JOURNAL OF ATHLETIC PERFORMANCE AND NUTRITION

http://www.dergipark.ulakbim.gov.tr/japn e-ISSN:2148-7488

Original Article Journal of Athletic Performance and Nutrition

Accepted Date : 13/11/2014 Volume: 2 Issue: 1 pp: 13-20, 2015

Published Date: 30/01/2015

Comparing the Physical and Selected Basic Motoric Properties of Sportsmen in Racket Sports

Özdemir ATAR[1] *Hürmüz KOÇ*[2]

ABSTRACT

Objectives: The objective of this study was to compare the physical and selected basic motoric properties of sportsmen in racket sports.

Methods: The study group consisted of 14 tennis and 12 badminton students who received education in the Department of Coaching Training of Erciyes University School of Physical Education and Sports and participated in the study voluntarily. The volunteers who participated in the study were measured in terms of length, weight, body mass index, static and dynamic balance, hand and foot reaction, vertical jump, anaerobic power, hand grip strength, speed, agility and flexibility. The data were recorded with the SPSS 16.0 package software. One-Sample Kolmogorov-Smirnov test was used for the normal distribution of the data. Independent samples t-test was used in inter-branch comparisons. $P<0.05$ value was accepted to be significant.

Results: We determined no significant differences between the age, length, weight, body mass index, dynamic balance, foot reaction, vertical jump, anaerobic power, hand grip strength and agility parameters of volunteers who participated in the study ($p>0,05$) and significant differences between the static balance, hand reaction, flexibility and speed parameters ($p<0,05$)

Conclusion: As a consequence, we observed similarities between some of the physical and selected basic motoric properties of tennis and badminton sportsmen. Physical and motoric properties that do not show similarities are thought to be caused by different field measurements in tennis and badminton sports, as well as the different materials being used.

Keywords: Tennis, Badminton, Motoric Properties

INTRODUCTION

Attracting a great attention in the international area, sport is a powerful dynamic that has millions of fans and implementers around the world. In the developed countries and in our country, sport has been brought into schools and clubs and become a part of life. The fact that sport has reached large masses has made it a phenomenon that would bring both moral and material achievement rather than just an activity. Sport scientists and trainers constantly research efficient methods to develop and determine the properties that contribute to the sport performance.

Being a subject to our study, the racket sports badminton and tennis have been accepted by implementers and fans, brought into schools and clubs and become a part of life. Racket sport is both a performance and mass sport where everyone from every age group could join in accordance with the philosophy of lifelong sports (İnal, 1998; Aslan and Okumuş, 2003; Salman, 2009).

Today, especially the racket sports have become a large sector. In parallel with this development, the sportive performance has gradually become more and more

[1,2]Physical Education and Sport Department of Erciyes University, Kayseri/TURKEY

important. A number of scientific studies have been carried out for long years in order to maximize the performance of sportsmen. Once applied with an accurate technic, racket sports bring basic motoric properties into the forefront in achievement. In the branches of tennis and badminton, the parameters like balance, flexibility, reaction time, static power, agility, explosive power, arm movement speed and speed are among the most important elements in applying the technic in the most efficient way. Involving hits that require strength in terms of game characters, badminton and tennis sports require the constant application of these hits during the competition. The continuity of achievement in badminton and tennis is directly proportional with the physical, physiological and psychological sufficiency of sportsmen just like in many other sport branches (Sevim, 2007).

In order to increase the sportive efficiency and achievement of sportsmen in the branches of badminton and tennis, it is required to develop the basic motoric properties like balance, agility, flexibility, reaction time, hand grip strength and speed via well-planned trainer methods.

In our study, it was aimed to compare the selected basic motoric properties of sportsmen in the branches of badminton and tennis, which show similarities in terms of physical and basic motoric properties.

METHODS

This study included totally 26 sportsmen, 14 tennis and 12 badminton players, who were in the age group of 19-27, joined the tennis and badminton teams of their university, had a training age of three years and above and regularly trained for 4 days a week. The volunteers who accepted to participate in the study were made sign the 'Volunteer Informed Consent Form'.

