European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v6i8.3365 Volume 6 | Issue 8 | 2020

COMPARISON OF AVERAGE AND PEAK ANAEROBIC POWER LEVELS BY LOCATIONS IN HANDBALL

Cengiz Taşkın[1i],
Ali Kemal Taşkın[1],
Rukiye Yasemin Üzüm[2],
Ayşe Ece Ak[3]
[1]Kilis 7 Aralık University,
School of Physical Education and Sports,
Turkey
[2]Kilis 7 Aralık University,
Institute of Health Sciences,
Department of Coaching Education,
Turkey
[3]Selcuk University Institute of Social Sciences,
Department of Business Administration,
Turkey

Abstract:
The aim of this study is: it is thought that researching and knowing the physical characteristics of handball players and their quickness and agility performances according to their playing positions can also be helpful in choosing athletes according to their positions in handball. Research in Turkey handball federation 2. league active handball playing 5 keeper, 10 central playmaker, 5 right quarterback, 5 left playmaker, 5 right, 5 left, and was attended by 5 volunteered a total of 40 male handball players, including pivot. Agility test measurement illionis test was performed. In the speedy test measurement, the test distance is determined as 5 meters. The track consists of 4 slaloms, two at the beginning and two at the end. One photocell is placed at the exit and at the end. When we examine the quickness and agility performances of the athletes in our study; It has been observed that the players playing in the right and left wing players and the right-left playmaker have the best values in their quickness and agility performances, and the players playing in the pivot area have the worst values.

Keywords: handball, anaerobic energy, anaerobic power

[i] Correspondence: email taskin.c@hotmail.com

1. Introduction

With science and technology developing endlessly in the world, great increases have been observed in the performance of handball players as in all sports branches. Improving performance and ensuring success is among the objectives of the research in the field of sport (Kurudirek, 1998). The handball, which spreads rapidly among individuals and is very popular, has become a sport that is primarily a remarkable audience and practitioners in Europe. It has also become a appeal to large communities in Turkey and significant progress has been made in the infrastructure of handball. Contemporary handball has become a fast branch that demands superior sportive performance from athletes with the changing game rules over time.

In handball, athletes apply the tactics requested from them in a short time with movements that require action such as running, jumping, rusting, changing direction, and scoring goals (Cardinale, 2001). The dispersion of the athlete's motor characteristics was recorded as 15% endurance, 15% coordination, 15% flexibility, 20% special jump-throw, 25% speed, 10% general strength (Taşucu, 2002). Anaerobic performance is an important term for sport that does not last long or applies explosive force, because the player's performance can be influenced by environmental and individual factors (Özkan et al., 2011). Handball is a contact sport that requires power, force, where jumping, hitting, running, blocking and pushing are all important (Gorostiaga et al., 2006). The attacking athletes often shoot towards the goal by rising from distances of 9, 10, 11 meters, depending on the instant position of the game. There are many research methods to evaluate the physiological conditions of the players and the physical requirements of the game played (Can, 2009). Technological developments in terms of sports, the increase in the number of athletes enabled the teams to operate at a higher level and it was determined that many training programs were needed to increase sports efficiency. Trainers and sports experts can increase their performance by determining the strength and ability of the players in their teams and creating a training program accordingly. Regular training can provide an increase in the anaerobic performance of the players. The purpose of this study is: rather than aerobic energy systems, it is the investigation of anaerobic power values according to the playing positions of the athletes in handball, where anaerobic energy systems are used more.

2. Material and Methods

Research in Turkey handball federation 2. league actively playing handball 7 keeper, 12 middle quarterback, 6 right quarterback, 6, left playmaker, 5 right, 6 left, and participated in eight voluntarily total of 50 male handball players, including pivot. The athletes were informed about the measurements before the research, and they were informed about their nutrition and rest 24 hours before each measurement. Measurements were made in Kilis 7 Aralık University School of Physical Education and Sports Gym.

