International Journal of Science Culture and Sport
March 2018 : 6(1)
ISSN : 2148-1148
Doi : 10.14486/IntJSCS725

Research on Balance Performance of Hearing-Impaired Badminton Players*

Celalettin KANBER, Ekrem BOYALI[1]
[1]Corresponding Author, Faculty of Sport Sciences, Selcuk University, Konya, TURKEY
Email: eboyali@selcuk.edu.tr

Type: *Research Article (**Received:** 05.02.2018 – **Corrected:** 28.02.2018 – **Accepted:** 03.03.2018)*

Abstract

The objective of this study is both to determine the balance features of the hearing-impaired badminton players and to examine the effects of badminton sport on balance development of hearing-impaired individuals by comparing the results with hearing-impaired individuals who do not deal with sports. 10 male and 10 female players from Turkey Hearing-Impaired Badminton National Team and 10 male and 10 female individuals who do not actively deal with any kind of sports, totally 40 individuals, participated in the study. Balance Error Scoring System was used in determining the balance features. SPSS 15.0 program was used in the analysis of the data, and Two Way ANOVA analysis was used in order to define the differences between the groups. Significance level was admitted as $p<0.05$. As the conclusion of the research, it was determined that the hearing-impaired male and female national players have statistically significant ($P<0.05$) scores in foam-floor double-foot measurements compared to sedentary individuals and have better (lower) scores in other parameters. As the conclusion, it was determined that hearing-impaired badminton players have better balance performances compared to hearing-impaired individuals who do not deal with sports.

Keywords: Badminton, balance, hearing-impaired.

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* *This study was based on a part of an unpublished master dissertation. Part of this research was presented as oral presentation in Konya-Turkey, 20-21 October 2017, during the 3rd International Physical Education and Sports Conference for the Disabled.*

Introduction

Sport activities are vital for balance development since the balance is the ability of the body to stay in the required position while moving. This ability can be performed simpler with increased sport activities. Balance function is the system that enables us to locate the exact position of our body in the space, thus to coordinate our posture and perform our moves according to the environment. Balance is an important factor in emergence of efficiency of move development, and performance players fulfill sequential moves by means of balance control (Tetik et al., 2013).

Functional inability of the balance center, functioning with each other, is the most important problem for the hearing-impaired people since they cannot turn the stimulus into auditory perception. The relation of balance performance and sport is revealed via researches on different sports branches. There are studies emphasizing that sport habits improve particularly vestibular system, and coordination features of the individuals (Butterfield, 1991; Short et al., 1999). There are numerous sports branches adapted for the hearing-impaired individuals. Having an archaic past from a historical point of view, badminton is one of the sport branches that disabled individuals participate (Yüksel, 2017a).

Badminton is one of the most favourite sports in the world, which can be played either for competition or for recreation within all age groups (Sucharitha et al., 2014). Since concentration needs to be always at a high level in badminton, it was accepted as a performance sport by large masses. Particularly hearing-impaired badminton is a fast and exciting sport having the same standards with able-bodied badminton in terms of play rules and court size. Particularly the balance is vital for technically challenging hits such as over-head hits and positioning on the court in a badminton game. When the literature is examined, there are numerous useful researches on badminton sport branch and on disabled individuals (Arslanoğlu et al., 2010; Aydoğmuş et al., 2006; Bankosz et al., 2013; Bhabhor et al., 2013; Eroğlu Eskicioğlu and Çoknaz, 2016; Giacobbi et al., 2008; Karahan et al., 2007; Yüksel and Aydos, 2017; Yüksel, 2017b). Besides, it is considered important to determine the balance performances of the hearing-impaired badminton players and to examine the effects of badminton sport on balance development of hearing-impaired individuals by comparing the results with hearing-impaired individuals who do not deal with sports.

The objective of this study is both to determine the balance features of the hearing-impaired badminton players and to examine the effects of badminton sport on balance development of hearing-impaired individuals by comparing the results with hearing-impaired individuals who do not deal with sports.

