The Effect of Core Exercises on the Technical Skills of Female Futsal Players

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Yakup Aktaş
Harran University, Turkey
https://orcid.org/0000-0002-0147-9223

Ali Saeed Ali
Viya sport Institute, North Iraq

Abstract
The aim of this study was to investigate the effect of 8 weeks of core exercises on the technical skills of female futsal players. Thirty-two female futsal players participated in the study, 16 from the experimental group with an average age of 20.00±2.75 (years), an average height of 160.62±5.37 (cm) and a body weight of 49.62±8.98 (kg) and 16 from the control group with an average age of 18.87±1.59 (years), an average height of 158.75±5.72 (cm) and a body weight of 53.37±11.73 (kg). All participants received routine futsal training 3 days per week for 8 weeks. In addition to futsal training, the experimental group performed core exercises 3 days per week (bridge exercise with Pilates ball, plank exercise with Pilates ball, hip lift exercise with Pilates ball, superman exercise on the floor, right-left side plank exercise, foot change exercise with bridge on Pilates ball, plank exercise with lifting feet and half sit-ups with Pilates ball). Technical skill tests (ball bounce, slalom test, goal kick test and header bounce) were carried out on all participants before and after the core training programme. The SPSS.26 programme was used for data analysis. The paired sample t- test was used to compare the variables within the groups and the independent simple t- test was used to compare the variables between the groups. The significance level was set at $p<0.01$. In the results of the study, a statistically significant difference was found between the results of the experimental group before and after the test with regard to the skill parameters of the female futsal players in the slalom test, the ball bounce with the head, the goal kick test and the ball bounce test ($p<0.01$). In the control group, a statistically significant difference was found in the pre-test and post-test results of the ball bounce with head test, goal kick test and ball bounce test ($p<0,01$), while no significant difference was observed between the slalom test values ($p>0.01$). While no difference was found between the groups in the pre- and post-test results of the dexterity tests ($p>0.01$), the dexterity performance of the groups was numerically in favour of the experimental group. In summary, the results of this study indicate that effective strengthening of the core muscles contributes not only to physical but also to technical performance.
Keywords: Futsal, Core Exercise, Technical Skill

Introduction

Football is one of the most popular sports in the world and is played by a large number of men and women of varying abilities. Another variation of football, futsal, is a sport sanctioned by the International Federation of Association Football (FIFA) called indoor football and is played 5 vs 5. Futsal was introduced in 1930 and is becoming increasingly popular worldwide. The Futsal World Cup has been organised every 4 years since 1989 by countries from all continents. Futsal is a 2×20 minute game consisting of high-intensity and intermittent actions that demand a high level of physical, tactical and technical commitment from the players. The pitch is approximately 40×20 m in size and has a 3x2 m goal (Barbero-Alvarez et al., 2008).

In sports such as futsal, where agility, balance and quick movements are paramount, various training programmes are used to improve the technical skills of athletes. One of these programmes is core exercises. These exercises are performed using only one's own body weight on a movable and immovable floor, without the use of a Pilates ball, teraband or other objects.

Core exercises improve balance, strength and flexibility by helping to strengthen the centre of the body in athletes (Hibbs et al., 2008). Core exercises are exercises that involve the central core muscles and aim to develop these muscle groups in a balanced way. They are generally used to improve spinal stabilisation, support posture and enhance performance in athletes (Hodges et al., 1997). Active use of the core muscles allows athletes to move faster and with more control on the pitch, which is a great advantage in sports played in a narrow field, such as futsal (Leetun et al., 2004). For futsal players in particular, such exercises have been reported to help players take up better positions, offer more resistance to opponents and display their technical skills in a more controlled manner (Willardson, 2007).

