Comparison of Dynamic Balance Test Scores of Young Female Volleyball and Soccer Players

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Abstract

Flexibility and balance are two main fitness components which are commonly prescribed to enhance athletic performance and reduce the risk of injury (1). However it has been not well documented in the literature that how athletes from different sports branches perform on these components. This study proposed to compare the scores of young female soccer and volleyball players in the Star Excursion Balance Test (SEBT) which is designed to measure flexibility and dynamic postural control or balance.

Twenty-one female student-athletes aged 15–17 years participated in the study. The sample included soccer (n=10) and volleyball (n=11) players who attend a sports high school in Turkey and compete at national and international level.

Mean age, height and weight of the participants were 15.9±0.3 years, 161.5±6.1 cm, and 50.8±4.5 kg, respectively, for soccer players, and 16.5±0.7 years, 165.1±7.8 cm, and 55.9±7.7 kg, respectively, for volleyball players. Normalized reach distances (leg length percentages) were compared for anterolateral (AL), anterior (ANT), anteromedial (AM), medial (MD), posteromedial (PM), posterior (PO), posterolateral (PL), and lateral (LAT) directions using the Independent Samples T-TEST. The soccer players reached farther than the volleyball players on the right leg in the PL and LAT directions, and on the left leg in the MD and PO directions ($p<0.05$) while there were no significant differences in forward lunge with right and left leg distances between the groups ($p<0.05$).

We can conclude that volleyball and soccer players may differ in terms of dynamic balance in the SEBT. The findings of this study may also contribute to the literature to reveal to establish reference values for SEBT performance in adolescent population.

Keywords: Proprioception, Postural Control, Dynamic Balance.

1. Introduction

Athletes aim to increase their athletic performance and prevent injuries by developing flexibility and balance (1). These performance components are of particular importance in team sports such as volleyball, basketball, and soccer, where motions such as sudden changes in direction and jumps are frequently observed, which may cause joint injures (2). It is known that the biggest factors in joint injuries are mechanical or functional balance problems (3), and the balance will directly affect athletic performance in these branches (4). Flexibility, like balance, is another important fitness component that may have an influence on injuries and athletic performance (5). However, it is not yet known to what extent these two performance components act on the abovementioned variables and which other variables can affect these components. In previous studies conducted with measurement methods where flexibility and balance were performed together, such as the Star Excursion Balance Test (SEBT), it was observed that different results were reported according to different sports branches apart from factors such as age, gender, and physical characteristics. The fact that each sports branch contains its own motion patterns may cause differences in balance and flexibility performance requirements. For example, there may be differences in the balance factor as a result of load at different intensities on one foot when compared to another (6) due to the fact that soccer players use their dominant legs in each contact with the ball (7). Similarly, basketball players use their postural control mechanisms at different rates according to their motions with the ball. Finally, it is obvious that there may be differences in the performance as a result of the double-foot and single-foot jumps, which volleyball players frequently repeat, and which require dynamic balance performance. Different results have been presented in the literature on how the balance and flexibility will differ according to the branches. In their study, reported (8) that soccer players and basketball players were better at both static and dynamic

balance than gymnasts. In the study (9), which support the findings of this study, it was reported that the balance skills of soccer players exhibiting with single leg were better than of basketball players and swimmers. While creating the research question for this study, it was aimed to examine the balance elements of the volleyball players as well as of the soccer players who are expected to have good single-leg balance performance. It is, albeit, difficult to compare the findings of the present study with of the previous ones because different populations (different age and gender groups, being an athlete or sedentary, sports history, etc.) and methods (static/dynamic balance, postural control, etc.) were used in those studies. Therefore, the aim of this study was to compare the dynamic balance of young female volleyball and soccer players who have similar training routines and attend the same sports high school.

2. Method

2.1. Participants

In this study, a total of 40 young male athletes (10 sprinters, 13 martial arts athletes, 11 soccer players, and 6 handball players) aged 15-17 attending the same sports high school voluntarily participated in our study. The participants were informed about the test procedure one day before the measurements and that the tests administered did not pose any health risks.

