IJBPAS, November, 2015, 4(11), Special Issue: 387-396

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

THE RELATIONSHIP OF PHYSIOLOGICAL FEATURES AND PHYSICAL FITNESS WITH THE PERFORMANCE OF ADOLESCENT GENIUS VOLLEYBALL PLAYERS OF IRAN

HASSAN MATINHOMAEE[*1], YASAMAN MOJIBIAN[1]

1: Department of Exercise Physiology, Islamic Azad University, Central Tehran Branch, Tehran, Iran

***Corresponding Author: E Mail: hassanmatinhomaee@yahoo.com; Ph.: +98 9123680810**

ABSTRACT

The aim of current study was to determine the relationship of physiological features and physical fitness of Iranian adolescent genius volleyball players with their performance.

25 in touch, genius and adolescent Iranian volleyball players were selected purposely as the subjects. Following objects have measured from the participants: muscular strength, muscular stamina, flexibility, movement speed, muscular power, maximum consuming oxygen and lactate threshold. Their performance such as spike, service and on-net defense was specified through analyzing the game. To study the relationships between predictor and scale variables, one used Pierson correlation factor in a significant level of $P \leq 0.05$.

A significant relationship was observed among muscular stamina, speed and muscular power have increased, the performance of spike and on-net defense have increased too, in players. In contrast, no significant relationship was observed among muscular strength, flexibility, maximum consuming oxygen and lactate threshold with the performance of the players ($P > 0.05$). It is recommended that coaches concentrate on increasing the muscular stamina, speed and muscular power of their players much more.

Key words: Volleyball, Physiological Fitness, Sport Performance, Power, Muscular Stamina

INTRODUCTION

No doubt success in any field requires using the scientific principles and basis that is necessary in body activity and sport. Neglecting the effective factors in training professional athletes, and in attention to personal differences, may drag people to sport fields which not consistent with their physical features and abilities **[1].**

For achieving in international competitions, different factors are effective such as: 1) physical abilities (proper anthropometric features, physiological and physical fitness), 2) skill ability (proper technique, personal and team tactic), 3) mental abilities (self-confidence, motivation and concentration) **[2].** So physical and body abilities including a great part athletic training plan. The volleyball game was invented by William J. Morgan in 1895. This sport includes aerobic and anaerobic activities, so it requires muscular strength, power, agility, aerobic fitness and flexibility **[3].**

In addition to anthropometric features in a team sport, certain situations may need for more special physical characteristics that are based on the physiological demand of that situation, during the game and it's adjustment for the players **[4].** Recognizing physical and physiological differences in order to select players is very important and effective in recovery of physical fitness features and improvement of technique and tactic skills during a competition season. But how to select players for different position, using special tactical trainings, physical fitness and keeping it during the whole competition season, are very important. On the other hand, it is obvious that all the sports in which using ball, require more and comprehensive abilities. Among these, physical and physiological abilities are very important, because the sports with ball require maximum power repetition, like extreme kicking and jumping.

Most of findings in most studies prove that, there are significant differences between physiological features with physical tests (agility, aerobic power, vertical jump) for younger people in different levels. Determining special skills of a sport field is as important as physiologic and anthropometric features in different sports, and they are critical for the performance **[5].**

Some surveys have been done on male and female players and the results have shown that agility, strength and type of vertical jump, have effects on volleyball players performance. The players always jump and descent during a volleyball game with high intensity. These jumps may need pullback

(like spike jump) and without pullback (defense jump). The nature of jump and type of match and type of jump should be considered for successful performance. Several studies have shown the strong relationship between strength, power and vertical jump performance, although it seems that this relationship may be different toward type of sport and athlete's level **[6].** One of the basic factors for the improvement and increasing the performance of a team is the effective features measurement in optimum skills performance. This evaluation plays and important role in athlete's performance level recovery and increases the necessary motivations for regular trainings and steadiness and their achievements, and this is because of the weak and strength points, that are effective in athlete's success or nonsuccess, and the important is that, it prevents wasting money and time. The aim of current study was to determine the relationships of physiological features and physical fitness for Iranian adolescent genius volleyball players with their performance.

SUBJECTS AND METHODS

25 in touch, adolescent genius volleyball players, purposely were selected as the objects. According to previous coordination with the coaches, athletes and team responsibilities, volleyball performance points such as spike, service and on-net defense were recorded based on match computer analysis. Then physiological and physical fitness measurements such as muscular strength, muscular stamina, respiratory cardiac stamina, flexibility, movement speed, muscular power, maximum consuming oxygen and lactate threshold have been done for 25 participants.