Materials and Method

10 male and 10 female players from Turkey Hearing-Impaired Badminton National Team and 10 male and 10 female individuals from Konevi Special Training and Vocational High School (Selçuklu/Konya) who do not deal with sports, totally 40 individuals, participated in the research. All the volunteers participating in the research signed the informed consent form and filled personal information form.

Firstly, necessary permissions for the research were taken from the Konya Konevi Special Education and Vocational High School Administration, and from the responsible person of the Hearing-Impaired Badminton National Team. The research was carried out in two steps. Firstly, measurements of Konya Konevi Special Education Vocational High School students (n = 20, 10 male-10 female) were carried out in the school sports hall. In the second stage, the

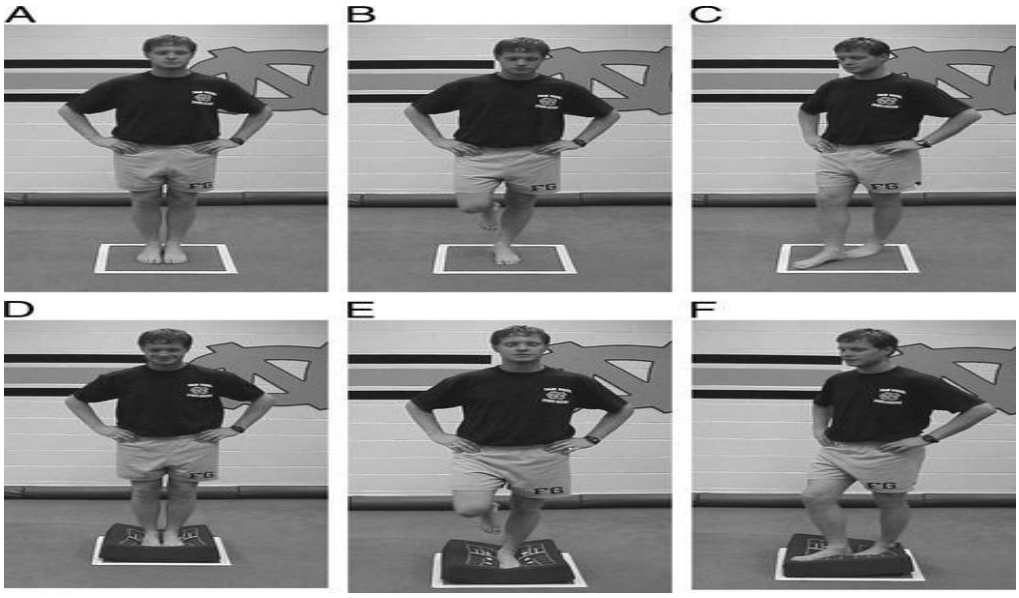
Hearing Impaired Badminton national team athletes (n = 20, 10 male-10 female) in the national team preparation camp in Ankara were carried out in Altındağ sports hall. After the height and weight measurements of the athletes, a 15 min warm-up period was given before the tests started. During the Balance Error Score measurements, video recordings were made to check once again the faults of the subjects. The protocols for the tests and measurements are as follows.

Applied Tests

Stature and Body Weight: A tape with 0.01 m sensitivity was used in the linear measurements. Weight measurements were made with a digital weighing scale with 0.01 kg sensitivity (Zorba and Saygın, 2009).

Balance: Balance performances of the participant players were measured with *Balance Error Scoring System (BESS)* test. The test was implemented for the participants on two different surfaces (plain floor, foam floor), and in three different positions (double foot, single foot, and tandem position), totally in six different conditions. Plain floor test was applied in the sports hall with tiled floor. A medium-density soft foam block with a diameter of 50x41x6 cm was used for soft foam floor test. The test was implemented in a way that the players stood still for 20 seconds with closed eyes, and the fault scores were determined through the standings. During the test, 1 fault score was recorded as the participant raised his/her hands over the hip, took a step, opened his/her hip joints more than 300, raised his/her tiptoe or heel, or opened his/her eyes (Erkmen et al., 2009; Riemann and Guskiewicz, 2000).