2.2. Materials and Procedure

The Star Excursion Balance Test (SEBT) was used to determine the dynamic balance performance of the athletes. The SEBT requires the individual to maintain body stability by standing on the single leg (support leg), to reach the maximum position in different directions with the help of the other leg, and to return to the first position. The participants were asked to reach the lines, the last points they are able to reach, in eight different directions (anterior, posterior, medial, lateral, anterior medial, anterior lateral, posterior medial, and posterior lateral) (Figure 1). During the test, the participants were required to return to the starting position in the center without distorting the support leg when tapping the reach point. The maximum reach distance was determined as the distance reached by the reaching leg at the last point. The test was terminated and re-administered once the participant lifted its support leg, moved it away from the center point, or stepped on the point where it should have tapped. Each participant was given 3 attempts to tap on 8 pre-determined lines with both legs. Each participant started the test with the right leg in the center and took a 5-minute break at the end of 3 attempts. Then, 3 more attempts were done with the other leg (10).

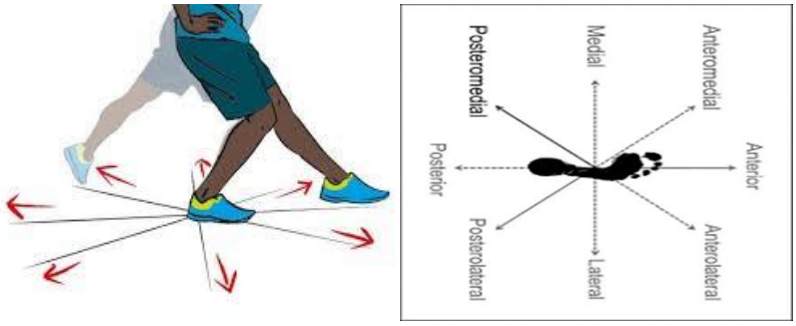


Figure 1: The Star Excursion Balance Test (SEBT)

The best value from the data obtained in the SEBT was recorded in cm. The balance performance values of the participants were normalized according to the leg length of them. Normalization was done by dividing the reach distance to each direction by the leg length of the participant, and then multiplying the outcome by 100. (*Normalized score (cm) = Reach distance (cm) / leg length (cm) x 100)* (10)

2.3. Data Analysis

The data obtained were analyzed with the SPSS for Windows Release 21.0 (Statistical Package for Social Sciences Inc. Chicago, IL, USA). In the analysis of the data, the data set was examined primarily in terms of erroneous value, outlier value, and normality of the distribution. The normality of the distribution

was analyzed by the Shapiro Wilk test and it was concluded that the distribution was normal (p> 0.05). In the present study, the variables determined by measurement were indicated as mean (**X**) and standard deviation (S). Independent Samples T-Test was used to compare the balance performance of young male athletes training in soccer, handball, sprinting, and martial arts. In all statistics, p significance value was taken as n = 0.05.

3. Results

Table 1. Shows that the groups divided into two as soccer and volleyball players are similar in terms of physical characteristics.

	N	*Age (years)*	*Weight (kg)*	*Height (cm)*
Soccer Players	***10***	***15.9±0.3***	***50.8±4.5***	***161.5±6.1***
Volleyball Players	***11***	***16.5±0.7***	***55.9±7.7***	***165.1±7.8***
Total Mean	***21***	***16.2±0.6***	***53.5±6.8***	***163.4±7.1***

It has been previously reported that the leg length may be the determinant factor for the performance variable, and values should be discussed based on the leg length. Therefore, normalized SEBT values are given in Table 2.