2.1. Height

The height of the athletes without shoes, holding their breath and standing firmly in a standing position with both toes and heels together, was measured in accordance with the measuring technique with a stadiometer (SECA, Germany) with a sensitivity of 0.01 m.

2.2. Body Weight

Body weight measurements of athletes were measured without shoes and sports clothing (shorts and t-shirts) and with an electronic scale (SECA, Germany) with a sensitivity of 0.1 kg.

2.3. Body Mass Index (BMI) Calculation

The body mass index of the subjects was calculated by dividing the body weight in kilograms by the square of the height in meters with the formula accepted by the World Health Organization.

$$\text{Body Mass Index (BMI)} = \text{Body Weight (kg)} / \text{Square of height (m}^2\text{)}$$

2.4. Anaerobic Power

Vertical jump test from anaerobic power tests was used to determine the anaerobic peak and average power values of the subjects. The difference between the highest point that the subjects could reach by extending their arms while leaning against the wall and the highest point they could touch by jumping was measured and recorded as the vertical jump value of the individual.

The peak and average anaerobic powers of the volunteers were calculated with the formula using the jump distance, body weight and height data (Johnson and Bahamonde, 1996).

$$\text{Peak Power (W)} = [78.6 \times \text{VJ (cm)}] + [60.3 \times \text{BW (kg)}] - [15.3 \times \text{height (cm)}] - 1308$$

$$\text{Average Power (W)} = [43.8 \times \text{VJ (cm)}] + [32.7 \times \text{BW (kg)}] - [16.8 \times \text{height (cm)}] + 431$$

Where, VJ is vertical jump; BW is body weight.

2.5. Statistical Analysis

All the data obtained in the study were analyzed in SPSS 20.0 software program. Whether the data showed normal distribution or not was measured by Kolmogorov-Smirnov test and it was determined that they showed normal distribution. From this point of view, one-way analysis of variance, One-Way Anova test, was used to determine whether the average and peak anaerobic power values of handball players differ according to the positions.

As a result of the comparisons, Tukey HSD method, one of the post hoc multiple comparison tests, was used to determine among which groups the difference occurred. In this study, the significance level was taken as 0.05.

3. Results

Table 1: Descriptive statistics values regarding the number of game positions of the subjects

Variables	N	Percent (%)
Goalkeeper	7	14,00
Middle point guard	12	24,00
Right-Left point guard	12	24,00
Right-Left wing player	11	22,00
Pivot player	8	16,00
Total	**50**	**100,00**

When Table 1 is examined, it is observed that the number and percentage values of the groups participating in the study are handled.

Table 2: Descriptive statistical values for the subjects participating in the study

Variables	Goalkeeper	Middle point guard	Right-Left point guard	Right-Left wing player	Pivot player
	Average ± SS	Average ± SS	Average ± SS	Average ± SS	Average ± SS
Age (year)	19,8± 1,08	19,7± 1,57	20,0± 1,10	20,3± 1,13	20,4± 1,68
Height (cm)	181,4± 1,97	181,3± 1,98	181,8± 2,65	179,2± 2,11	181,5± 2,77
Weight (kg)	77,43± 2,12	76,09± 2,03	77,19± 2,67	75,54± 2,19	82,15± 2,20
BMI (kg/m²)	23,53± 1,78	23,14± 1,43	23,35± 1,29	23,52± 0,99	24,93± 1,07

When Table 2 is examined, the statistical data of the age, height, weight and body mass index average values of the subjects are given according to their playing positions.