Also the athletes should be advised about necessary nutrition the day and night before the test and the match. At the end, the correlation between physiological and physical measures with skill performance has been measured in order to determine their relationships. Strength with dynamometer, muscular stamina with sits-up, speed with 20 meter running test, power with Sargent jump test, flexibility with sit and stretch the hands were measured. For calculating the maximum consuming oxygen (VO2 max) and lactate threshold, we have used a treadmill, model Yun 900 in following order. We put personal information such as age, weight and gender into the machine. Then fastened a heartbeat belt under the athlete's shirt, on chest.

We selected maximal test protocol and pushed the start button. The machine warmed up the athlete for 15 minutes in following order. 5 minutes with 60% of maximum

heartbeat, 5 minutes with 65% of maximum heartbeats and 5 minutes with 70% of maximum heartbeat. Then after 15 minutes, the treadmill had started with 8 km/ hour speed and has been increased 1 km/hour till the athlete felt exhaustion and could not continue. Then we pushed the stop button and the machine gave us the information such as VO2, lactate threshold, maximum test speed, consuming Calorie during the test and VO2 Kg/min. As it is told above, lactate threshold and maximum consuming oxygen, were measured by a Yun 900 model treadmill and maximal test protocol. Direct spike point, service point and on-net defense point are obtained by match computer analysis. To study the relation among predictor and scale variables, Pierson correlation factor was used in a significant level ($P \leq 0.05$).

RESULTS

The scale deviation and average of survey data are presented in table 1. Also the related results to Pierson correlation factor test are reported in table 2.

No significant relationship between muscular strength and volleyball performance was observed ($P>0.05$). A significant relationship was observed between muscular stamina with spike and also muscular stamina with defense (respectively P=0.007 and P=0.032). But no significant relationship was seen between muscular stamina with service (P=0.72). In a way that, by increasing in muscular stamina, the performance of spike and defense has increased in adolescent genius volleyball players. No significant relationship was observed between flexibility and performance ($P>0.05$).

A significant relationship was observed between the movement speed with spike and also the movement speed with defense (respectively P=0.002 and P=0.007). But not between movement speed and service (P=0.86). In a way that by increasing the speed, the performance of spike and defense has increased in adolescent genius volleyball players. A significant relationship was observed between muscular power with spike and also muscular power with defense (respectively P=.009 and P=0.041), but no significant relationship was seen between muscular power and service (P=0.39). In a way that by increasing muscular power, the performance of spike and defense increases in adolescent genius players. No significant relationship was observed between maximum consuming oxygen with volleyball performance and also between lactate threshold with volleyball performance ($P>0.05$).

Table 1: The average and scale deviation of survey data

Variables	Scale Deviation ± Average
Age (year)	17.92 ± 0.81
Strength (kg)	78.56 ± 4.31
Muscular stamina (the number of movements)	55.20 ± 3.88
Flexibility (cm)	35.12 ± 3.07
Movement speed (second)	3.68 ± 0.20
Maximum consuming oxygen (milliliter*kg*min)	44.12 ± 2.58
Lactate threshold(beat in min)	150.92 ± 2.91
Spike	50.92 ± 6.14
Service	47.84 ± 8.70
Defense	-0.36 ± 17.81

Table 2: The results of Pierson correlation factor in order to study the relationship among the variables

Predictor variable	Scale variable	R	P
Muscular strength	Spike	0.07	0.73
	Service	0.12	0.54
	Defense	0.23	0.26
Muscular stamina	Spike	0.52	*0.007
	Service	-0.075	0.72
	Defense	0.42	*0.032
Flexibility	Spike	-0.08	0.70
	Service	-0.10	0.60
	Defense	-0.16	0.42
Movement speed	Spike	0.58	*0.009
	Service	-0.035	0.39
	Defense	0.52	*0.041
Muscular power	Spike	0.51	*0.009
	Service	0.17	0.39
	Defense	0.41	*0.041
Maximum consuming oxygen	Spike	0.008	0.96
	Service	0.30	0.13
	Defense	-0.14	0.49
Lactate threshold	Spike	0.04	0.82
	Service	0.36	0.07
	Defense	0.07	0.73

significant in level of P≤0.05

DISCUSSION

According to recent findings, a significant relationship was observed among speed and muscular power with the performance of spike and defense but not service in adolescent genius volleyball players. As, by increasing muscular stamina, speed and muscular power, the performance of spike and on-net defense increases in the players. In contrast, no significant relationship has been observed among muscular strength, flexibility, maximum consuming oxygen and lactate threshold.