Before the tests, the sportsmen were individually informed about the tests and their measurements were received in the Sports Hall of Erciyes University, School of Physical Education and Sports. In determining the ages of sportsmen who participated in the study, we grounded on their identity information and measured their lengths via a length measurement device (Rodi Super Quality) in terms of cm and their body weights via an electronic weighbridge (a premier brand) in terms of kg. Body mass indexes (BMI); the body weight and stature measurements received from the subjects that participated in the study were calculated via the BMI= body weight (kg) / stature (m^2) formula.

The flexibilities of subjects were measured with the sit and reach test on the flexibility table (Zorba, 1990). Hand grip strength of subjects was measured with a hand dynamometer (Takkei). Following the warm-up, three measurements were received for the Dominant hand and the best value was recorded (Zorba, 1990; Tamer, 2000). Nelson Reaction Time Scale (table) was used in measuring the hand and foot reaction time. We read the upper value of the table that was held between the thumb and index finger for the hand reaction and the value of the table above the toes that was constrained between the wall and the foot for the foot reaction; we also received measurements from the dominant hand and foot of the subject and recorded the best rating (Tamer, 2000).

Nelson movement speed test was used to measure the movement speed of the subject. In order to measure the reaction time, we received five measurements, excluded the best and the worst values and recorded the average of the remaining three measurements as the extent of the table. The reaction times of the subjects were determined by calculating the acquired value in the following formula (Tamer, 2000).

Reaction Time = $\sqrt{}$ 2 x Extent of the Table / Speed regarding the Gravity

Reaction Time= $\sqrt{}$2 x Extent (cm) / 980 sec

The vertical jump measurements of sportsmen were determined by marking the highest point that could be reached by sportsmen when they stopped and the highest point that could be reached when they jump. And then the difference between them was recorded in terms of cm. Following the jump test that was applied to sportsmen for five times, we excluded the best and the worst value and recorded the average of the remaining three measurements in terms of cm.

Anaerobic power of sportsmen were calculated with the Lewis Formula, which is calculated using the jump extent and body weight. (Zorba, 1999; Tamer, 2000).

Anaerobic Power: [$P = \sqrt{4.9}$ (Weight) $\sqrt{D^n}$]

Static balances of volunteers who participated in the study were measured with the Flamingo Balance Test (Şipal, 1989). Johnson *Modification of the Bass Test* of Dynamic Balance was applied to measure the dynamic balances of volunteers who participated in the study (Başöz et al., 1999). T test was used to measure the agility. This test was applied in an attempt to determine the speed of sportsmen to cover distance by changing directions such as forward sprint, shift to the right-left and running backwards (Sporis et al., 2010). The test of touching the disks was applied to measure the hand movement speed. (Şipal, 1989).

Statistical Analysis

SPSS (Statistical Package for the Social Sciences) package software was used in the data analysis. One-Sample Kolmogorov-Smirnov test was used in determining whether the data showed a normal distribution or not and it was found out that they showed a normal distribution. The measurement results were presented as Mean and Standard Deviation (S_D). Independent samples t-test was used in inter-branch comparisons. $P<0.05$ value was accepted to be significant.

RESULTS

Table 1: Distribution of the physical properties of badminton and tennis players.

Variables	Group	n	Mean	S_D	t	p
Age (year)	Badminton	12	21,75	1,28	-1,703	0,254
	Tennis	14	22,50	1,87		
Height (cm)	Badminton	12	173,83	8,90	-0,255	0,801
	Tennis	14	174,71	8,66		
Body Weight (kg)	Badminton	12	69,17	10,64	0,646	0,524
	Tennis	14	66,36	11,39		
BMI (kg/(m)^2)	Badminton	12	22,75	2,02	1,369	0,184
	Tennis	14	21,61	2,20		

The table 1 displays the distribution of the physical properties of badminton and tennis players who participated in the study. According to the acquired data, no statistically significant difference was determined in the parameters of volunteers such as age, length, weight and BMI (p>0,05).

Table 2: Distribution of the balance parameters of badminton and tennis players.