Picture 1. Balance fault scoring system positions



Statistical analysis

SPSS 15.0 program was used in the calculation and evaluation of the values obtained through the research. In order to simultaneously analyze the common effect of national players and the sedentary with females and males on dependent variables two-way variance analysis (two-way ANOVA) was used. Significance level was admitted as $p<0.05$.

Results

Table 1. Arithmetic mean and standard deviation values regarding the physical features of the participants

Variables	National Team		Sedentary	
	Female (N=10)	Male (N=10)	Female (N=10)	Male (N=10)
Age (years)	16.56±1.81	16.50±1.56	16.20±0.92	18.00±1.33
Stature (cm)	159.89±6.09	170.42±5.84	154.60±4.90	168.90±5.88
Body weight (kg)	51.44±3.13	59.92±5.40	56.10±5.43	73.10±5.11

Table 2. Arithmetic mean and standard deviation values regarding the balance scores of the participants

Variables	National Team		Sedentary	
	Female (N=10)	Male (N=10)	Female (N=10)	Male (N=10)
Hard floor double foot	0.00±0.00	0.00±0.00	0.00±0.00	0.40±0.97
Hard floor single foot	3.78±2.86	2.67±2.19	4.30±2.50	4.70±3.13
Hard floor tandem	2.33±2.18	0.67±1.16	3.20±2.62	2.20±1.99
Foam floor double foot	0.56±1.13	0.00±0.00	2.50±2.55	2.30±3.16
Foam floor single foot	8.00±1.32	7.83±1.70	7.20±2.57	6.80±2.04
Foam floor tandem	3.89±1.54	3.75±1.49	3.90±3.00	4.70±2.63

Table 3. Comparison of the balance scores of national team players and the sedentary participants with regards to groups, genders, and group*gender interaction

Variables		Total of squares	Average of squares	F	P
Hard floor double foot	Group	0.406	0.406	1.787	0.189
	Gender	0.406	0.406	1.787	0.189
	Group*Gender	0.406	0.406	1.787	0.189
Hard floor single foot	Group	16.557	16.557	2.334	0.135
	Gender	1.282	1.282	0.181	0.673

	Group*Gender	5.789	5.789	0.816	0.372
Hard floor tandem	Group	14.603	14.603	3.605	0.065
	Gender	18.028	18.028	4.451	**0.042***
	Group*Gender	1.127	1.127	0.278	0.601
Foam floor double foot	Group	45.673	45.673	10.640	**0.002***
	Gender	1.447	1.447	0.337	0.565
	Group*Gender	0.321	0.321	0.075	0.786
Foam floor single foot	Group	8.521	8.521	2.207	0.146
	Gender	0.814	0.814	0.211	0.649
	Group*Gender	0.138	0.138	0.036	0.851
Foam floor tandem	Group	2.342	2.342	0.466	0.499
	Gender	1.108	1.108	0.220	0.642
	Group*Gender	2.235	2.235	0.444	0.509

***P<0.05**

When Table 3 is examined, it was determined that there was statistically significant difference between male and female participants with regards to the average values of hard floor tandem position, and between national players and sedentary individuals with regards to the average values of foam floor double foot (P<0.05).

Table 4. Comparison of hard floor tandem position balance scores of national team players and the sedentary participants with regards to genders

Variables	**Gender**	**Average**	**Standard error**	**Gap between the averages**	**F**	**P**
Hard floor tandem	Female	2.76	0.462	1.333	4.451	**0.042***
	Male	1.43	0.431			

*P<0.05

When Table 4 is examined, it was determined that there was statistically significant difference between male and female participants with regards to the average values of hard floor tandem position (P<0.05).

Table 5. Comparison of double foot on foam floor position balance scores of national team players and the sedentary participants with regards to genders

Variables	Group	Average	Standard error	Gap between the averages	F	P
Foam floor double foot	National team	0.278	0.457	2.122	10.640	**0.002***
	Sedentary	0.400	0.463			
Female	National team	0.556	0.691	1.944	4.172	**0.048***
	Sedentary	2.500	0.655			
Male	National team	0.000	0.598	2.300	6.722	**0.014***
	Sedentary	2.300	0.655			

***P<0.05**

When Table 5 is examined, it was determined that there was statistically significant difference between national team players and sedentary participants with regards to the average values of foam floor double foot position (P<0.05).