If one examines the studies that have been carried out, one realises that core training is now widespread. Although there are studies in the literature that examine the effects of core exercises on motor characteristics (Burnett et al., 2011; Boyacı & Bıyıklı, 2013; Guan & Ma, 2010; Taşkın, 2016; Sever, 2016; Karacabey et al., 2016; Doğan et al, 2016; Bilici & Selcuk, 2018; Macit, 2019; Göktepe et al., 2019; Özgül, 2019; Sannicandro et al., 2020; Arı & Çolakoğlu, 2021; Yılmaz, 2022; İri & Kıvanç, 2024) when the studies are examined, examining the effect of core training on the skills of different industries and age groups, there are also studies that have an effect on technical skills (Leetun et al., 2004; Grissafi, 2007; Prieske et al., 2016; Şimşek, 2019; Li, 2022; Ning, 2022; Başkaya et al., 2023).

In addition to the effect of strong core muscles on physical attributes such as speed, balance and coordination, studies have shown that technical skills such as ball control, precise passing and dribbling are directly influenced (Grissafi, 2007, Reed et al., 2012). The technical skills of core drills in female futsal players are limited. With this in mind, this study aims to contribute to the limited number of studies in the literature by investigating the effects of core exercises on technical skills such as ball control, passing accuracy and shooting in female futsal players.

Material and Method

The population of the study includes female futsal players who play futsal in local clubs in the city of Dhoke in northern Iraq. The sample of the study consists of 32 female players aged 18-20 years who regularly practise futsal in the futsal section of Dhoke Sports Club. They were randomly divided into two groups: the experimental group (n=16) and the control group (n=16). The study used an experimental method with an experimental and a control group with a pretest and a posttest design.

Participants

Table 1 Age, Height and Body Weight Values of the Experimental and Control Groups

Variables	Experiment (16) X±SD	Control (16) X±SD
Age (years)	20,00±2,75	18,87±1,59
Height (cm)	160,62±5,37	158,75±5,72
Body Weight (kg)	49,62±8,98	53,37±11,73

Table 1 shows that the mean age of the experimental group was 20.00±2.75 years, the mean height was 160.62±5.37 cm and the mean body weight was 49.62±8.98 kg, while the mean age of the experimental group was 18.87±1.59 years, the mean height was 158.75±5.72 cm and the mean body weight was 53.37±11.73 kg.

Table 2 Core Exercise Program

Exercise	Time
Plank Exercise with Pilates Ball	20 sec x 3 reps
Side Plank Pose (Side Plank Exercise) Right-Left	20 sec x 3 reps
Bridging on the Exercise Ball	15 reps x 3 sets
Swiss Ball Pike	15 reps x 3 sets
Supermans	15 reps x 3 sets
Alternate Leg Bridge with Shoulders on Ball	15 reps x 3 sets
Ball planks with leg lifts	15 reps x 3 sets
Crunch- legs on exercise ball	15 reps x 3 sets

Data Collection Tools

Measurements of Height and Body Weight

The body weights of the female futsal players participating in the study were measured using the Inbody 720 Bioelectric Impedance device with a sensitivity of ± 0.01 kg. The participants stepped on the device with bare feet in shorts and T-shirt and

were measured in a stationary position and recorded in kg. The participants' height measurements were taken using a Seca brand measuring device with a sensitivity of ± 0.01 mm. The measurements were taken with bare feet, head facing forward, soles of the feet on the metre without bending the knees and the body in an upright position and the measurements were recorded in cm.

Technical Skill Tests

Slalom Test: The participants were asked to run a slalom with a futsal ball between a total of 10 slalom poles at a distance of 1.5 m within a distance of 16.5 m in length. The results were recorded in seconds using an electronic light barrier. This course was used by Sevinç (2008).

Shot on Goal Test: Participants were asked to shoot at a previously divided goal from a distance of 16.5 m with the desired technical shot (up, inside, etc.). The futsal goal was previously divided into 15 parts and the corresponding parts were scored as follows (Figure 1). Each participant took a total of six shots and the total number of shots was recorded.

4	2		4	2
3	1		1	3
4	2		2	4

Figure 1 Futsal Goal Divided into 15 Pieces

Ball Bouncing with the Foot: Participants were asked to bounce a ball with their feet in a circle with a diameter of 180 cm, which was previously drawn on a flat surface. Each participant was given 3 rights and the number of uninterrupted bounces without leaving the circle and without dropping the ball was recorded on each trial. At the end of the test, the sum of the 3 rights was calculated and recorded.

