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Araştırma Makalesi

PİLATES TOPU İLE YAPILAN CORE ANTRENMANIN FUTBOLCULARIN STATİK VE DİNAMİK DENGE PERFORMANSINA ETKİSİ

THE EFFECT OF CORE TRAINING PERFORMED WITH PILATES BALL ON THE STATIC AND DYNAMIC BALANCE PERFORMANCE OF FOOTBALLERS

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Pilates Topu ile Yapılan Core Antrenmanın Futbolcuların Statik ve Dinamik Denge Performansına Etkisi

ÖZET

Bu çalışmanın amacı, pilates topu ile yapılan core antrenmanın futbolcuların ve sedanter bireylerin statik ve dinamik denge performansına etkisinin incelenmesidir. Araştırmaya,aktif olarak spor yaşantıları devam eden 18-25 yaşları arasında 22 futbolcu ve 20 sedanter birey katılmıştır. Çalışma grubu 2 kontrol ve 2 deney olmak üzere 4 gruba ayrılmıştır. Antrenmanlara başlamadan önce ön test uygulaması gerçekleştirilmiştir. Daha sonra deney gruplarına pilates topuyla (60dk/2gün/10hafta) core antrenman programı uygulanmıştır.Kontrol gruplarına antrenman programı uygulanmamıştır. 10 haftalık antrenman programı bittikten sonra son test ölçümleri gerçekleştirilmiştir. Denge ölçümleri biodeks denge aleti ile gerçekleştilmiştir. Katılımcıların Statik Denge ön test puanları incelendiğinde ortalamalar arasında istatistiksel olarak fark olmadığı belirlenmiştir ($p>0.05$). Ancak katılımcıların dinamik denge ön test puanları incelendiğinde ortalamalar arasında istatistiksel olarak farklılık olduğu tespit edilmiştir ($p<0.05$). Farklılıkların kaynağına bakıldığında futbolcu deney ve kontrol grubu, futbolcu kontrol ve sedanter deney grubu arasında, ve sedanter deney ve kontrol grubu arasında fark belirlenmiştir ($p<0.05$). Ayrıca katılımcıların statik denge ön test ve son test değerleri arasındaki puan ortalamaları incelendiğinde futbolcu deney, sedanter deney, sedanter kontrol grupları arasında fark olduğu gözlemlenmiştir. Dinamik denge ön test ve son test değerleri arasında fark olduğu görülmüştür($p<0.05$). Sonuç olarak; pilates topu ile yapılan core antrenmanın futbolcuların ve sedanter bireylerin statik ve dinamik dengesini olumlu yönde etkilediği belirlenmiştir.

Anahtar Kelimeler: Core antrenman, Futbol, Denge, Pilates

The Effect of Core Training Performed with Pilates Ball on the Static and Dynamic Balance Performance of Footballers

ABSTRACT

The aim of this study is to examine the effect of core training with pilates ball on the static and dynamic balance performance of football players and sedentary individuals. 22 football players and 20 sedentary individuals between the ages of 18-25, who are actively involved in sports, participated in the research. The study group was divided into 4 groups as 2 control and 2 experimental. Before starting the training, a pre-test application was carried out. Then, core training program was applied to the experimental groups with a pilates ball (60min/2days/10weeks). The control groups were not trained. After the 10-week training program was over, post-test measurements were carried out. Balance measurements were made with a biodex balance instrument. When the Static Balance pre-test scores of the participants were examined, it was determined that there was no statistical difference between the averages ($p>0.05$). However, when the dynamic balance pre-test scores of the participants were examined, it was determined that there was a statistical difference between the averages ($p<0.05$). Looking at the source of the differences, a difference was determined between the football player experimental and control group, between the football player control and sedentary experimental group, and between the sedentary experimental and control group ($p<0.05$). In addition, when the mean scores between the static balance pre-test and post-test values of the participants were examined, it was observed that there was a difference between the football player experiment, sedentary experiment and sedentary control groups. It was observed that there was a difference between the dynamic balance pre-test and post-test values ($p<0.05$). As a result; It has been determined that core training with pilates ball positively affects the static and dynamic balance of football players and sedentary individuals.

Key Words: Core training, Soccer, Balance, Pilates

INTRODUCTION

Football which requires technical, tactical, and physical skills and strength and muscle endurance[22] is the most popular sports branch with more than 300 million male and female participants[4] In football, in addition to the components of physical fitness such as swiftness, coordination, and flexibility, strength is also required for high performance[38]. Extremities take on separate tasks in order to provide body stability and balance during a match[44]. It is required to provide body control for these tasks to be carried out and control can only be provided with balance[1,11,26,46]. Thus, studies that examine the balance features of footballers came into prominence[9,28,33,43].

