African Educational Research Journal
Vol. 8(3), pp. 597-602, September 2020
DOI: 10.30918/AERJ.83.20.144
ISSN: 2354-2160
Full Length Research Paper

Investigation of the effects of balance education studies on university women in Turkey

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Accepted 2 September, 2020

ABSTRACT

In this study, it was aimed to investigate the effects of 8-week balance educatıon studies applied to women aged 19-22 on dynamic balances. A total of 48 women volunteering at the University of Erciyes and 24 women engaged in team sports (basketball and futsal) with at least two years of licensing and individual sports (badminton and taekwondo) participated in the study. Necessary permissions were obtained from the schools and clubs of the volunteers and “acceptance consent form” was filled in for female athletes. The dynamic balance pretest values of the women in both groups were measured with the biodex balance instrument, and a balance training program was applied 3 days a week for 8 weeks, and the differences between the balance measurements were examined by taking the posttest values at the end of the study. The data obtained from the pretest and posttest measurements made to evaluate the dynamic balance developments of the female athletes who constitute the sample of the study, by taking the percentage (%), arithmetic mean ($\bar{x}$), standard deviation (ss) and frequency (n) values in the SPSS 25 package program. It was evaluated. As the number of observations was less than 50, the Shapiro-Wilk test was used to test whether the data showed normal distribution. Parametric tests were used in statistical analysis since it was understood that the data showed normal distribution. In the research, the Independent sample t-test was used to determine whether the difference between the averages of the two independent groups was significant. Paired sample t test was used to test the significance of the difference between the arithmetic means of the two related groups. Significance level was accepted as $p < 0.05$. In the statistical analysis, it was observed that there was a significant difference between the dynamic balance measurements of the university female athletes dealing with individual sports (badminton and taekwondo) between the pretest and posttest scores ($p < 0.05$). The dynamic balance measurements of female athletes dealing with team sports (basketball and futsal) could not be detected between the pre and post test results ($p > 0.05$). When the pre-test and post-test balance measurements of the female athletes in the two groups were compared, significant differences were found in favor of the women engaged in individual sports ($p < 0.05$). In line with the findings obtained in the study, it was found that the 8-week balance training program applied to university women contributed to the development of dynamic balance in female athletes engaged in individual sports, but did not change the dynamic balance of women who do team sports. With this finding; It can be suggested that educators and coaches engaged in women's team sports should include dynamic balance-enhancing and protective special activities.

Keywords: Education, individual sports, team sports, balance education, dynamic balance.

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INTRODUCTION

Balance is a general term describing the dynamics that prevents body mass from falling to the ground (Okubo and Baron, 1979; Neptune and Vistamehr, 2019; Halabchi et al., 2020). The balance for the human body is to maintain the sequence under the influence of the body's gravity, internal and external forces, and the sum

of the forces acting on the body can be reset (Akman and Karataş, 2003). It is known that the balance skill, which is at the center of performance abilities, which forms the basis of performance, plays an important role in the successful demonstration of many sports skills, changing direction, stopping, starting, holding, moving the object, and maintaining the certain position of the body (Altay, 2001).

In individual sports, it is much easier to determine performance values than to prepare and follow prescriptions that will affect them. In team sports, the situation is a bit more complicated. It is known that the performance and sportive efficiency of the team depends on more complicated formulas than the mathematical sum of the performances of the individuals that make up the team (Bayraktar and Kurtoğlu, 2009). Sports-specific movements involve performing basic motoric movements at the top level during training or competition, as well as maintaining both static and dynamic balance simultaneously (Erkmen et al., 2007). Learning and training a sport also improves the effectiveness of dynamic and static balance in daily life activities (Perrin et al., 2002). During a balanced standing position, the body center of gravity projection must be maintained within the boundaries of the support area of the soles. The situation in which the body media-lateral (M/L) oscillation is the least is the situation where the support area is the best, that is, between the feet is open (Carr and Shepherd, 1987; Onofrei et al., 2019; Ringhof and Stein, 2018).

Postural control or balance can be defined as the ability to maintain a support base statically, with minimal movement, and the ability to dynamically perform a task while maintaining a stable position (Woollacott and Shumway-Cook, 1990; Winter et al., 1990; Bressel et al., 2007). Dynamic balance is a complex motor capability that includes control of balance, integration of sensory inputs, as well as the planning and implementation of flexible movement patterns. It can be considered as maintaining or maintaining balance in some movements or unstable surfaces (Hrysomallis, 2001). Man's ability to balance can be defined as a determining factor in the development of other motor systems (Erkmen et al., 2007). Coordinated movement of the whole body as a whole takes place in direct proportion with the balance skill (Taşkın et al., 2015). Although there are many scientific studies (Mononen et al., 2007; Neptune and Vistamehr, 2019; Halabchi et al., 2020; Maszczyk et al., 2018) that demonstrate the sporty importance of proprioception in the sensory basis of balance and balance in determining sports ability, skill and performance (Mononen et al., 2007), there are not enough studies examining the balance characteristics and performances specific to sports branches. For this reason, the aim of this study is to examine the effects of balance education studies on university women in Turkey aged 19-22 who are engaged in individual and team sports on dynamic balance values.