Ball Bouncing with the Head: Participants were asked to bounce a ball with their head in a circle with a diameter of 180 cm, which was previously drawn on a flat surface. Each participant was given 3 rights and the number of uninterrupted bounces without leaving the circle and without dropping the ball was recorded on each trial. At the end of the test, the sum of the 3 rights was calculated and recorded (Sevinç, 2008).

Analysing the Data

The SPSS.26 programme was used for data analysis. The paired sample t- test was used to compare the variables within the groups and the independent simple t- test was used to compare the variables between the groups. The significance level was set at $p<0.01$.

Ethical Statement

Ethics committee approval for this study was granted by the Clinical Research Ethics Committee of the University of Harran on 31/10/2022 under the number 2022/21/17.

Findings

The comparison of the pre-test-post-test mean values of the futsal skill parameters of the female futsal players participating in the study is shown in Table 3.

Table 3 Comparison of In-Group Pre-Test-Post Test Measurement Means of Futsal Skill Parameters of Experimental and Control Groups

Variables	Measurement	Experiment (16) X±SD	p	Control (16) X±SD	p
Slalom Tests (sn)	Pre-Test	15,75±0,94	0,00*	15,14±1,37	0,09
	Post Test	12,64±1,63		14,13±1,36	
Ball Bounce Test with Head (pcs)	Pre-Test	8,68±1,85	0,00*	10,00±2,16	0,04*
	Post Test	13,37±3,42		11,50±3,05	
Shot on goal test (pcs)	Pre-Test	16,50±1,96	0,00*	18,75±4,64	0,00*
	Post Test	24,81±4,94		21,87±6,31	
Ball Bounce Test (pcs)	Pre-Test	5,81±0,75	0,00*	7,12±1,45	0,00*
	Post Test	11,56±4,74		9,31±2,67	

p<0,01*

In Table 3, a statistically significant difference was observed in the pre-test and post-test measurement results of the experimental group in the slalom test, ball bouncing with head, goal kick test and ball bouncing tests (p<0.01). In the control group, statistically significant difference was observed in the pre-test and post-test results of the ball bouncing with head, goal kick test and ball bouncing tests (p<0,01), while no significant difference was observed between the slalom test values (p>0,01).

Table 4 Comparison of Intergroup Pre-Test-Post Test Measurement Means of Futsal Skill Parameters of Experimental and Control Groups

Variables	Measurement	Experiment (16) X±SD	Control (16) X±SD	p
Slalom Tests (sn)	Pre-Test	15,75±0,94	15,14±1,37	,249
	Post Test	12,64±1,63	14,13±1,36	
Ball Bounce Test with Head (pcs)	Pre-Test	8,68±1,85	10,00±2,16	,726
	Post Test	13,37±3,42	11,50±3,05	
Shot on goal test (pcs)	Pre-Test	16,50±1,96	18,75±4,64	,808
	Post Test	24,81±4,94	21,87±6,31	
Ball Bounce Test (pcs)	Pre-Test	5,81±0,75	7,12±1,45	,601
	Post Test	11,56±4,74	9,31±2,67	

In Table 4, in the pre-test and post-test values of the skill tests of the experimental and control groups, it was observed that although there was a positive difference in favour of the experimental group in the slalom test, ball bounce with head, shot at goal test and ball bounce tests, this difference was not statistically significant (p>0.01).

Discussion

The aim of this study was to investigate the effect of 8 weeks of core exercises in addition to futsal training on the technical skills of female futsal players. In the study, futsal skill tests were conducted before and after training in the experimental and control groups.

The studies show that core training is now widely used. While studies investigating the effects of core exercises on motor characteristics can be found extensively in the literature (Burnett et al., 2011; Boyacı & Bıyıklı, 2013; Guan & Ma, 2010; Taşkın, 2016; Sever, 2016; Karacabey et al., 2016; Doğan et al, 2016; Bilici & Selcuk, 2018; Macit, 2019; Göktepe et al., 2019; Özgül, 2019; Sannicandro et al., 2020; Arı & Çolakoğlu, 2021; Yılmaz, 2022; İri & Kıvanç, 2024), there are also studies that examine the effects of core training on the skills of different sectors and age groups (Leetun et al., 2004; Grissafi, 2007; Prieske et al., 2016; Şimşek, 2019; Li, 2022; Ning, 2022; Başkaya et al., 2023).