Table 3: Comparison of the physical parameters of the subjects according to their playing positions

Variables	Locations	Average	Standard Deviation	F	P	Difference
Age (year)	Goalkeeper	19,8	1.08	0,651	0,574	
	Middle point guard	19,7	1.57			
	Right-Left point guard	20,0	1.10			
	Right-Left wing player	20,3	1,13			
	Pivot player	20,4	1,68			
Height (cm)	Goalkeeper	181,4	1,97	1,097	0.319	
	Middle point guard	181,3	1,98			
	Right-Left point guard	181,8	2,65			
	Right-Left wing player	179,2	2,11			
	Pivot player	181,5	2,20			
Weight (kg)	Goalkeeper	77,43	2,12	6,841	0.000*	1-5
	Middle point guard	76,09	2,03			2-5

	Right-Left point guard	77,19	2,67			3-5
	Right-Left wing player	75,54	2,19			4-5
	Pivot player	82,15	2,20			
BMI (kg/m²)	Goalkeeper	23,53	1.01	8,372	0.000*	1-5
	Middle point guard	23,14	0,81			2-5
	Right-Left point guard	23,35	0,67			3-5
	Right-Left wing player	23,52	0,86			4-5
	Pivot player	24,93	1,43			

Note: 1-Goalkeeper, 2-Middle point guard, 3-Right-Left point guard, 4-Right-Left wing player, 5-Pivot player

* Significance at p <0.05 level

By examining Table 3 above, in comparing the physical parameters of the handball players participating in the study according to their playing positions; there were no statistically significant differences in age and height parameter values (p> 0.05). However, it was determined that the players playing in the pivot area were statistically higher in weight and body mass index values than the players playing in other regions in terms of both weight and body mass index values (p <0.05).

Table 4: Comparison of the vertical jump distance of the subjects according to their playing positions

Variables	Locations	Average	Standard Deviation	F	P	Difference
Vertical Jump (cm)	Goalkeeper	57,8	6,89	5,179	0.000*	1-5
	Middle point guard	60,1	5,32			2-5
	Right-Left point guard	59,9	5,17			3-5
	Right-Left wing player	61,4	4,51			4-5
	Pivot player	51,1	6,29			

Note: 1-Goalkeeper, 2-Middle point guard, 3-Right-Left point guard, 4- Right-Left wing player, 5-Pivot player

* Significance at p <0.05 level

By examining Table 4 above, it was determined that the vertical jump distance degrees of the handball players participating in the study were statistically higher than the vertical jump distance degrees of the goalkeeper, middle point guard, right and left point guard, right and left wing players than the vertical jump distance degrees of the players playing in the pivot zone (p <0.05).

By examining Table 5 below, in comparing the average anaerobic power and peak anaerobic power values of the handball players participating in the study according to the playing positions, the average anaerobic power and peak anaerobic power values of the goalkeeper, middle point guard, right and left wing players, right and left wing players, the average anaerobic power and peak power values of the players playing in

the pivot area it was determined that it was statistically higher than the anaerobic power values ($p < 0.05$).

Table 5: Comparison of the subjects mean and peak anaerobic power values according to their playing positions

Variables	Locations	Average	Standard Deviation	F	P	Difference
Anaerobic (Watts)	Goalkeeper	2447	5,27	7,813	0.000*	1-5
Average Power	Middle point guard	2505	4,11			2-5
	Right-Left point guard	2524	3,81			3-5
	Right-Left wing player	2579	3,07			4-5
	Pivot player	2306	4,47			
Anaerobic (Watts)	Goalkeeper	6435	6,37	9,052	0.000*	1-5
Peak Power	Middle point guard	6536	4,99			2-5
	Right-Left point guard	6579	5,23			3-5
	Right-Left wing player	6638	5,67			4-5
	Pivot player	6191	5,99			

Note: 1-Goalkeeper, 2-Middle point guard, 3-Right-Left point guard, 4- Right-Left wing player, 5-Pivot player

* Significance at $p < 0.05$ level

4. Discussion and Conclusion

In handball, which is one of the important sports branches, it is necessary to analyze well the training and match-specific metabolic requirements, as well as the distances, running speeds and movement patterns. In the past studies, due to the limitations experienced in obtaining the data, more focused on profile determination such as anaerobic capacity and anthropometric measurements (Granados et al., 2008; Rannou et al., 2001). But nowadays, technological advances offer researchers the opportunity to examine the players' burden in more detail.

