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Examination of Reaction Times of Elite Physically Disabled Badminton Players[1]

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Abstract

The aim of this study was to determine the reaction times of physically disabled International badminton players, and to analyze the effects of badminton on their reaction times. The study was based on physically handicapped badminton players from different countries (Turkey, France, Spain, Russia, Poland, Thailand, India, Bulgaria, and England) who attended 3rd International Enes-Cup Physically Disabled Badminton Tournament (experiment, n=39, 15 females-24 males), and physically handicapped individuals who do not deal with any sports (control, n=21, 9 females-12 males), totally 60 participants. Forming the research group, the players were divided into two groups according to the disability classification of the International Paralympic Committee, SL-3, SL-4, SU-5 (playing on foot, n=23), and WH-1, WH-2 (playing on wheelchairs, n=12). At the end of the study, it was determined that there was a statistically significant difference in between the visual-audial reaction times of the male players compared to male control group, and in between visual reaction times of the female players compared to female control group ($p<0.05$). As a conclusion, it was detected that the reaction times of both male and female players were lower (better) than the control group.

Keywords: Badminton, physically handicapped, reaction

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Introduction

There are more than 1 billion people with disability globally, that is about 15% of the world's population or one in seven people. Of this number, between 110 million and 190 million adults experience significant difficulties in functioning. The number of people who experience disability will continue to increase as populations age, with the global increase in chronic health conditions. National patterns of disability are influenced by trends in health conditions and environmental and other factors (UN, 2015; WHO, 2011, 2015).

Sport highly contributes to mental, physical, social, and emotional development of the individuals. Considering the WHO and UN reports, exercise and sport gains much more importance for the individuals who have limited physical activity due to physical disabilities. Today, it is observed that disabled sportsmen and sportswomen show great paces of improvement and gain big prizes, since disabled sport branches are sought after (Auxter et al., 2001; Devilard et al., 2007; Giacobbi et al., 2008; Goosey, 2010; Özdemir and Ersoy, 2009). There are numerous adapted sport branches for the individuals with disabilities. Having an archaic past form a historical point of view, badminton is one of the paralympic sport branches that disabled individuals participate.

In badminton sport, where there is no touch to rival, quick arm movements and fast veers (Vicen et al., 2012). Coordinative talents are vital in badminton sport. One of these coordinative features, reaction is important for responding fast and instantaneously to the changing and unanticipated situations (Kale, 2011). Particularly the unbelievable speed of the shuttlecock leaves too little a time to react, thus badminton player should decide quick and accurate during the game. Reaction time is a decisive element in many kinds of sports, and it can be improved by regular exercises (Çolakoğlu et al., 1993). Şenel et al. (1998) mentioned as well, that reaction time is one of the prerequisites of success in badminton game. When the literature is observed, although there are many researches, which examined the reaction times of the badminton players and stated that they have better reaction times compared to control groups (Arslanoğlu et al., 2010; Aydoğmuş et al., 2006; Bankosz et al., 2013; Bhabhor et al., 2013; Bijanrajaeian et al., 2014; Dube et al., 2015), the reaction times of elite level physically disabled badminton players were not encountered. It is thought to be important to examine the reaction times of physically disabled international level badminton players with long years of experience, and to compare the results with physically disabled individuals who do not deal with sports, thus to determine what kind of effects does badminton sport have on the reaction times of the disabled individuals.

This research was conducted to examine simple visual and auditory reaction times of physically disabled elite badminton players.

Materials and Method

The research was conducted on physically disabled badminton players (experiment, n=39) and physically disabled individuals who did not deal with sports (control, n=21), totally 60 participants, from different countries (Turkey, France, Bulgaria, Spain, Russia, Poland, Thailand, India and Britain) participating in the 3rd International Enes-Cup Physically Disabled Badminton Tournament.

Approval was obtained from the Ethics Committee (Report No: 2017/1033) at Necmettin Erbakan University Medical Faculty. Necessary permissions regarding the tests and measurements were taken from the organization committee and the country representatives

participating in the tournament. All the volunteers participating in the research signed the informed consent and personal data form.