Discussion and Conclusions

This study was carried out to determine the balance features of the hearing-impaired badminton players and to examine the effects of badminton sport on balance development of hearing-impaired individuals by comparing the results with hearing-impaired individuals who do not deal with sports.

Balance Error Scoring System was used in determining the balance performances of the participants of the research. The most important factors in the differences in balance scores were gender and doing active sports. It was determined in this study that the hearing-impaired male national badminton players had better (lower) values compared to hearing-impaired male sedentary individuals with regards to hard floor double foot, single foot, tandem, and foam floor tandem positions; and that the hearing-impaired female national badminton players had better values compared to hearing-impaired female sedentary individuals with regards to hard floor single foot, tandem, and foam floor tandem positions. Moreover, it was determined in foam floor double foot measurements that both male and female national badminton players had statistically significant and better values compared to hearing-impaired sedentary individuals (P<0.05). It was determined in inter-gender results that males had statistically significant and better results compared to females, and it was observed that all of the other parameters yielded similar results.

It is observed that there is much research on balance performance in different age groups and different disabilities in the literature. Karakoç (2014), stated that regular balance and coordination exercises contribute to the performances of hearing-impaired judo players in a positive manner and that dynamic balance exercises rather than static balance exercises affected the performances of the players. In a research on hearing-impaired individuals Kurt (2007), stated that the group which was actively doing sports had better balance performances than the group who did not deal with sports. In another research, dynamic balance values of three groups composed of able-bodied wrestlers, hearing-impaired wrestlers, and the

sedentary individuals were compared. As a result of this study, it was determined that able-bodied wrestlers had statistically significant and better (lower) values compared to hearing-impaired wrestlers, and hearing-impaired wrestlers had statistically significant and better (lower) values compared to the hearing-impaired individuals with sedentary lifestyles, and as the conclusion it was stated that wrestling sport developed the dynamic balance in hearing-impaired individuals (Polat, 2008). It can be mentioned that the findings of studies of different sports branches on the hearing-impaired individuals are parallel with the findings of our study.

In a research using Balance Error Scoring System, balance performances of football players, basketball players, and gymnasts were compared. When the balance error scoring average scores were examined it was reported that the gymnasts had the best performances, while football players had the second best and basketball players had the worst balance performances (Erkmen, 2006). In another research, it was stated that hearing-impaired volleyball players had statistically significantly better performances compared to handball players (Taşkın et al., 2015). In another research on volleyball players, it was determined that there were statistically significant differences between hearing-impaired players and able-bodied players (Ciğerci et al., 2011). Using Balance Error Scoring System and focusing on the effects of badminton sport on physical parameters, it was reported that badminton players had better (lower) balance performances (Yüksel et al., 2015). The different type of sport branches, activities, and disabilities have different effects on balance performance. As the conclusion of the study, the findings regarding that the hearing-impaired badminton players had better balance performances compared to the hearing-impaired individuals who did not deal with sports, are supported by many research stating that hearing-impaired individuals who deal with sports had better balance performances (Erkmen 2006; Karakoç, 2014; Kurt, 2007; Polat 2008; Rajendran et al., 2013; Yağcı et al., 2004; Yüksel et al., 2015)

Balance is an important factor in badminton as is in many sport branches. During the game, the player needs to keep his/her balance to perform almost all kinds of hits and balance exercises are regularly included into the exercise programs of the badminton players whether they are disabled or able-bodied. According to the findings of this study, the result that hearing-impaired badminton players had better values in 9 test parameters was evaluated to be the indicator of the fact that the individuals who exercised for years in this sport branch had more developed balance performances compared to the sedentary individuals.

As the conclusion, determining that hearing-impaired national badminton players had better balance performances compared to the hearing-impaired sedentary individuals, we can mention that badminton sport had positive contributions to the balance skills of the hearing-impaired individuals.

Conflict of Interest

The authors have not declared any conflicts of interest.

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