In the study, it is aimed to compare average and peak anaerobic power values in handball according to game positions. The average height of the subjects participating in the study was found to be 181.4 ± 2.48. Srhoj et al. (2002)'s study on elite handball players reported that the average length of the subjects who participated in the study was 190.79±6.59 cm. It is thought that the difference in our study is due to the age and league level factor of the subjects used in the study. It is thought that the difference between this study and the study in the literature is due to the age and league level factors of the

participants. In addition, in another study Taskin et al (2016), analyzed the reaction time of footballers according to their positions and the average height of the goalkeepers 185.10 ± 4.84 defenders 178.73 ± 5.91 midfield players 175.10 ± 5.13 strikers in the average height according to the positions was found to be 186.20 ± 4.42 cm it was observed to be. As can be seen in this study, physical characteristics of athletes according to the characteristics of the positions they play is an important factor in their sportive performance. In the study of Ateşoğlu and Tamer (1999) on female handball players, it was determined that the height average of female handball players was 169.78 cm. With the results of the mentioned study, it can be said that the average height differences observed in this study are caused by the gender differences of the athletes. In comparing the physical parameters of the handball players participating in the study according to their playing positions; it has been observed that players playing in the pivot area have statistically higher values in terms of body mass index values than players playing in other regions in terms of both weight and body mass index values.

When the average anaerobic power and peak anaerobic power values of the handball players participating in the study are compared, the average anaerobic power and peak anaerobic power values of the goalkeeper, middle point guard, right and left point guard players, right and left wing players are compared to the average anaerobic power and peak anaerobic power values of the players playing in the pivot area, it is observed that it is statistically higher. On the other hand, it was observed that right and left wing players and right and left point guard players had the best anaerobic power values. Looking at the studies on vertical jump used in anaerobic power measurement, Massuca et al. (2015) examined the vertical jump distances of players according to their playing positions in handball and found that the wing and playmakers had the highest degree. In another study, the vertical jump values of elite handball players were examined, and it was observed that playmakers and wingers had the best scores (Şentürk, 2016).

In a study conducted on 10 male cyclists from the Czechoslovakian mountain bike national team, a significant relationship was found between lean body mass and anaerobic power (Heller and Novotny, 1997). In a study examining body composition and anaerobic performance in elite young wrestlers, a positive significant relationship was found between body mass index and anaerobic power (Vardar et al, 2007). In a study conducted on basketball players, the relationship between playing positions and anaerobic power was examined and it was reported that there was a strong negative relationship between vertical jump and body weight they used for anaerobic power (Ostojic et al, 2006). In a study related to this issue, it was stated that the sports level and physical differences may be different in elite and amateurs, that is, these values may differ in different groups (Gorostiaga et al, 2005). In a study, the reaction time and MaxVO2 values were compared according to the positions of the players, and it was observed that the goalkeepers had the best time in the reaction times and the midfield players had the best values in the MaxVO2 values (Taşkın et al., 2016). In another study conducted on handball players, the reaction times of the athletes were examined

according to their playing positions and it was found that the reaction times differed according to the playing positions (Hasdemir et al., 2003).

When comparing the results of the studies with the literature results, it is observed that the results are in parallel with the literature. The reason why the peak and average anaerobic power values of the players in the pivot area are lower than the players playing in other game positions is due to the increase in body mass index values, which is supported by the literature results. As a result, it is thought that anaerobic power is an important feature in achieving the result in handball and it may differ according to the game positions. It should be specified that it is an important factor in increasing the athletic success that the trainers create a work program by taking into account their playing positions and physical characteristics while planning the training they will apply to the athletes.

References

Ateşoğlu U, Tamer K, 1999. Türkiye Bayan Hentbol Liginde Oynayan Hentbolcuların Fiziksel ve Fizyolojik Profilleri. Gazi Beden Eğitimi ve Spor Bilimleri Dergisi, IV, 1, 1-8.