There were 24 male and 15 female players in the experiment group while there were 12 male and 9 female individuals in the control group. According to the disability classification of the International Paralympic Committee, the players composing the experiment group were classified in two groups: SL-3, SL-4, SU-5 (on foot), and WH-1, WH-2 (on wheelchair); while SS-6 category dwarfs were not included. 22 of physically disabled badminton players were on foot while 17 of them were on wheelchair; and 12 individuals of control group were on foot while 9 of them were living on wheelchair. In order to determine the physical features of the participants, age, stature, body weight, BMI and visual/auditory reaction times of the dominant hand tests were applied. Reaction times were located via New Test 2000 reaction devise.

Applied tests

Height and Body weight: In the linear measurements a tapeline with 0.01 m sensitivity score was used. Weight measurements were made with a digital weighing scale with a sensitivity level of 0.01 kg (Zorba and Saygın, 2009).

Body mass index: Using body weights and lengths, BMI was determined using the BMI = Body weight / (Length)2 formula (Zorba and Saygın, 2009).

Visual-auditory reaction times measurement: Visual-auditory reaction times were located via New-Test 2000 measurement devise in a noise free setting while the subject is in a sitting position. The subject was made 10 repeats and the average of the last 5 repeats was recorded in terms of msec as the reaction time (Günay et al., 2013).

Statistical analysis

SPSS 21.0 program was used in the analysis of the data obtained in the study. Arithmetic averages and standard deviations were given with descriptive statistics. The inter-group differences were detected via Mann-Whitney U test. Significance level was admitted as ($p<0.05$).

Findings

Table 1. The average values of physically disabled male elite badminton players (1) and the control group (2)

VARIABLES	Group	N	Mean	Standard deviation
Age	1	24	34.29	14.07
	2	12	38.41	7.50
Training age	1	24	5.29	3.38
	2	12	0.00	0.00
Height	1	24	172.25	9.44
	2	12	169.75	7.52
Weight	1	24	67.95	8.48
	2	12	76.91	8.44
BMI	1	24	22.95	2.85
	2	12	26.64	1.67
Visual reaction	1	24	325.91	36.59
	2	12	371.41	47.12
Auditory reaction	1	24	313.66	34.55
	2	12	354.00	38.95

Table 2. Mann Whitney U analysis of physically disabled male elite badminton players (1) and the control group (2)

VARIABLES	Group	N	Mean	U	p
Age	1	24	17.46	119.000	0.401
	2	12	20.58		
Height	1	24	19.42	122.000	0.459
	2	12	16.67		
Weight	1	24	15.02	60.500	**0.005***
	2	12	25.46		
BMI	1	24	14.44	46.500	**0.001***
	2	12	26.63		
Visual reaction	1	24	15.04	61.000	**0.005***
	2	12	25.42		
Auditory reaction	1	24	14.79	55.000	**0.003***
	2	12	25.92		

***p<0.05**

When the Table 2 is examined, it was defined that there was statistically significant differences between experiment and control groups with regards to body weight (U=60.500, p<0.05), BMI (U=46.500, p<0.05), visual reaction (U=61.000, p<0.05) and auditory reaction

(U=55.000, p<0.05) parameter, and there was no difference with regards to the other parameters.

Table 3. The average values of physically disabled female elite badminton players (1) and the control group (2)

VARIABLES	Group	N	Mean	Standard deviation
Age	1	15	29.46	9.43
	2	9	32.55	6.87
Training age	1	15	4.53	2.26
	2	9	0.00	0.00
Height	1	15	161.06	4.69
	2	9	158.77	5.69
Weight	1	15	56.46	7.24
	2	9	59.22	3.92
BMI	1	15	21.78	2.92
	2	9	23.49	0,95
Visual reaction	1	15	347.26	39.94
	2	9	388.22	45.58
Auditory reaction	1	15	338.13	38.82
	2	9	373.66	45.69

Table 4. Mann Whitney U analysis of physically disabled male elite badminton players (1) and the control group (2)

VARIABLES	Group	N	Mean	U	p
Age	1	15	11.70	55.500	0.474
	2	9	13.83		
Height	1	15	13.77	48.500	0.256
	2	9	10.39		
Weight	1	15	11.23	48.500	0.255
	2	9	14.61		
BMI	1	15	9.47	22.000	**0.007***
	2	9	17.56		
Visual reaction	1	15	9.83	27.500	**0.017***
	2	9	16.94		
Auditory reaction	1	15	10.33	35.000	0.053
	2	9	16.11		

***p<0.05**

When the Table 4 is examined, it was defined that there was statistically significant differences between experiment and control groups with regards to BMI (U=22.000, p<0.05)

and visual reaction (U=27.500, p<0.05) parameters, and there was no difference with regards to the other parameters.