METHODOLOGY

Research model

In the study, pretest-posttest experimental method was used. The sample of the study; A total of 48 volunteer female athletes studying at Erciyes University, 24 women engaged in individual sports (badminton and taekwondo) between 19-22 years of age and team sports (basketball and futsal) for at least 2 years. The study is an experimental study and all participants are volunteers. The sample group was chosen from the groups that the most accessible individual and team athletes produced. The necessary permissions were obtained from the schools and clubs of the volunteers and the athletes were given “acceptance consent form”. Our aim before starting treatment is to increase the dynamic balance performance to higher levels. Dynamic balance pretesting and 8-level dynamic balance test measurement (on both legs and eyes open) with the biodex balance instrument were performed by researchers experienced in the gym before 8 weeks and 3 days a week balance training program to be applied to the groups. Dynamic balance exercises 3 times a week for 8 weeks were applied to the groups in the gym at the same hours with the number of repetitions in the program, and general and special warm-up and cooling exercises were done before the studies. At the end of 8 weeks, the final test values were taken again with the biodex balance device and the values of the athletes were recorded on the computer. The pretest and posttest balance measurements were evaluated within the groups and between the groups in the statistical program.

Tests applied

Balance measurement methods

Biodex balance system (Biodex, Inc, Shirley, New York) was used for balance measurement in the study. The Biodex balance system uses a round platform that can be moved synchronously in the anterior-posterior and medial lateral axis. It gives three results as general stability index, anterior-posterior stability index and medial-lateral stability index. Among the balance indices obtained, the total balance index is considered the best indicator for total ability (OA) (Cachupe et al., 2001). In our study, the subjects stood on both feet with their eyes open, and the 8th level dynamic balance tests were used with the shoulder-width gap between the feet. The tests were done in two feet in a flat position. Balance tests were performed 1 repetition for 1 minute. Before the tests, each volunteer made a 10-second trial to adapt and recognize the dynamic balance tests. Participants were asked not to move or speak during the test. Tests of the participants who lost their balance were restarted.

Dynamic balance education program

The dynamic balance improvement education program implemented by Suveren et al. (2017) was used in the research. For 8 weeks, 3 days a week bare feet, the first four weeks were flat, and the second four weeks were curved surface plastic wedges, and 5 different models and difficulty balance gradually increasing dynamic balance exercise program was applied (Table 1). The scope of the exercise was determined by the number of repetitions and sets. 20-piece plastic balance wedges with a flat (9.5 cm in diameter) and curved (12 cm in diameter) surface, 5 cm high from the ground, 40 cm wedge spacing's, were lined on a 25 meter rope. Differentiation and application of different models (straight-curved) created with plastic wedges. The principle of full rest between movements was applied and rest time between sets was determined as 1 minute. Subjects were asked to complete the track as soon as possible (running) (Suveren et al., 2017).

Table 1. 8-week dynamic balance education program applied.

Week	Day	Set	Repeat	Difficulty level
1	3 day	2x	5	Flat surface
2	3 day	3x	5	Flat surface
3	3 day	4x	5	Flat surface
4	3 day	5x	5	Flat surface
5	3 day	2x	5	Curved surface
6	3 day	3x	5	Curved surface
7	3 day	4x	5	Curved surface
8	3 day	5x	5	Curved surface

Statistical analysis

The data obtained in the study were obtained as a result of the measurements made by the researchers and transferred to the data set. The data obtained from the pretest and posttest measurements made to evaluate the dynamic balance performances of the female athletes forming the sample of the study were evaluated in the SPSS 25 package program by taking the percentage (%), arithmetic mean ($\bar{x}$), standard deviation (ss) and frequency (n) values. As the number of observations was less than 50, the Shapiro-Wilk Test was tested to see if the data showed a normal distribution. Parametric tests were used in statistical analysis since it was understood that the data showed normal distribution. In the study, Independent sample t test was used to determine whether the difference between the averages of the two independent groups was significant, and the paired sample t test was used to test the significance of the difference between the arithmetic averages of the two related groups. Significance level was accepted as $p < 0.05$.