While core is indicated as the area that provides the connection between arms and legs[27,32] it is also defined as the anatomical area that consists of 29 muscle pairs constituting the abdomen, back (paraspinal and gluteals), diaphragm, pelvic floor, and hip[39]. A strong and solid core is required for carrying out dynamic functions. A strong core is also required for the balance during high-level sports activities[15]. Core stability training programs start with the regulation of spine position (waist flexion and extension) and this situation is considered as the strength and balance position for optimum athletic performance in many sports[2]. It is stated that a strong and functional core training contributes to functional performance and balance[19].

Pilates emerged as a training method in Germany approximately one hundred years ago[29]. It is stated that pilates training improves the adaptation to conditions that require neuromuscular activation, total core strength, arm strength, and leg strength. As a result of this adaptation, it provides an improvement in balance, static and dynamic posture among physiological and motor functions[24]. Pilates training affects the strength and coordination of dancers and gymnasts. Furthermore, it was determined that the training contributes to the flexibility, transversus abdominis activation, pelvic lumbar stability, and muscle activity in healthy adults[6,7].

When athletes cannot control their center of gravity, the weight imposed on the lower-extremity, joint, ligament and muscle structure increases[37] and this situation cause injuries[20]. In an examination conducted on 24 football teams, a report of 7792 injuries and loss of time during matches[17,49] and training lead the researchers to examine the causes[37]. Posture and center of gravity should be regulated in order to prevent falling. This posture regulation can be performed by the activation of the core muscle system in order to regulate the backbone. The condition of regaining balance as fast and easy as possible depends on the fitness of the core[10]. It is stated that pilates training contributes to balance in this respect[12]. In this study, it was considered that core training performed with pilates ball would contribute more to the footballers than the regular football trainings. Because in football strength trainings, usually a standard procedure is followed and the core is not focused well. Moreover, strengthening the body with a different and more entertaining method which is also accompanied by music would contribute more to the improvement of balance. There aren't any studies in the literature that examine the effects of such a training program. Therefore, the aim of the present study is to examine whether a core training program with pilates ball is effective in improving dynamic and static balance in order to decrease the number of falling in young footballers.

MATERIAL AND METHODS

Participants

A total of 42 males between the ages of 18-25 were included in the study. The participants were informed about the core training program. None of the participants were seriously injured or had an illness for the past year. Age (year), height (cm), weight (kg) values were taken from all of the groups as anthropometric parameters and balance values were measured. 11 experimental and 11 control group among the footballers, 10 experimental and 10 control group among the sedentary individuals were formed for the study. The study initiated with ethical approval from the Uşak University Health Sciences Scientific Research and Publishing Ethics Committee (06.07.2017/08). The created participant groups and their information are given below.

Groups (n=42)	$\bar{X}_{age}$	$\bar{X}_{height}$	$\bar{X}_{weight}$	$\bar{X}_{BMI}$
Footballer Experimental Group (Group1)	18.09±0.30	174.72±4.33	67.27±6.90	21.99±1.56
Footballer Control Group(Group2)	18.01±0.60	172.09±7.46	67.36±7.08	22.72±1.62
Sedentary Experimental Group(Group3)	21.30±0.82	175.90±5.06	73.80±7.89	23.88±2.78
Sedentary Control Group (Group4)	19.80±1.22	171.00±3.39	67.60±7.42	23.13±2.54

Body Weight

Bodyweight measurement was performed with a Tanita digital scale. The experimental and control groups were asked to wear thin tights and t-shirts. The length measurement was performed with a measuring stick. Body Mass Index was measured by calculating the proportion of length and weight values with each other. BMI=(Body Mass Index (kg) / Height^2)[5].

Balance Measurement Device

In biodex balance system (BBS), a circular platform in which free motion is synchronous to anterior-posterior (AP) and medial-lateral (ML) axes is used. In addition to axes, it is possible to change the balance of the platform by applying different resistive force to the platform. There are eight suspension resistance levels and they are localized around the balance platform. During the dynamic condition, as against the measurement of the deviation of pressure center during the static condition, the measurement of the gradient of each axis with this device is preferred. BBS calculates the medial-lateral stability index (MLSI), anterior-posterior stability index and total stability index (OSI) from the gradient of BDS, AP, and ML to axes[12].

Static and Dynamic Balance Measurements

Balance measurements were performed with biodex balance system. The participants were tested after performing 5 minutes of warm-up exercise with sportswear. The participants were informed about the working principle of the device. Optimum temperature and a quiet environment were provided during the measurements. After the athletes and sedentary individuals stepped on the balance system barefoot, they were asked to stay balanced for 20 seconds on the device without touching the supporting points of the platform and the measurements were recorded.