Table 5. Mann Whitney U analysis of physically disabled female and male elite badminton players with regards to gender

VARIABLES	Group	N	Mean	S. D.	Mean Rank	U	p
Visual reaction	Female	15	347.26	39.94	24.13	118.000	0.073
	Male	24	325.91	36.59	17.42		
Auditory reaction	Female	15	338.13	38.82	24.83	107.500	**0.036***
	Male	24	313.66	34.55	16.98		

***p<0.05**

When the Table 5 is examined, it was defined that there was statistically significant differences between elite physically disabled female and male groups with regards to auditory reaction (U=107.500, p<0.05) parameter.

Discussion and Conclusion

In this research, it was aimed to examine simple visual and auditory reaction times of physically disabled elite badminton players participating in the 3rd International Enes-Coup Physically Disabled Badminton Tournament from different countries.

When the physical features of the participants were examined, it was observed that both female and male badminton players were younger, taller in height, lighter in weight, and lower in body mass indexes compared to the control group. There were statistically significant differences between control group and male players with regard to the body weights and BMI average values, and between control group and female players in terms of BMI average values. It was evaluated that the difference in favor of the badminton players with regards to body weight and BMI parameters were stemming from regular exercises.

When the visual and auditory reaction time results of the female and male players participated in the research were examined, it was observed that male players had better reaction times compared to the female players. Besides, the visual reaction average values of the female badminton players and visual/auditory reaction average values of the male badminton players were statistically significantly lower (better) compared to control groups. Moreover, that the reaction times of the physically disabled badminton players were lower compared to the physically disabled individuals who did not deal with sports, is an expected situation, and it can be accepted as the positive effect of the practices performed. Particularly, the significant differences in visual reaction average times were thought to be results of continuous exercises for years reacting to stimulus, which is visual in the badminton game.

In a study in India, the visual reaction times of the control group, which was composed of male badminton players and healthy individuals, were examined and significant differences

were determined in favor of the badminton players (Bhabhor et al., 2013). In another study on badminton players, it was observed that six-week visual exercises made credible improvement in visual reaction times (Bijanrajaeian et al., 2014). When the studies on disabled individuals were examined, Wang et al. (2005) the simple and selective visual reaction times of 37 basketball players with wheelchairs were determined respectively 0.19 sec and 0.25 sec. In another study on basketball players with wheelchairs, simple visual reaction times were reported 0.28 sec in right hand, and 0.31 sec in left hand (Arnhold and Auxter, 2003). While it was reported that a 12-week basketball exercise program on trainable disabled children provided statistically significant improvement compared to the prior to the program (Atan et al., 2014); in another study with a 10-week program, it was observed that the reaction times were improved but they were not statistically significant (Karahan et al., 2007). In a study on hearing impaired futsal players, it was reported that right and left hand visual reaction times of hearing impaired players were statistically significantly lower (better) than the players with hearing device aided (Açak et al., 2012). In another study on hearing impaired people, the visual reaction times of the players in different sports who regularly make exercise, were statistically significantly better than the hearing impaired individuals who do not deal with sports (Eroğlu Eskicioğlu and Çoknaz, 2016). It can be stated that, the findings obtained from this study are supported with regards to the fact that individuals with disabilities in different categories have better reaction times compared to the disabled who do not deal with sports.

As the conclusion, it was determined that the reaction times of female and male disabled elite badminton players were lower (better) compared to the control group. This situation, considering the speed of the shuttlecock, could be stemmed from the characteristic features of the game. Moreover, it can be stated that the need to quick arm movements in badminton game, and numerous exercises with racquets in practices and tournaments had a positive effect on the reaction times of the badminton players. It is thought that, during the game it is an important feature for the players to have a good level of quick reaction speed against harsh hits like smash, drive, and net-kill, and it is necessary to include reaction time improving practices in the exercise programs.

Conflicts of Interest

The author has no conflicts of interest to acknowledge.

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