
Sjournals
ISSN 2322-2433
Scientific Journal of
Review
S
J
R
Sjournals Publishing Company | www.sjournals.com

Scientific Journal of Review (2016) 5(5) 423-429
ISSN 2322-2433
doi: 10.14196/sjr.v5i5.2206

Contents lists available at Sjournals

Scientific Journal of **Review**

Journal homepage: www.Sjournals.com

Original article

Correlation between Sargent jump and 45-meter dash in the estimation of the anaerobic power

Sana Shokri[a], Sakineh Varmazyar[b,*], Payam Heydari[a], Hajar Dazi[a]

[a]*MSc student in Department of Occupational Health Engineering, Faculty of Health, Qazvin University of Medical Sciences, Qazvin, Iran.*

[b]*Associate professor in Department of Occupational Health Engineering. Faculty of Health, Qazvin University of Medical Sciences, Qazvin, Iran.*

*Corresponding author; Associate professor in Department of Occupational Health Engineering. Faculty of Health, Qazvin University of Medical Sciences, Qazvin, Iran.

ARTICLE INFO

Article history,
Received 11 April 2016
Accepted 10 May 2016
Available online 15 May 2016
iThenticate screening 14 April 2016
English editing 7 May 2016
Quality control 10 May 2016

Keywords,
Physical fitness
Anaerobic power
Sargent jump
Run 45 meters

ABSTRACT

Mental and physical health of students is important objects of every society, because their health ensures scientific progression and development. The current study was aimed to estimate the anaerobic power in two ways Sargent jump and run 45 meters and the factors influencing them among selected male and female students of Qazvin University of Medical Sciences. This was an analytical cross-sectional study among 110 students who participated in the study that were selected randomly. To measure anaerobic power, Sargent jump and run 45-meter test was used. In order to analyze the factors affecting anaerobic power test, independent t-test and ANOVA with a significance level of 0.05 was conducted, and also to examine the relationship between two tests Pearson correlation test was used. Data analysis showed that sex, weight, height and body mass index in Sargent jump and sex and weight in 45 meters test are significant. Pearson correlation test between anaerobic power test results are positive and significant relationship (r= 0.83 and P<0.001), respectively. The overall results of this study showed a high correlation between the two methods. Also, variables such as sex and weight in both tests showed significant association in the mean anaerobic power.

1. Introduction

Success in any sport requires specific physical and physiological capabilities. Physical fitness plays an effective role in the implementation of the exercise. One of the main methods to determine the effectiveness of training programs on athletic performance is the awareness of fitness of athletes. Continuous measurement of the physical capabilities that are considered as one of the most important factors influencing successful sports performance is the responsibility of coaches. Therefore, testing is the first step in selecting athletes, followed by the development and control of possible training programs (Gharakhanlou, 2000). One of the most important tests of physical fitness among athletes is the anaerobic power. Anaerobic power measurement is done fast and explosively (Stauffer, 2005).

Various tests can be measure anaerobic power in the upper and lower organs, but the factors that influence test results should be fully recognized. For example. Such factors include age, gender, duration of exercise, environment, heredity, psychological aspects such as motivation, equipment required for performance measurement and protocol of the tests. The most common test to measure anaerobic power are Sargent jump, Margaria-Kalamen power test, 45-meter dash, Wingate and so on (Khaledan and Abkar, 2002). In the last two decades, athletes have become more powerful and sports performances, particularly anaerobic performances have improved. The most accurate method to assess anaerobic performance are laboratory tests that due to high cost, being time-consuming and requiring sophisticated laboratory facilities using them is limited and in most cases access to them is hard for coaches and athletes. On the other hand, field tests have a simple nature, are cheap and easily accessible. Thus, determining the validity and reliability of field trials is of particular importance, and it is always tried to invent tests that in addition to the scientific and applied aspects have enough validity (MacDougall and Wenger, 1991).