Besides only the aforementioned researchers took part in the application parts of the study. To reveal the degree of effect of balance training practices on dynamic balance, "Cohen d" value was calculated. As a result of the calculations, if the Cohen d value is less than 0.2, it is interpreted as "weak", 0.5 "medium", and greater than 0.8 as "large" effect (Cohen, 2020).

RESULTS

In this part of the study, the findings obtained from the female university athletes performing individual and team sports are categorized and interpreted.

Table 2 shows descriptive characteristics of individual and team athletes. There was no statistically significant difference between the age, height and body weight of the athletes engaged in team sports and individual sports ($p > 0.05$)

It is seen in Table 3 that the pre-test average score of individual athletes engaged in Taekwondo sport is higher than the post-test average score. It has been found that the athletes engaged in Badminton individual sports have a higher pre-test average score than the post-test average score. It was found out that the pre-test average scores of the athletes who are engaged in team sports, futsal sport are higher than the post-test average scores. It has been determined that the average score of the athletes doing basketball team sports from the pretest is higher than the average score.

In Table 3, it is seen that there is a significant difference between the pretest and posttest scores regarding the dynamic balance performance of university women dealing with individual sports (badminton and taekwondo) branch ($p < 0.05$). However, it is seen that there is no significant difference between the pre-test and post-test scores regarding the dynamic balance performance of female athletes engaged in team sports (futsal and basketball) ($p > 0.05$). When the effect points calculated to determine the effect of the program on balance were examined, it was determined that the program applied to the athletes doing Taekwondo (0.57) and Badminton (0.77) had a "moderate" effect. Although there was no significant difference in the balance scores of the athletes engaged in Futsal and Basketball team sports, it was determined that there was a "weak" level of effect. When the average values are analyzed, it can be stated that there is a significant improvement in the balance performances of the female athletes engaged in individual sports after the 8-week dynamic balance training program, although there is a balance development in the female athletes engaged in team sports after the program, this development is not significant.

Table 4 shows statistics between pre-test and post-test scores of female athletes engaged in individual (taekwondo/badminton) and team (futsal/basketball) sports. Results of team sports show that they were no

Table 2. Descriptive characteristics of individual and team athletes.

	Group	n	X ± ss	p
Age (year)	Individual Athletes	24	21.11 ± 2.25	0.273
	Team Athletes	24	22.17 ± 4.23	
Length (m)	Individual Athletes	24	1.76 ± .06	0.801
	Team Athletes	24	1.75 ± .13	
Body weight (kg)	Individual Athletes	24	73.23 ± 9.86	0.719
	Team Athletes	24	72.34 ± 6.67	

p > 0.05. Significance at the level.

Table 3. Comparison of pretest and posttest scores of balance measurements of individual and team sports and university students.

Group	Test	n	$\bar{x}$	ss	$sh_{\bar{x}}$	t	p	Effect size
Taekwondo	Pre test	12	1.36	0.27	0.07	3.44	0.00*	0.57
	Post test	12	1.04	0.17	0.05			
Badminton	Pre test	12	1.80	0.14	0.04	6.07	0.00*	0.77
	Post test	12	1.37	0.20	0.05			
Futsal	Pre test	12	1.68	0.15	0.04	.863	0.39	0.22
	Post test	12	1.63	0.13	0.03			
Basketball	Pre test	12	1.80	0.12	0.03	1.77	0.09	0.35
	Post test	12	1.70	0.14	0.04			

*p < 0.05 Significance at the level.

Table 4. Comparison of individual and team sports and women with university students in terms of balance performance.

Variables	Group	n	X	ss	$sh_{\bar{x}}$	T test	
						t	p
Balance pre test	Individual sports	24	1.58	0.31	0.06	-2.186	0.036*
	Team Sports	24	1.74	0.15	0.03		
Balance post test	Individual sports	24	1.20	0.25	0.05	-7.788	0.000*
	Team Sports	24	1.66	0.14	0.02		

*p< 0.05 Significance at the level.

different when combined with futsal and basketball athletes (p > 0.05). It is understood that there is a significant difference. When the values obtained from the pretests to determine the balance development are examined, it is seen that the balance performance of the athletes engaged in individual sports before the 8-week dynamic balance training program is better than the athletes engaged in team sports. When the values obtained from the post-tests are analyzed, it is understood that the difference in favor of athletes engaged in individual sports increased after the 8-week dynamic balance training program. Accordingly, it can be said that the 8-week dynamic balance training program contributes more to the development of dynamic balance in athletes engaged in individual sports.

DISCUSSION

In the statistical analysis within the scope of this

research, 8-week dynamic balance training program applied to women athletes aged 18-22; While improving the dynamic balance performances in women dealing with the individual sports branch (taekwondo and badminton), the team did not cause the same effect in women engaged in the sport branch (futsal and basketball) (Table 3). It has been determined that many publications in the international literature are in line with our study, and few studies have opposite findings.