Training Method

The experimental groups performed the core training program for a total of 10 weeks (1hour/2days/Week). The footballers performed the training in Kayserispor F.C. facilities and sedentary individuals performed their training in Erciyes University

facilities. Since the footballers were in pre-season, they continued their football trainings. While football experimental group performed core training two days a week with pilates ball instead of strength training, the control group continued their regular football trainings and strength training. The sedentary control group, on the other hand, didn't perform any training. In the application, pilates balls that are suitable for the physical features of athletes were used (75 cm and 65 cm in size). The sessions were conducted as 10 minutes of warm-up to get prepared to the pilates ball, core exercises with pilates ball (40 min), and the cooling period (10 min). Small participant groups were formed to control all of the participants and the exercises were conducted on mats (by fives). The pilates program was designed to operate all of the core. The participants were asked to perform the exercise in a controlled way and to breathe correctly during the training[24].

Groups	Week/Days	Training program	Period	Used Equipment
Footballer Experimental Group	10/2days	Core+football training	1 hour	Pilates ball
Footballer Control Group	10/2days	Football training	1 hour	Pilates ball
Sedentary Experimental Group	10/2days	Core training	1 hour	Pilates ball
Sedentary Control Group	10/2days	-	1 hour	Pilates ball

Statistical Analysis

In the statistical evaluation of the study, the Windows SPSS IBM statistics program was used. The results for the statistical analyses were defined as average values (x) and standard deviation (sd) and the obtained data were evaluated between 95% confidence interval and 5% significance level (0.05). The homogeneity of the findings was evaluated with the Shapiro-Wilk test. The pre-exercise pre-test and post-exercise post-test values of the groups were evaluated with the Kruskal Wallis test. Wilcoxon T-test method was used in the pre and post-exercise comparison of the groups.

FINDINGS

Table 1. Kruskal Wallis Test Analysis of Static and Dynamic Balance Performance in Pre-Test by Groups

	Groups	N	Average Rank	Df	X^2	p	Average Differences
Static Balance	Group 1	11	19.05	3	6.089	.107	-
	Group 2	11	16.86				
	Group 3	10	29.25				
	Group 4	10	21.55				
Dynamic Balance	Group 1	11	26.50	3	12.603	.006*	Group 1>Group 2 Group 2<Group 3 Group 3>Group 4
	Group 2	11	12.73				
	Group 3	10	29.40				
	Group 4	10	17.75				

*p<0.05 / Group 1: Footballer Experimental Group. Group 2: Footballer Control Group. Group 3: Sedentary Experimental Group. Group 4: Sedentary Control Group.

When the Static Balance pre-test scores of the participants were examined, it was determined that there wasn't a statistical difference between the averages (p>0.05). However, when the Dynamic Balance pre-test scores of the participants were examined, it was determined that there was a statistical difference between the averages (p<0.05). When the source of the differences was examined, differences were determined between Group 1 and Group 2, Group 2 and Group 3, and Group 3 and Group 4 (p<0.05; Table 1).

Table 2. Kruskal Wallis Test Analysis of Static and Dynamic Balance Performance in Post-Test by Groups

	Groups	N	Average Rank	df	X^2	p	Average Differences
Static Balance	Group 1	11	10.95	3	14.658	.002*	Group 1<Group 2 Group 1<Group 3 Group 1<Group 4
	Group 2	11	22.32				
	Group 3	10	22.50				
	Group 4	10	31.20				
Dynamic Balance	Group 1	11	18.09	3	2.027	.567	-
	Group 2	11	20.09				
	Group 3	10	24.95				
	Group 4	10	23.35				

*p<0.05 / Group 1: Footballer Experimental Group. Group 2: Footballer Control Group. Group 3: Sedentary Experimental Group. Group 4: Sedentary Control Group.

When the Static Balance post-test scores of the participants were examined, it was determined that there was a statistical difference between the averages (p<0.05). When the source of the differences was examined, differences were determined between Group 1 and Group 2, Group 1 and Group 3, and Group 1 and Group 4 (p<0.05). However, when the Dynamic Balance post-test scores of the participants were examined, it was determined that there wasn't a statistical difference between the averages (p>0.05; Table 2).

Table 3. Wilcoxon T-test Analysis of Static Balance Performance in pre and Post-Test by Groups

		Pre-test	Post-test		
	N	Average±SD	Average±SD	Z	p
Group 1	11	0.79±0.59	0.36±0.11	-2.823	.005*
Group 2	11	0.75±0.59	0.84±0.63	-1.160	.246
Group 3	10	1.27±0.65	0.79±0.58	-2.809	.005*
Group 4	10	0.86±0.39	1.16±0.51	-2.673	.008*

*p<0.05 / Group 1: Footballer Experimental Group. Group 2: Footballer Control Group. Group 3: Sedentary Experimental Group. Group 4: Sedentary Control Group.