Can İ, 2009. 16-18 Yaş Grubu Basketbol, Futbol ve Hentbolcuların Aerobik Güç Performanslarının Karşılaştırılması: Deneysel Araştırma. Karadeniz Teknik Üniversitesi Sosyal Bilimler Enstitüsü Beden Eğitimi ve Spor Anabilim Dalı, Yayınlanmış Yüksek Lisans Tezi.

Cardinale M, 2001. Handball Performance: Physiological Considerations and Practical Approach for Training Metabolic Aspects. Materials From 3rd & 4th Congress Sport Medicine & Handball from: http://www.sportscoach-sci.com

Gorostiaga EM, Granados C, Ibanez J, Gonzalez-Badillo JJ, Veizquierdo M 2006. Effects of an Entire Season on Physical Fitness Changes in Elite Male Handball Players. Medicine veScience in Sports ve Exercise, 38(2), 357-366.

Gorostiaga EM, Granados C, Ibáñez J, Izquierdo M, 2005. Differences in physical fitness and throwing velocity among elite and amateur male handball players. Int J Sports Med.; 26(3), 225-32.

Granados C, Izquierdo M, Ibáñez J, Ruesta M, Gorostiaga EM, 2008. Effects of an entire season on physical fitness in elite women's handball players. Med Sci Sports Exercise, 40(2), 351-61.

Hasdemir S, Gündüz N, Müniroğlu S, 2003. Bayan Hentbolcuların Görsel ve İşitsel Reaksiyon Zaman Farklarının İncelenmesi, Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi. 1(1), 49-52.

Heller J, Novotny J, 1997. Aerobic and Anaerobic Capacity in Elite Mountain Bikers, Acta Universitatis Carolinae Kinanthropologica. 33, (1), 61-68.

Johnson DL, Bahamonde R, 1996. Power output estimate in university athletes. J Strength Cond Res.,10(3), 161-6.

Kurudirek M, 1998. Antropometri, Sporda Yetenek Seçimi ve Morfolojik Planlama Erzurum.

Massuça L, Branco B, Miarka B, Fragoso I, 2015. Physical fitness attributes of team-handball players are related to playing position and performance level. Asian J Sports Medicine.

Ostojic SM, Mazic S, Dikic N, 2006. Profiling in Basketball: Physical and Physiological Characteristics of Elite Players. Journal of Strength and Conditioning Research. 20 (4), 740-744.

Özkan A, Koz M, Ersöz G, 2011. Wingate Anaerobik Güç Testinde Optimal Yükün Belirlenmesi. Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi. 9(1), 1-5.

Rannou F, Prioux J, Zouhal H, Gratas-Delamarche A, Delamarche P, 2001. Physiological Profile of Handball Players. J Sports Med Phys Fitness. 41(3), 349-53.

Srhoj J., Marinovi M, Rogulj N, 2002. Characteristics of Male Handball Players, Coll. Antropol, 26, 1: 219-227. 1,Tunisian Research Laboratory «Sport Performance Optimization», Tunis, Tunisia.

Şentürk İ, 2016. Elit Hentbolcularda Sürat, Çeviklik ve Kuvvet Parametrelerinin Pozisyonlara Göre İncelenmesi. Marmara Üniversitesi Sağlık Bilimleri Enstitüsü. Yüksek Lisans Tezi. Beden Eğitimi ve Spor Anabilim Dalı, İstanbul.

Taşkın C, Karakoç Ö, Taşkın M, Dural M, 2016 . Analysis of Reaction Times and Aerobic Capacities of Soccer Players According to Their Playing Positions. Journal of Education and Training Studies Vol. 4, No. 8; ISSN 2324-805X E-ISSN 2324-8068.

Taşucu E, 2002. Türk Erkek Hentbol Milli Takımının Somatotip Profilinin Belirlenmesi, Gazi Üniversitesi Sağlık Bilimler Enstitüsü, Yüksek Lisans Tezi, Ankara.

Vardar SA, Tezel S, Öztürk L, Kaya O, 2007. The Relationship Between Body Composition and Anaerobic Performance of Elite Young Wrestlers. Journal of Sports Science and Medicine, 6 (CSSI-2), 34-38.