Prieske et al. (2016) found in their study that in addition to football training applied to 39 football players, a significant difference was found in the shooting performance of athletes who trained on unstable surfaces as a result of core training on stable and unstable surfaces. Şimşek (2019) reported that as a result of core and plyometric training applied to adolescent football players in his study, there was a significant difference between the pre-test and post-test values in the experimental group in the slalom dribbling test, ball bouncing and shooting test. Alpşahin and Menteş (2019) found no statistical significance in terms of dribbling skills in their study, in which they examined the football skills of male football players with 8 weeks of core strength training, while the passing test was significantly in favour of the experimental group. Savaş et al. (2020) found that the effect of core strength training on the passing and shooting skills of 10-12-year-old male football players was statistically significant. Başkaya et al. (2023) found that core training in addition to football training had a positive effect on football skills in 10-12-year-old football players. İri and Kıvanç (2024) found that core training had a significant difference in the values of slalom with the ball, goal kick, bouncing the ball with the head and bouncing the ball with the foot in the football skill training tests.

Looking at the studies that examined the effects of core training on basketball skills, significant differences were found between control and experimental groups (Doğan & Savaş, 2021; Şahiner & Koca, 2021; Li, 2022, Ning, 2022).

Macit (2019), in his study on the technique of core exercises in 9-10-year-old male handball players, found that 8 weeks of core training has a positive effect on the development of technical skills of handball players.

However, it can be said that there are few studies investigating the effects of core exercises on the technical skills of female futsal players (Grissafi, 2007, Reed et al., 2012).

When analysing the literature, it was found that the effects of core exercises on the motor characteristics and technical skills of different divisions and age groups have been highlighted, but few studies have been conducted on the technical skills of female futsal players.

In this study, a statistically significant difference in technical skills was found in the pre-test-post-test comparison of the experimental group of the core training programme in the slalom test, ball bounce with the head, goal kick test and ball bounce test ($p<0.01$). A statistically significant difference was found in the results of the control group before and after the test in the ball bounce with the head, goal kick test and ball bounce tests ($p<0.01$), while no significant difference was observed between the slalom test values ($p>0.01$). While there was no statistical significance between the experimental and control groups ($p>0.01$) in the pre- and post-test values of the slalom test, the ball bounce with the head, the goal kick test and the skill test with the ball, a positive trend was found in favour of the experimental group. The results obtained in our study were consistent with the few studies on technical skills in female futsal players in the literature and showed parallels.

Conclusion and Recommendations

As a result of this study, a statistically significant difference was found in the technical skills of the group in the pre-test-post-test comparison of the experimental group in the slalom test, ball bounce with the head, goal kick test and ball bounce test. In the pre-test and post-test results of the control group, statistically significant differences were found in the ball bounce with the head, goal kick test and ball bounce test, while no significant difference was observed in the slalom test values.

In the pre-test-post-test comparison of the technical ability variables of the experimental and control groups, it was found that although there was a positive difference between the experimental group and the control group in the slalom test, ball bouncing with the head, goal kicking test and ball bouncing, this difference was not statistically significant.

It was also observed that although there was a statistically significant difference between the pre- and post-test values in both groups, the increase in the experimental group was more positive than in the control group. In summary, the results of this study indicate that effective strengthening of the core muscles contributes not only to physical but also to technical performance.

Recommendations

In addition to the motor development of futsal players, this study found that core muscle exercises also contribute to technical development. Therefore, core exercises should be included in the futsal training content. To achieve the desired result, the core muscle training programme should be properly periodized and continued without interruption. Core exercises performed by athletes with their own body weight are recommended to be used in sports branches, especially in young age categories in the development period and in different sports branches.

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Author Details

Yakup Aktaş, *Harran University, Turkey,* ***Email ID****: yakupaktas@harran.edu.tr*

Ali Saeed Ali, *Viya sport Institute, North Iraq*