As a result of the analysis that was conducted in order to determine whether Static Balance Pre and Post-Test score averages had a significant difference, significant differences were determined between the pre and post-test results of Group 1, Group 3, and Group 4 (p<0.05; Table 3).

Table 4. Wilcoxon T-test Analysis of Dynamic Balance Performance in Pre and Post-Test by Groups

		Pre-test	Post-test		
	N	Average±SD	Average±SD	Z	p
Group 1	11	2.43±2.07	1.48±0.98	-2.949	.003*
Group 2	11	0.81±0.59	1.18±0.51	-2.386	.017*
Group 3	10	1.94±0.86	1.52±0.57	-2.250	.024*
Group 4	10	1.13±0.61	1.45±0.65	-2.379	.017*

*p<0.05 / Group 1: Footballer Experimental Group. Group 2: Footballer Control Group. Group 3: Sedentary Experimental Group. Group 4: Sedentary Control Group.

As a result of the analysis that was conducted in order to determine whether Dynamic Balance Pre and Post-Test score averages had a significant difference, significant differences were determined between the pre and post-test results of Group 1, Group 2, Group 3, and Group 4 (p<0.05; Table 4).

DISCUSSION

When the score averages between the Static Balance pre and post-test of the participants were examined, significant differences were determined between Group 1 (0.79±0.59>0.36±0.11), Group 3 (1.27±0.65>0.79±0.58) and Group 4 (0.86±0.39<1.16±0.51) ($p<0.05$; Table 3). When the score averages between the Dynamic Balance pre-test post-test of the participants were examined, significant differences were determined between Group 1 (2.43±2.07>1.48±0.98), Group 2 (0.81±0.59<1.18±0.51), Group 3 (1.94±0.86>1.52±0.57), and Group 4 (1.13±0.61<1.45±0.65) ($p<0.05$; Table 4). In accordance with these results, it can be clearly observed that the static and dynamic balance of the groups who performed core training with pilates ball improved significantly. It is already known that performing pilates exercises regularly has physical and psychological benefits. Additionally, pilates exercises improves pelvic control and posture[11,18,34,35] and static and dynamic balance[8].

Body control is provided and balance can be improved with core training. The risk of injury can be decreased by increasing the strength of large and small muscle groups with core training. Depending on the increase in balance, the transition efficiency between the movements can be regulated as well[16]. Although it was stated that this exercise improves dynamic and static balance[48], there wasn't any explicit information about whether the exercise can provide an additional contribution to the active footballers. In a similar study in which the effects of core training were examined, it was determined that the static balance performance of volleyball players did not improve after a 9-week training program and this result contradicts with the results of the present study[41]. The reason for this may derive from the content and duration of the performed training. Because when the data are examined, it was observed that there was an improvement, however, there wasn't a statistical difference[41]. It was demonstrated that the balance training consisting of core training performed by the athletes of American football and badminton in addition to their regular exercises improved the balance performance of the athletes[25,31] and this result is significant since it supports the findings of the present study.

When the studies conducted on football were examined, it can be observed that Dilber et al. (2016)[14] determined a statistically significant difference between the balance measurement results of footballers after an 8-week core training and in the study of Sharma and Multani (2017)[41] it was stated that core training was effective in increasing the dynamic balance of footballers. Core muscles provide the stability of the abdomen, back, spine, and hip[23]. It was determined with scientific studies that these muscles play a significant role in creating the required strength[21,42]. In a compilation study in which the effects of core stability on the performance of the athletes were examined thoroughly, it was stated that there was a significant relationship between core stability and performance of the athletes[36]. The element that makes the present study different from other studies is the fact that core training with pilates ball was applied to the active footballers in the pre-season period. In this respect, it can be observed that applying this training in the pre-season period contributes to the balance performance of active footballers and this condition can be regarded significant in terms of preventing the risk of falling and injury.

When the related literature and the present study are examined together, it was determined that core training is required for increasing sportive performance and

preventing injuries[2]. However, it should be considered that different tests should be conducted in accordance with the branch of the sports in order to better understand the role of core training on all of the body movements[30]. There aren't adequate number of studies in the literature that examine the effect of core training with pilates ball on the parameters of the football branch. However, it might be beneficial in increasing the balance performance of the athlete to the desired level. It should also be considered that the choice of moves should be determined in accordance with the sports branch if the core training program is planned to be applied. It is considered that applying this training in the pre-season and transitional period would be more efficient if the core training with pilates ball program will be included in the regular training content of football trainings. Core training is a type of strength exercise that does not require weight due to its structure and can work with one's own body weight. It can be used for preventive, rehabilitation or performance purposes.

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