Two of the important physical fitness indexes in volleyball which researchers have studied, are spike height and defense **[7,8].** Because teams success depends on passing over the net or on-net defensing. Today in modern volleyball, the competition focus point is the on-net supremacy and the best way to achieve this subject, is to use the players with taller height, stretched hands and height vertical jump **[9].** These indexes are

increasing among international high level teams, as in adolescent world cup 2009, the teams average height was 328 ±7.9 and the defense height was 314.5±11.1, that it has been increased in 2011 in which spike height was 330±10.2 and defense height was 317±12.3 **[10].**

Agility and speed are important performance factors in volleyball **[11].** Volleyball players require abilities like sudden jump and veer and quick reaction time **[12].** These factors are necessary in abilities like first receipt, ball possession, and on-net defense, sending different passes and other skills in different circumstances **[13].**

Anaerobic power is another important physiological factor for volleyball players. Because the dominant energy system in volleyball includes anaerobic glucoses and phosphates. Aerobic system would not be used as initial burning resource, but it is necessary for recovering energy resources during resting period **[14,15].** Strengthening central area of body especially recuts abdomen muscle is very important in agility, balance, power and vertical jumps; and as we know, the sits-up can strengthen this muscle **[16].**

Volleyball is type of interval sports with attention intensity. Moreover, the presence of aerobic and anaerobic energy resources and unpredicted oscillation of biological requirements, is observable in this sport **[17,18].** Specially in volleyball game, sudden explosive and short efforts in range of 2-20 seconds, are necessary; hence, high level athletes can be distinguished through high muscular power in trunk and organs and also increasing in acid lactic anaerobic capacity **[19,20].** Moharram zadeh and Mohammad zadeh (2000) have studied the physical fitness level of Orumieh university students, and have prepared exam norm. They have observed that, there is a positive correlation between pair foot jump height with objective's height, and there is a negative correlation between subjects height and agility test **[21].** Behpour et al (2001) has studied the relationship between type of body and body composition with performance in basic movement patterns and basic skills performance, that has observed no significant relationship between vertical jump and BF% and FM but there was a positive and significant relationship between vertical jump and FFM. No significant relationship was observed among the results of agility running test 4*9 m, and %BF, FM and FFM **[22].**

Most sport fields require performing quick and short time activities with maximum power efficiency **[23].** Tsunawake et al

(2003), has compared body composition and physical fitness in volleyball and basketball players of Japan high schools, and concluded that, both volleyball and basketball player's high anaerobic, aerobic capacity and high body mass to succeed in competitions **[24].**

One of the important prediction factors for athlete's successful performance in a special sport field is to determine the share of body factors, physiological and psychological factors. Physiological, body and player's skills level factors are such factors that may limit tactical and technique potential power in a volleyball team. Service is an important skill is volleyball; so if a player can move the ball with more strength and acceleration, controlling the ball for the receiver players would be more difficult. On the other hand, a player should be able to perform such these resistant movements during the match. Muscular strength and agility indexes are important for success in volleyball, and to achieve the maximum success and select better players, it is necessary to consider these factors **[6].**

Jump ability is important for success in volleyball especially for strikers, to hit the ball higher than the defender's hands. Usually for higher vertical jump, players should increase their power and strength of lower parts of body. Usually this is useful for increasing feet strength, and this increase is effective in quality of jumps **[25].** The spike strike is performed when the player, powerfully hits the ball with proper acceleration, by using bended arm above his head. Controlling speed and direction of the ball is necessary for achievement. The defense plays an important role in a team's success during the match. Another important factor during the match is service. A good service striker is who, in addition to make ball reception difficult for opposing team, disturbs their attack. Selecting young players should be based on physical condition, ability, improvement in training and skills training growth capacity.

CONCLUSION

According to recent studies, it is recommended that probably by muscular stamina, muscular power and speed, the performance of spike and on-net defense increases in adolescent genius volleyball players of Iran. Probably who has higher muscular stamina, would get tired later and keep his quality of spike and defense during the match, but probably service has no relationship with muscular stamina, because it makes more gap for players. Also, probably who has more speed, strikes his spike faster, but may be service requires no speed. Moreover, a player who has higher

power would be successful in jumps, so has a better performance in spike and defense, but every player does not use jump service. In contrast, probably flexibility, strength, maximum consuming oxygen and lactate threshold have no relationship with volleyball performance. Nevertheless, more surveys are required and other volleyball performance indexes should be considered. In any way, it is recommended that, the coaches have to concentrate more on increasing muscular stamina, speed and muscular power of their players, especially under-net players.

REFERENCES

[1] Parto AH. 2004. Studying physiological and anthropometric profile of Iranian genius futsal players, MA Thesis, Humanities Scientific University of Tarbiat-e-Modarres.