In a study by the Latin RW to determine the correlation between some anaerobic tests and the maximum isokinetic torque values, 40 male students were tested, the results showed a strong correlation in anaerobic tests Margarya-Kalamn stairs, vertical Sargent jump and bicycle ergometer test of feet and hands (Latin, 1992). Hoffman et al (2000) reported a positive relationship between the vertical jump test at peak power and mean of Wingate test of basketball players. In addition, there was a weak relationship between Bosco 15-second test with peak power and Wingate test mean. The researchers concluded that jumping and speed tests may be acceptable in measuring specific anaerobic power of basketball players (Hoffman, 2000). During recent studies, there has been a significant relationship (r=0.86) between the vertical jump and anaerobic peak power among volleyball players (Rokhsati and Salimi, 2015).

The results of a study by a group of researchers from Croatia to test anaerobic that was performed on rafting teenagers of 12-14 years showed that anaerobic power is a reliable method for estimating it in among rafting teenagers (Mikulić et al., 2009). In addition, other factors that can affect anaerobic power, factors such as body mass (BMI), age, and mental factors. The results of a study in Poland on the ice hockey athletes to measure anaerobic power showed that the used test to measure anaerobic power of the athletes are reliable and can be trusted (Szmatlan-Gabrys et al., 2006; Rocznioka and Gołaśb, 2014). Thus, the purpose of the study is to estimate the anaerobic power among male and female students of Qazvin University of Medical Sciences by Sargent jump and two 45-meter dash, to determine the correlation between the two methods, and factors affecting anaerobic power.

2. Materials and methods

This study is descriptive-correlational, where to determine the samples, first 10 samples were studied as pilot and then the value of the correlation coefficient (r = 0.46) was estimated. Then, according to 95 percent confidence and a margin of error of 5%, the total number of 89 cases was estimated that 110 patients were studied for more accuracy. The samples were randomly selected from among all students of Medical Sciences. After attending Gymnasium of University of Medical Sciences of Qazvin and wearing light clothes, students studied received instructions on how to correctly run the test and had body warm up for 15 minutes. The tools needed to conduct the study were meter, stopwatch, handrail and a number barriers. They were prepared prior to the study and checked regarding to safety.

2.1. Measuring anaerobic power mean

2.1.1. Sargent jump test (SJT)

In Vertical SJT, first the students were asked to stay next to the wall that was marked in centimeters and stretched their hands as high as possible and touch the meter. Place of the tip of the middle finger of the student was recorded with the meter on the wall as initial height. Then they were asked again, after 2 to 3 seconds, to jump with all the muscle strength of their legs in pairs and touch the meter on the wall. This point was recorded as the secondary height. Subjects performed the jump two times and the best record was recorded. Finally, by obtaining the difference between the two points recorded, the distance of jump was obtained for each student. Sargent approach anaerobic power value for each student was calculated according to the following equation.

$$P = \sqrt{4.5} \times (W) \times \sqrt{D}$$

P = the anaerobic power (in kg-m per second)
D = difference in vertical jump (in meters)
W = weight (in kilograms)
B) 45-meter dash test

To run 45-meter test in a straight line, first the students started from 13 meters distance to start running quickly. Upon reaching the first obstacle that was the starting distance of 45 m stopwatch was started. Then, after running the distance of 45 meters that was the second obstacle, the stopwatch was stopped. According to the path run and the time recorded, anaerobic power was calculated according to the following equation.

$$p = \frac{w \times D}{T}$$

P = power (kg- meters per second)
W = weight (kg)
D = distance (m)
T = displacement time (s)

In this research, to identify correlations and relationships between variables Pearson correlation coefficient and two independent samples t-tests (age groups, gender, and smoking) and one-way analysis of variance (groups weight, height, index body mass and hours of exercise per week) were used. Statistical analysis was done using SPSS version 16 with a significance level of 0.05.

3. Results and discussion

Demographic characteristics of individuals participating are presented in Table 1 separately for genders. Of the 110 people studied, 36.4% were male and 63.6 percent were women.

Comparing the mean of anaerobic power test using Sargent jump and 45-meter run in kilograms-meters per second, according to sex is presented in Figure 2.

