The Effect of Balance and Stability Workouts on the Development of Static and Dynamic Balance in 10-12-Year-Old Soccer Players

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Abstract

The purpose of this study is to explore the effect of balance and stability workouts on the development of static and dynamic balance in 10-12-year-old soccer players. The sample of the study was 40 soccer players (n=20 control and n=20 experimental) aged 10-12 years (age=11.2±08). Besides daily training program, soccer players in the experimental group participated in an extra 8-week fitness program which included bosu & swiss ball workouts, balance board workouts, plyometric workouts and bodyweight core stability workouts. Soccer players in the control group only continued their daily routine training. The static and dynamic balance performances of the players in the experimental and control groups were measured using Flamingo Balance Test (FBT) and Star Excursion Balance Test (SEBT) before and after the 8-week fitness program. Statistical analysis demonstrated significant differences between pre and post test results regarding both static and dynamic balance performance of the players in the experimental group (p<0.05). Based on the findings, it was concluded that the 8-week fitness program which included bosu & swiss ball workouts, balance board workouts, plyometric workouts and bodyweight core stability workouts contributed to the static and dynamic balance development in 10-12-year-old soccer players.

Keywords: soccer, static balance, dynamic balance

1. Introduction

Balance refers to the situation in which an object or a person remains steady without falling. A general term describing the dynamic that prevents the body mass from falling down; the balance is the ability to keep and maintain a person's center of gravity within the base of support in varying situations. In kinesiological terms, it is the ability to maintain the balance of the body under the influence of gravity, internal and external forces, by making the sum of the forces acting on the body equal zero. In terms of sports sciences, it is a skill considered within the scope of coordination which refers to the interaction of the central nervous system and the skeletal-muscular system in a mutual adjustment for the intended movement (Okudur & Sanioğlu 2012).

There are two types of balance: static and dynamic. Static balance is the ability to achieve and maintain balance without moving; dynamic balance, on the other hand is the ability to move without losing balance or falling. To ensure static balance, gravity center of the body on the second sacral vertebra should be placed on the base of support (Hotchkiss et al., 2004).

Balance is a complex process involving the coordinated activities of many sensory, motor and biomechanical components. For that reason, the acquisition of effective strategies to maintain balance provides the basis for sporting performance (Erkmen, 2009). It therefore forms the basis for dynamic sports which involve sudden changes in the movement pattern. All sports have a certain level of balance (Altay, 2001).

Soccer is among the games that require an improved balance performance. High-level performance in soccer calls for improved motoric and coordinative abilities such as strength, endurance, speed, agility, balance and flexibility. Soccer players need to perform skills such as ball control, passing the ball, shooting and dribbling in a short time and efficiently on different grounds (soil-based, grass or artificial turf) and climates (Bloomfield et al., 2007; Jovanovic et al., 2011). All these skills require an improved balance performance. For this reason, appropriate fitness programs should be organized to enhance static and dynamic balance performance by determining the balance performance of soccer players.

Balance begins to increase in pre-school age (between 3 and 6/7 years), reaches the maximum level in youth (17-18 years in girls, 18-19 years in boys) and it then declines with age (Dündar, 2005). Static balance grows linearly with age between the ages of 2-12 years (Kesilmiş, 2012). The fitness programs to improve the static and dynamic balance performance should start from the early ages. Present study was therefore aimed at exploring the effectiveness of an

8-week fitness program in improving static and dynamic balance performance by determining the static and dynamic balance performances of 10-12-year-old soccer players.

2. Method

2.1 Participants

The sample of the study included 40 soccer players (n=20 control and n=20 experimental) aged 10-12 years (age=11.2±08). Soccer players in the experimental group participated in 30-minute static and dynamic balance fitness programs including bosu & swiss ball workouts, balance board workouts, plyometric workouts and bodyweight core stability workouts. These workouts lasted for 8 weeks, 3 days a week. Players in the control group continued their regular training program without an additional fitness program.

2.2 Data Collection Tools

2.2.1 Flamingo Balance Test (FBT)

Static balances of the subjects were determined using the Flamingo Balance Test (FBT). To administer the flamingo test, the subject stands on a wooden beam (50 cm. long, 4 cm. high and 3 cm. wide) with a dominant foot and keeps balance. The free leg is flexed at the knee and the foot of this leg is held close to the buttocks. Stopwatch is started and the subject tries to stay balanced for one minute on one foot. The stopwatch is paused each time the subject loses balance (either by falling off the beam, letting go of the foot being held or touching ground with any part of the body). Once the subject stands on the beam and regains balance, the stopwatch is started again. The test continues for one minute in this way. When the time is over, the total number of falls or loss of balance in 60 seconds is recorded and this number is recorded as FBT score (Hazar & Tasmektepligil 2008).

