / Week	30min
Quadriceps Femoris m.	1	3Time / Week	30min
Hamstrings m.	1	3Time / Week	30min
Tensor Fasciae Latae	1	3Time / Week	30min
Gluteus m.	1	3Time / Week	30min

EX: Exercise Group. **CON:** Control Group.

Speed. The speed was measured by the 20m sprint method. Rubber markers were installed and marked on both sides from start to finish. The subject started with a standing start following the start signal of the measurer from the start point and ran 20m at the fastest speed to measure the time to pass to the finish point. Two measurements were taken, and excellent results were recorded.

Agility. Agility was measured by the side step method. With the center line as the starting point, lines were marked at 120 cm on each side. After taking a ready posture at the starting point, the subject starts to cross the right line following the start signal of the measurer, returns to the center, and performs side steps to cross the left line. Repeat the side step for 20 seconds, and each time it crosses each line, it is one time, except when the line does not cross the left and right side steps and when the center line is not between both feet during the center line side step, 2 Measurements were made twice, and excellent results were recorded.

Reaction Time. The reaction time was measured by Whole Body Reaction Time (WBRT). Subjects stand comfortably on a 90 cm wide and 60 cm long test plate, with their knees bent about 120 to 160 degrees, and measure the reaction time of jumping over the plate according to the beep sound of the measuring device. It was excluded and measured three times, and excellent results were recorded in units of 0.001 seconds.

Quickness. Quickness was measured by the sergeant jump method. Subjects were measured by standing comfortably on a 90 cm wide and 60 cm test plate and then jumping to the maximum without double steps according to their preparation. Falling out of the test plate during landing and bending of the knee joint were excluded from the results, and the results were measured twice to record excellent results.

Dynamic stability. The Dynamic stability was measured by the method of the Y-Balance test. Subjects took this measurement after practicing six times before the measurement. Hold the center of gravity with bare feet and place both hands on the pelvis to minimize upper body movement. During the measurement, the case of losing the center of gravity or being unable to return to the starting point was excluded from the results. In addition, the length of both legs was measured following the relative physical characteristics of the subjects, and the actual leg length from the upper anterior iliac spine to the center of the medial malleolus was used in the calculation of the score in the supine position. The score was calculated by averaging the measured values in three directions from three measurements, multiplying the average value in three directions by 100, and recording the result.

Active Range of Motion. Active range of motion was measured by Active Straight Leg Raise. In the Supine position, the subject prepares with both feet in a neutral state and actively raises the leg with the hip joint as the axis while the ankle joint is dorsiflexed, and the knee joint is extended. At the time of measurement, the measurer measured the height of the hip joint three times while watching the maintenance of dorsiflexion of each ankle joint and extension of the knee joint and recorded the excellent result value. 2 points were recorded if the movement was achieved through compensatory action, 1 point if the smooth movement was not performed, and 0 points if pain occurred during movement.

RESULTS

Speed. In EX, the post (3.30±0.07) speed was improved (t=1.249, P=0.247) than the pre (3.31±0.08), and the post (3.27±0.15) speed decreased in CON than before (3.25±0.12) (t=-1.525, P=0.166). Moreover, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was not significant (F=3.824, P=0.068) (Table 3).

Agility. EX showed improved agility after (54.77±2.27) than before (54.22±1.98) (t=-1.250, P=.247), and CON showed decreased agility after

(54.66±3.27) than before (55.11±4.48). (t=0.736, P=0.482). Furthermore, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was not significant (F=1.780, P=0.201) (Table 3).

Reaction time. EX showed a significantly improved response time after (0.262±0.00539) than before (0.264±0.00598) (t=3.061, P=0.016), and CON also showed a significant improvement in response time after (0.259±0.00428), the reaction time decreased (t=-0.355, P=0.732). Moreover, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was not significant (F=3.223, P=0.092) (Table 3).

Table 3. Comparison of change in Speed, Agility, and Reaction time between each group (Mean ± Standard deviation.)

	EX	CON	F	P
20M Sprint(times)			3.824	0.068
Pre	3.31 ± 0.08	3.25 ± 0.12		
Post	3.30 ± 0.07	3.27 ± 0.15		
t	1.249	-1.525		
p	0.247	0.166		
Side Step(rep)			1.780	
Pre	54.22 ± 1.98	55.11 ± 4.48		
ost	54.77 ± 2.27	54.66 ± 3.27		
t	-1.250	0.736		
p	0.247	0.482		
Whole Body Reaction Time			3.223	
Pre	0.264 ± 0.00598	0.260 ± 0.00529		
Post	0.262 ± 0.00539	0.259 ± 0.00428		
t	3.061	-.355		
p	0.016*	0.732		

EX: Exercise Group. **CON:** Control Group.

Quickness. In EX, improvisation was improved after (42.61±3.18) than before (42.00±3.20) (t=-1.033, P=0.332), and in CON, impulsive power increased after (43.18±3.79) than before (43.21±3.69). (t=0.099, P=0.924). Moreover, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was found to be significant (F=12.277, P=0.003) (Table 4).