Variables	Group	n	Mean	S_D	t	p
Static Balance	Badminton	12	7,08	1,44	2,163	**0,041***
	Tennis	14	6,00	1,11		
Dynamic Balance	Badminton	12	81,58	4,60	-0,625	0,538
	Tennis	14	82,64	4,05		

*(* p>0,05)*

As is seen in the table 2, while there is a significant difference in the static balance parameters of badminton and tennis players who participated in the study (p<0,05), there is no significant difference in their dynamic balance parameters (p>0,05).

Table 3: Distribution of the reaction time of badminton and tennis players

Variables	Group	n	Mean	S_D	t	p
Hand Reactions	Badminton	12	14,57	1,96	-2,284	**0,032***
	Tennis	14	16,34	1,99		
Foot Reactions	Badminton	12	22,68	3,18	-0,975	0,339
	Tennis	14	23,72	2,23		

*(* p>0,05)*

While there is a statistically significant difference in hand reactions of badminton and tennis players who participated in the study (p<0,05), there is no significant difference in their foot reactions (p>0,05), (table 3).

Table 4. Distribution of the vertical jump, anaerobic power and hand grip strength parameters of badminton and tennis players.

Variables	Group	n	Mean	S_D	t	p
Vertical jump	Badminton	12	34,38	7,93	-0,006	0,995
	Tennis	14	34,40	4,95		
Anaerobic Power	Badminton	12	107,59	19,60	0,283	0,780
	Tennis	14	105,62	15,77		
Hand Grip Strength	Badminton	12	23,76	5,15	-1,839	0,078
	Tennis	14	28,02	6,44		

The table displays the distribution of the selected motoric properties of badminton and tennis players who participated in the study. There is no significant difference in the vertical jump, hand grip strength and anaerobic power parameters of volunteers who participated in the study (p>0,05), (table 4).

Table 5. Distribution of the selected basic motoric properties of badminton and tennis players.

Variables	Group	n	Mean	S_D	t	p
Flexibility	Badminton	12	28,92	5,39	2,787	**0,010***
	Tennis	14	22,55	6,14		
Agility	Badminton	12	10,86	0,73	0,570	0,574
	Tennis	14	10,64	1,17		
Speed	Badminton	12	4,29	0,40	-2,132	**0,043***
	Tennis	14	4,74	0,64		

*(* p>0,05)*

Examining the table 5, while there is no significant difference in the agility parameter (p>0,05), there is a significant difference in the flexibility and speed parameters (p<0,05).

DISCUSSION

Comparing the findings acquired as a result of this study with the findings of relevant studies, we observed both similarities and differences.

The difference in the age, length and body weight parameters of badminton and tennis players, who showed similarities in terms of physical properties, was determined to be statistically insignificant (p>0,05). This result is also supported by

sports scientists. In all sport branches, the ability of reaching a high performance level depends on a number of factors. Among these factors, the most important one is the physical convenience. Physical convenience is the most important criteria in revealing the physiological capacity (Açıkada and Ergen, 1990; Aydos, 1991; Yalçıner, 1993; Gelen et al., 2009). The similarity between the physical properties of badminton and tennis players is thought to be caused by the talent selection in these branches and the training program being applied.

Examining the balance parameters of volunteers who participated in the study, it was observed that the difference in the dynamic balance values was not significant ($p>0.05$), whereas the difference in the static balance parameter was significant ($p<0.05$). Examining the studies on balance in different sport branches, it was determined in the study of Erkmen et al. that the performers of gymnastics, which is among individual sports, had higher balance performances than the performers of basketball, which is among team sports (Erkmen et al., 2007). Samson states that five-week belly balance trainings comprise an important component of the dynamic balance in tennis players (Sitti, 2013). As a result of their study on 36 individuals aged 20-25, Yaggie and Armstrong established that balance was a performance determinant in the talent selection at the end of the 2-week balance exercises (Yaggie and Armstrong, 2004). Even though there is no significant difference in the dynamic balance parameters of sportsmen who participated in our study, it is observed that tennis players have better dynamic balance values, compared to badminton players.

While the differences in hand reaction times of badminton and tennis players who participated in the study were determined to be statistically significant ($p<0.05$), the difference in their hand reaction times was not determined to be significant ($p>0.05$).