2.2.2 Star Excursion Balance Test (SEBT)

The Star Excursion Balance Test (SEBT) requires athletes to maintain their balance with their stance leg and return to their beginning position after reaching as far as possible in different directions using the other non-stance leg. The subject was asked to reach maximally to touch a point along 8 designated lines (anterior, posterior, medial, lateral, anterior medial, anterior lateral, posterior medial and posterior lateral) on the ground. While standing on a single leg, the subject lightly touches the line with the reaching foot and then returns to the beginning position in the center without changing the position of the stance foot. The greatest distance the reaching foot reached is measured as the maximal reach distance. If the subject lifts the stance foot off the ground, moves it away from the center point, comes to rest at the touch-down point or makes contact with the ground with the reaching foot to maintain balance, the trial is not considered complete. In the current study, each subject completed 3 test trials in each of the 8 reach directions with each foot. Subjects started the test with their right foot placed in the center. The first 3 trials were followed by a 5 minute-recovery and 3 more trials were performed with the other leg (Robinson & Gribble 2008)

2.3 Statistics and Data Analysis

SPSS 22.0 was used to analyse the data obtained from pre-test and post-test to determine the static and dynamic balance performances of the subjects at the significance level of 0.05 and with a confidence interval of %95. The normality of the data was assessed using the Kolmogorov-Smirnov test. After verification of the data with normality test, the paired sample t-test was used to assess the significance of the difference between the arithmetic means of the groups.

3. Findings

Table 1. Experimental Group Pre-and Posttest Scores Regarding Static Balance

Variables	Pre-test			Post-test			p
	N	X	Sd ±	N	X	Sd ±	
Static balance	20	4.70	2.10	20	3.70	1.68	0.005*

*p<0.05

There is a significant difference between pre-test and post-test results of the soccer players in the experimental group (p<0.05). The mean values indicate that soccer players have better post-test scores than pre-test scores (Table 1).

Table 2. Control Group Pre-and Posttest Scores Regarding Static Balance

Variables	Pre-test			Post-test			p
	N	X	Sd ±	N	X	Sd ±	
Static balance	20	7.12	2.66	20	6.65	3.27	0.227

There is no significant difference between the pre-test and post-test results of the soccer players in the control group (p>0.05); their pre-test and post-test scores show similarity (Table 2).

Table 3. Comparison of the Pre- and Posttest Scores of Soccer Players Regarding Dynamic Balance

Reaching directions	Right leg					Left leg				
	Experimental group		Control group		p	Experimental group		Control group		p
	X	Sd±	X	Sd±		X	Sd±	X	Sd±	
Anterior	0.47	0.02	0.39	0.09	0.006*	0.46	0.04	0.41	0.03	0.016*
Anterolateral	0.45	0.03	0.40	0.05	0.046*	0.40	0.03	0.37	0.02	0.122
Lateral	0.36	0.06	0.28	0.07	0.002*	0.38	0.04	0.33	0.04	0.064
Posterolateral	0.40	0.07	0.35	0.08	0.017*	0.40	0.06	0.35	0.06	0.048*
Posterior	0.43	0.05	0.36	0.05	0.003*	0.42	0.05	0.38	0.05	0.262
Posteromedial	0.43	0.04	0.37	0.03	0.007*	0.44	0.07	0.37	0.06	0.036*
Medial	0.44	0.04	0.41	0.05	0.158	0.46	0.03	0.40	0.04	0.038*
Anreromedial	0.46	0.03	0.43	0.04	0.139	0.37	0.04	0.32	0.03	0.096

*$p<0.05$

A significant difference was found in dynamic balance between experimental and control group soccer players ($p<0.05$). It is seen that the players in the experimental group performed better reaching distances in anterolateral, lateral, posterolateral, posterior and posteromedial directions with the right foot than those in the control group. These players in the experimental group also recorded greater left-foot reaching distances in anterior, posterolateral, posteromedial and medial directions compared to the soccer players in the control group (Table 3).

4. Discussion and Conclusion

Conducted to find out whether the fitness programs for different age groups have an impact on balance performance, a large body of research studies have provided evidence for the effectiveness of fitness programs by reporting significant differences between groups (Asadi et al., 2015; Daneshjoo et al., 2012; Kachanathu et al., 2014; O'Malley et al., 2016; Pfile et al., 2016; Steib et al., 2016).

This study, too, found significant differences between soccer players in the experimental and control group after an 8-week fitness program implemented to improve static and dynamic balance performance (Table 1 and Table 3). It was observed that the 8-week fitness program reduced the number of errors made by the experimental group players in FBT. Furthermore, significant increases were seen in reaching distances in anterior, anterolateral, lateral, posterolateral, posterior and posteromedial directions with the right foot; and in anterior, posterolateral, posteromedial and medial directions with the left foot.

In the literature, there are a number of studies with findings that support this current research. Paterno et al. (2004) found that 6-week neuromuscular training in young female athletes resulted in increased stability. In a similar study, McLeod et al. (2009) reported that 6-week neuromuscular training improved dynamic balance performance and proprioceptive abilities. Leavey et al. (2010) reported that a 6-week fitness program contributed to increased balance and strength in healthy young male and female basketball players. Ricotti and Ravaschio (2011) found that break dance activities that lasted for 2 months contributed to the static balance development of 9-year-old soccer players.

The results of this study have shown that the 8-week fitness program including bosu & swiss ball workouts, balance board workouts, plyometric workouts and bodyweight core stability workouts contributed to the development of dynamic and static balance in 10-12-year-old soccer players. For that reason, balance and stability workouts should often be integrated into the training program of 10 to 12-year-old soccer players. It is thought that this will help develop the motor skills and technical capacities of 10-12-year-old soccer players.

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