In recent years, various researchers state that the fractal dimension of the oscillation curve obtained with the oscillation rate and oscillation acceleration of the pressure center and center of gravity may also be important in body oscillation measurement (Duarte and Zatsiorsky, 2000). In the light of this information, the dynamic balance values of the volunteer female athletes who were engaged in individual and team sports were compared. In a study investigating the effect of the exercise type on dynamic balance, healthy young women were divided into two groups, closed kinetic chain exercises, which were important for rehabilitation, and one group was performed open kinetic chain exercises to the other group, and their dynamic balances were compared using the LOS test. As a result, closed kinetic chain exercises have been shown to be more effective than open kinetic chain exercises in developing dynamic balance performance (Kim and Yoo, 2017). As a result of the body stabilization program applied to ballet and modern dance students, a statistically significant increase was found in dynamic balance, proprioception values for the dominant and non-dominant sides (Erkmen et al., 2007). In a study, especially in individual sports where dynamic balance is important, such as taekwondo, proper trunk position is important. Therefore, when the difference between team and individual sports is examined, it is thought that the difference arises from the fact that the trunk stabilization is used more. In a study examining the effects of 12-week semazen training on static and dynamic balance performances; found that dynamic balance values were 76.20 ± 13.07 sec before the study and 82.20 ± 13.48 s after the study (Tortop et al., 2014). As a result of the 8-week program that included Wii balance exercise in 16 young weightlifters, they reported that the lower limb muscle strength increased and this increase also affected balance performance (Siriphorn and Chamonchant, 2015). It is thought that the dynamic balance training performed in the study can increase the muscle strength of the athletes and therefore an increase in dynamic balance performances occurs. In a study that examined the effects of six-week balance disc exercises on dynamic balance and posture control, they found that exercises improved dynamic balance and posture control (Şahin et al., 2015). In another study examining the effects of 6-week balance exercise on thirty people, they found significant increases in balance performance (Aggarwal et al., 2010). Holm et al. found that the 8-week neuromuscular exercise program in female handball players produced a meaningful improvement in dynamic balance scores (Holm et al., 2004). In another study that supports this study, it has been reported that the bosu, balance board, plyometric and core exercises applied for 8-12 age group players for 8 weeks to improve dynamic and static balance contribute to the development of static and dynamic balance of footballers in the experimental group (Tanır, 2018). In this study, significant developments that occur when the dynamic balance posttest values are examined are supported by the literature information. Another study found that the performance of gymnastics in all of the balance tests was higher than that of basketball players, although the performance of the two branches in static balance tests were similar, the dynamic balance test performance was higher in gymnasts. On the contrary, there was no significant difference between the footballers and basketball players in terms of their balance performances. In the gymnastics branch, there are more studies to improve the static and dynamic balance, while the ground played in football is not exactly flat. It is thought by the authors that proprioceptive sensitivity may be more developed in order to maintain balance in such a ground and to observe other players in the field (Erkmen et al., 2007). Again, another study supports this, and it has shown that balance is important in distinguishing athletes who do and do not perform well and give a positive momentum for physical development (Altay, 2001). Bal et al. in their study, stated that the balance training performed for 8 weeks caused positive changes in handball players, while it did not change the basketball and futsal players. The findings were in line with the findings of the female team athletes in our study (Bal et al., 2020). Çelenk et al. did not find any difference between the balance values of the groups in their studies comparing the static and dynamic balances of 55 individual and team athletes in different branches (Çelenk et al., 2018). The findings in this study differed from our study. As it is known, balance needs vary according to the sports branches and it can be said that it is important to evaluate balance performance differently as team and individual athletes. Motor control work is of great importance for female athletes who do sports individually and collectively.

In conclusion, in line with the findings obtained in the study, it was concluded that dynamic balance training, which was applied to female athletes of 19-22 age group for 8 weeks, developed the dynamic balance of female athletes engaged in individual sports (taekwondo and badminton) branch. It has been determined that the contribution of the balance training program implemented in the research to the dynamic balance development in women engaged in team sports (futsal and basketball) is low. For this reason, trainers and coaches dealing with team sports branches, in order to improve and maintain balance performance, exercises should be frequently used to improve dynamic balance. It is anticipated that dynamic balance may develop if women who are

engaged in team sports (futsal and basketball) take part in longer-term studies that improve dynamic balance performance. The study can also be studied clinically.

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Citation: Afyon, Y. A., Çelikbilek, S., Kaya, E. Ö., and Kaya, M. (2020). Investigation of the effects of balance education studies on university women in Turkey. African Educational Research Journal, 8(3): 597-602.