Reaction Time is based on the time frame from the onset of Stimulant until the onset of movement and the functional skills of the nervous system. It involves the reaction depicted by the individual towards the stimulus and the movement times (Sevim, 2007). Among these two branches, the significant difference in the hand reaction is thought to be caused by the fact that the time passing between the occurrence of stimulant (the time when the opponent hits the ball) and the completion of the movement that is started as a reaction (meeting the ball) is shorter in badminton players. On the other hand, the occurrence of no significant difference in foot reaction times is thought to be caused by the fact that in both sport branches, upper extremities are used more intensely as a sport characteristics compared to the lower extremities.

The difference between the vertical jump, and anaerobic power values of tennis and badminton players that are obtained from the relevant formula is not statistically significant ($p>0.05$). In their study that was conducted with tennis players in the premier and minor league, Gelen et al., determined the vertical jump values respectively as 51,2 ± 6,60 cm and 45,4 ± 6,58 cm (Gelen et al., 2006). Findings obtained by Gelen et al. in their study are observed to be higher than our findings. This difference between the findings is thought to be caused by the difference in the performance levels of sportsmen. In their study on some physical and physiological properties of Turkish and foreign badminton players in the national team, Revan et al. determined no significant difference in the vertical jump parameter (Revan et al., 2007). These findings of Revan et al. support our findings. In many sport branches, the power generated by lower extremity muscles in the stages of eccentric and concentric contraction is important in terms of performance (Lepers et al., 2000). In addition to this, the skill of vertical jump

is among the most important elements for a successful performance in many sport branches. Milic et al. (Milic et al., 2008). reported that explosive power trainings had an important place in the power and jump skill development of sportsmen and in the procurement of their adaptation of central nervous system.

In their study, Revan et al. (Revan et al., 2007) determined the anaerobic power values of Turkish and foreign badminton players in the national team respectively as 102.6±16.2 kg.m/sec and 106.3 ± 10.5 kg.m/sec. In their study, Gelen et al. reported the anaerobic powers of premier league tennis players as 135,1 ± 5,6 kg.m/sec and the anaerobic powers of minor league tennis players as 100,4 ± 14,5 kg.m/sec (Gelen et al., 2006). Considering these studies, the literature findings support our findings.

Even though there is no statistical difference between these anaerobic power values of these two branches, this study and other studies show that the anaerobic powers of badminton players are better than that of tennis players. The fact that there is no statistically significant difference in the vertical jump and anaerobic power parameters in tennis and badminton is thought to be caused by applying similar training programs in both sport branches.

Comparing the hand grip strength values of badminton and tennis players in the study, it was determined that the difference was not significant ($p>0.05$). The insignificance of the difference between the hand grip strength, values of tennis and badminton players is thought to be caused by the fact that the sportsmen in both branches perform the same type of power trainings.

In this study, the difference between the flexibility values of tennis and badminton players was determined to be statistically significant. ($p<0,05$). Enabling the sportsmen to freely move towards all directions with the help of muscles and joints within a possible width (Çakmakçı, 2002), flexibility is lower in tennis players, which is thought to be related with the fact that flexibility exercises are involved less in trainings.

No significant difference was determined in agility parameters of volunteers who participated in the study ($p>0,05$). The fact that there is no statistically significant difference in the branches of tennis and badminton is thought to be caused by the similarity between the game characteristics and competition needs of these two sport branches.

The difference between the speed values of tennis and badminton players that participated in the study was observed to be insignificant ($p>0,05$). In their study, Gelen et al. determined the 20 m. sprint of premier league tennis players as 3,40±0,34 sec and the 20 m. sprint of minor league tennis players as 3,60±0,34 sec (Gelen et al., 2006). Speed is known to differentiate according to the fiber type in organisms (Günay et al., 2006). Even though there is no difference in the speed parameters of tennis and badminton players who participated in the study, the speed values of badminton players were determined to be better than that of tennis players, which is thought to be caused by the fiber type in sportsmen who participated in the study.

CONCLUSION

As a consequence, it has been observed that the selected physical and motoric properties of tennis and badminton players show similarities. On the other hand, the differences in dissimilar properties are thought to be caused by different training applications, different measurements and different materials in tennis and badminton. However, we think that there is a need for multiple-subject and multiple-repeated studies.

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