Table 1. Normalized SEBT values

	Group	ANT	AM	MD	PM	PO	PL	LAT	AL
RIGHT	VG	86.5±7.8	90.0±5.5	89.7±8.1	89.5±13.4	90.5±11.1	82.5±11.5	76.7±7.4	83.9±6.9
	FG	90.1±5.8	94.1±7.4	93.1±6.0	94.9±9.2	95.1±9.4	91.9±6.6*	83.2±6.0*	85.1±6.6
LEFT	VG	90.0±8.2	90.6±8.3	90.4±9.3	90.2±10.8	89.8±11.8	84.7±16.0	80.2±10.5	83.0±15.3
	FG	93.1±10.9	96.1±7.5	99.1±6.0*	99.2±10.7	102.0±5.4*	92.2±9.8	82.0±8.1	88.6±5.6

VG: Volleyball players, FG: Soccer players, AL: Anterolateral, ANT: Anterior, AM: Anteromedial, MD: Medial, PM: Posteromedial, PO: Posterior, PL: Posterolateral and LAT: Lateral *p<0.05

Table 2 shows that the soccer players have higher values than the volleyball players on the right leg in the PL and LAT directions, and on the left leg in the MD and PO directions (p <0.05). There is no SEBT parameter in which volleyball players have better values than soccer players.

5. Discussion and Conclusion

In this study, it was aimed to analyze the values of volleyball and soccer players in the Star Excursion Balance Test (SEBT) and make a comparison of these values. Previous research has shown that the SEBT may be an indicator of postural deformity as well as flexibility and dynamic balance factors (3, 10, 11) and therefore, the findings of the study are thought to make significant contributions to the relevant literature. The findings of the study revealed that soccer players were better than volleyball players, especially in the parameters of reach to the back and sideways (the posterolateral and lateral directions on the right leg; the medial and posterior directions on the left leg). It was initially predicted that the reach distances could be shorter in the volleyball branch, where single-leg performance is rarely used. In one of the few studies that examined the balance performance of volleyball and soccer players with a larger sample (12) group found similar results in soccer players. In their study, volleyball players had shorter reach distances than soccer players, but better reach distance than cricketers. In parallel with the literature, the findings of the current study indicate that single-leg reach distance of soccer players may be better than volleyball players. It is thought that the main reason for such a difference is the fact that soccer players exhibit a balance performance on the single leg in almost all the motions with the ball and accordingly, it improves their

single-leg postural control skills. In addition, it is thought the fact that soccer players use their body weight centers as a force to compete against their opponents or have to display accelerations and decelerations to get free of the opponent are other factors affecting their dynamic balance performance positively.

It was initially predicted that the height of the volleyball players could be higher than of the soccer players, so the leg lengths in the balance scores were normalized to eliminate such limitation. Although it was observed that there was no statistical difference between these two sports branches in terms of physical characteristics following the anthropometric measurements, normalization was still performed. It is believed that one of the reasons for not obtaining any differences in terms of physical characteristics of the participants may be due to the fact that the physical differences of the players were not taken into consideration in the analyses. It is known that the players in the libero position in volleyball are quite shorter, and defenders and goalkeepers can be taller than others in soccer. Another important issue considered before the study was the decision of whether to make an evaluation as right-left leg or dominant-non-dominant leg. In the light of previous studies and preliminary data of this study, it was decided that the evaluations should be performed as right-left leg instead of dominant-non-dominant leg, since it is deemed that athletes can perform better in any of their dominant or non-dominant legs.

Conclusion

As a result of this study, it can be asserted that young female soccer players exhibited better dynamic balance performance than volleyball players. However, it should be noted that there is no statistically significant difference in the reach distances other than 2 directions for each leg. Also, although the participants were selected from the same sports high school and they were relatively at similar levels, their sports histories or training situations were not taken into consideration. Especially considering that soccer players' balance skills may differ depending on their match histories or training situations (9, 13), future studies are recommended to consider this issue. The gender variable (14), another factor that may affect balance performance, was taken into consideration in this study, so only female athletes were measured. Subsequent studies on males are also thought to contribute significantly to the literature.

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