Dynamic stability. EX showed significantly improved dynamic equilibrium after (100.84±1.73) than before (99.43±1.78) (t=-8.165, P=0.001), and post-(100.25±2.00) dynamic balance better than pre-(100.71±2.12) CON (100.25±2.00). was decreased (t=0.830, P=0.431). Moreover, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was found to be significant (F=10.238, P=0.006) (Table 5).

Active range of motion. In EX, the active range of motion was significantly improved after (2.33±0.50) than before (1.66±0.70) (t=-2.828, P=0.022), and after CON (1.77±0.44) than before (1.89±0.60). Active joint range of motion was decreased (t=0.426, P=0.681). Furthermore, the effect according to the measurement period between the group (EX, CON) and the test (Pre, Post) was verified, and it was found to be significant (F=4.900, P=0.042) (Table 6).

DISCUSSION

In particular, the change in dynamic stability was found to be significant. There was a significant improvement in the interaction effect between EX and CON. Only EX improved the dynamic stability, and the dynamic stability was significantly improved after that before. In this regard, De Benito et al. It was reported that the performance showed a significant improvement in the Y-Balance test (23), and Shalamzari et al. also reported that 8 weeks of SMR performance increased joint stability and led to the improvement of the Y-Balance test (29). In this regard, Wiewelhove et al. and Padua et al. Argued that the performance of the form roller could accelerate recovery of peripheral and soft tissue neutral pathways and reduce rigidity, improving knee stability and lowering the risk of injury (30, 31).

It is thought to positively affect the activation of neuromuscular functions and securing stability due to the performance of the foam roller. Based on these previous studies, in this study, the

application of the SMR exercise program is thought to have a positive effect on dynamic stability. These results are thought to result from the foam roller's performance by activating the neuromuscular function. Therefore, SMR exercise is essential to improve dynamic stability, and future studies require research and development to support the need from various perspectives.

Table 4. Comparison of quickness changes between groups (Mean ± Standard deviation.)

	EX	CON	F	P
Sergent Jump(cm)			12.277	0.003**
Pre	42.00 ± 3.20	43.21 ± 3.69		
Post	42.61 ± 3.18	43.18 ± 3.79		
t	-1.033	0.99		
p	0.332	0.924		

EX: Exercise Group. **CON:** Control Group. ****:** p<0.01

Table 5. Comparison of Dynamic Stability changes between groups (Mean ± Standard deviation.)

	EX	CON	F	P
Y-Balance Test(score)			10.238	0.006*
Pre	99.43 ± 1.78	100.71 ± 2.12		
Post	100.84 ± 1.73	100.25 ± 2.00		
t	-8.165	0.830		
p	0.001**	0.431		

EX: Exercise Group. **CON:** Control Group. ***:** p<0.05**; **:** p<0.01

Table 6. Comparison of change in Active Range of Motion between groups (Mean ± Standard deviation.)

	EX	CON	F	P
Active Straight Leg Raise			4.900	0.042*
Pre	1.66 ± 0.70	1.89 ± 0.60		
Post	2.33 ± 0.50	1.77 ± 0.44		
t	-2.828	0.426		
p	0.022*	0.681		

EX: Exercise Group. **CON:** Control Group. ***:** p<0.05

It is the first study to analyze the effect on the performance of Korean professional futsal players by analyzing differences in speed, agility, agility, dynamic stability, active range of motion, and reaction time after 12 weeks of SMR exercise. Summarizing the above results, it is judged that the performance of the foam roller can increase ROM without a decrease in muscle strength and can be used as a method of maintaining the individual athlete's condition without negatively affecting the function. It should be noted in this result that the overall improvement of the exercise group variables is also a major factor, but it should be seen that all the control group variables decreased. These results disprove that SMR has a positive effect on game performance, and it indicates the need for SMR performance. Therefore, SMR is an absolute tool for improving game performance. If a long-term study considering the characteristics of position and fascia continuity is conducted in future studies, more detailed and advanced research on performance improvement training programs for Korean futsal players is needed.

CONCLUSION

In summarizing the results of this study, 12 weeks of SMR exercise produced good effects in all variables of the exercise group. In particular, the variables of dynamic stability and active range of motion showed significant differences between pre-test and post-test and between groups, showing the most positive effect. On the other hand, in the control group, decreasing results were observed for all variables. It is important to note that the specific fact from these results is that SMR exercise had a positive effect on all variables, but on the contrary, it should be noted that all variables of the control group decreased. Therefore, it is judged that SMR exercise is an absolute tool to improve performance and prevent deterioration. As a result, it can be seen that the effects on variables between groups differ sharply depending on whether or not SMR is performed. However, to find out more specific effects, I think conducting a wide and specific study, such as a longer study period and an exercise program that considers the characteristics of position and fascial continuity, is necessary.

APPLICABLE REMARKS

- This study supports that self-myofascial release improves the performance of futsal players.

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