[2] Esfarjani F. 2000. Comparing some of anthropometric and physiological features and general physical fitness of girls volleyball players, in Iran championship provinces with national team. MA thesis, university of Tarbiat-e-Moallem.

[3] Gaetano R. 2012. Didactics of volleyball into the educate program for coaches/trainers/technicians of Italian Federation of Volleyball (FIPAV). Journal of Physical Education and Sport, 12(1): 25-29.

[4] Brodie D, Moscrip VH, Hutcheon R. 1998. Body composition measurement: a review of hydro densitometry, anthropometry, and impedance methods. Nutrition, 14: 3.

[5] Tsolakis Ch, Vagenas G. 2010. Anthropometric, physiological and performance characteristics of elite and sub-elite fencers. Journal of Human Kinetics, 23: 89-95

[6] Sheppard JM, Dingley AA, Janssen I. 2011. The effect of assisted jumping on vertical jump height in high-performance volleyball players. Journal of Science and Medicine in Sport, 14: 85-89.

[7] Qian P, Yingga A. 2009. Comparative analysis on the physique and height over net of women′s volleyball players between the 28th and the 29th Olympic games. Journal of Nanjing Institute of Physical Education (Natural Science).

[8] Smith DJ, Roberts D, Watson B. 1996. Physical, physiological and performance differences between Canadian national team and university volleyball players. Journal of Sports Sciences, 10(2):131-138.

[9] Shondell DS, Reynaud C. 2002. The volleyball coaching bible. Human Kinetics, 1: 331-346.

[10] Salami avansar M. 2011. Studying the changes of personal and applicatory features and their relationship with obtained results of adolescent national volleyball team in recent 5 world cups. MA Thesis, University of Shahid Beheshti.

[11] Vescovi JD, McGuigan MR. 2008. Relationships between sprinting, agility, and jump ability in female athletes. Journal of Sports Sciences, 26(1): 97-107.

[12] Gabbett T, Georgieff B. 2007. Physiological and anthropometric characteristics of Australian junior national, state, and novice volleyball players. Journal of Strength Condition Research, 21(3): 902-908.

[13] Scates Al, Linn M. 2003. Complete conditioning for volleyball. Human Kinetics Pub.

[14] Dyba W. 1982. Physiological and activity characteristics of volleyball. Volleyb Tech Journal, 6(3): 33-51.

[15] Ercolessi D. 2000. Volleyball and the vertical jump. The Coach: The Official FIVB Magazine for Volleyball Coaches, 4(1): 27-29.

[16] Song-Lin G. 2006. Comparative analysis on the physique and height over net of women's volleyball players between the 27th and the 28th olympic games. Journal Beijing Sport University, 5.

[17] Concu A, Marcello C, Rocchitta A, Cuiti C, Esposito A. 1992. Telemetric measurement of heart rate matched oxygen consumption during a volleyball game. Medicine Sciences Research, 20: 149-151.

[18] Laconi P, Melis F, Crisafulli R, Sollai R, Lai C, Concu A. 1998. Field test for mechanical efficiency evaluation in matching volleyball players. International Journal of Sports Medicine, 19: 52-55.

[19] Sleivert GG, backus RD, Wenger HA. 1995. Neuromuscular differences between volleyball players, middle distance runners and untrained controls. International Journal of Sports Medicine, 16 (6): 390-398.

[20] Tant CL. 1997. Kinesiological analysis of pass with jump in volleyball. Strength Condition, 1: 29-35.

[21] Moharram zadeh M, Mohammad zadeh H. 2000. Studying the physical fitness level of Oroumieh university

students and providing exam norm. Journal of Harkat, 4: 103-117.

[22] Behpour N, Yousefi B, Faramarzi M. 2001. The relationship of body type and body composition with the performance in basis movement patters and performing basis soccer skills. Journal of Harkat, 7: 15-37.

[23] Gharakhanlou R, Agha ali nejad H, Rastegar M, Khazani A. 2008. Studying the correlation between RAST and 300 yard field test (went back) with Wingate test in measurement of anaerobic power of futsal players. Olympic, 4(44): 41-50.

[24] Tsunawake N, Tahara Y, Moji K, Muraki S, Minowa K, Yukawa K. 2003. Body composition and physical fitness of female volleyball and basketball players of the japan inter-high school championship teams. Journal of Physiology Anthropology Applied Human Sciences, 22: 195-201.

[25] Mitsuru T, Hirotsugu O, Hisao I. 2005. Individuality and reproducibility in high-speed motion of volleyball spike jumps by phase-matching and averaging. Journal of Biomechanics 38, 2050–2057.