Minimum, maximum, mean and standard deviation, and anaerobic power for groups regarding gender, age, height, weight, body mass index, hours of exercise per week and the number of cigarettes smoked tested by t-test and ANOVA are presented in table 2 with 95% confidence and the level of error less than 5. According to Table 2, gender, weight, height, and BMI had a meaningful and significant relationship with average anaerobic power in Sargent jump test, and gender and weight had a meaningful and significant relationship weight 45-meter dash.

Table 1
Demographic characteristics of the participants (n=110).

Variable		Gender	
		Men(n=40)	Women(n=70)
Year (Age)	Mean±SD	21.8±4.6	19.1±1.7
	Min-Max	17-36	18-36
Weight (Kg)	Mean±SD	72.2±13.5	58.2±9.6
	Min-Max	51-104	41-90
Height(Cm)	Mean±SD	177.3±6.3	163.1±5.4
	Min-Max	165-191	150-177
BMI	Mean±SD	22.7±3.5	21.8±3.4
	Min-Max	16.9-30.3	15.6±30.5
Exercise in Week (Hour)	Mean±SD	4.1±2.1	1.0±0.1
	Min-Max	1-10	1
Smoking	Yes	%6.4	%0
	No	%93.6	%100

Table 2
Results of independent t-tests and analysis of variance of two samples of different levels of independent variables on average anaerobic power.

Variable		Mean anaerobic power test in 45-meter dash (kg-m per second)				Mean anaerobic power test in Sargent jump (kg-m per second)			
		Min	Max	M±SD	P-Value	Min	Max	M±SD	P-Value
Gender	Men	257	637	456.6±81.1	<0.001	615.7	1503.1	993.6±189.1	<0.001
	Women	168.8	594.1	280.8±64.5	<0.001	141.7	1015.6	605.1±122.7	<0.001
Age(Year)	17-23	185.8	637.5	343.3±112.1		141.7	1408.7	736.3±230.3	0.15
	24-30	306.9	582	436.6±83.1	0.07	649.2	1503.1	1018.5±263.6	
	31-36	285.7	501.4	443.6±81.8		900.8	945.7	923.2±310.7	
Weight (Kg)	<60	168.8	594.2	281.2±47.2		403.8	986.4	606.7±119.9	
	60-70	245.9	480	76.1±46.6	<0.001	141.7	1053.5	764.5±184.2	<0.001
	71-80	324	521.3	60.8±15.7		742.9	1173.9	971.8±137.6	
	>80	361.3	637.5	86.5±24.1		646.5	1503.1	1162±214.5	
Height (Cm)	<170	168.8	594.2	289.7±74.2		403.8	1062.5	637.6±134.6	
	170-180	236.1	637.5	417.9±90.5	<0.12	141.7	1217.6	865.1±230.2	<0.03
	>180	406.3	607.8	490.2±68.5		910.5	1503.1	1126.9±191.1	
BMI	<20	168.8	594.2	298.2±15.6		403.8	986.4	646.7±172.9	
	20-25	236.1	637.5	340.1±96.6	0.12	141.7	1217.6	732.8±214.6	0.04
	26-30	406.3	607.8	464.6±135.5		593.2	1503.1	302.1±91.1	
	>30	168.8	637.5	460.1±104.8		742.9	1132.5	189.3±94.6	
Exercise in Week (Hour)	0-3.99	168.8	637.5	321.6±102.9		141.7	1408.7	701.1±222.9	
	4-7.99	316.2	610.7	449.8±76.1	0.12	415.7	1503.1	976.2±202.5	0.61
	8-11.99	456.9	464.5	460.7±5.4		649.3	1503.5	851.4±285.8	
Smoking	No	168.8	637.5	351.9±112.7	0.18	141.7	1503.1	765.4±248.6	0.36
	Yes	340.5	501.4	440.6±87.4		793.7	950.3	896.6±89.1	

Pearson correlation coefficient between the mean anaerobic power test in 45-meter dash and Sargent jump showed a significant positive correlation between these two parameters ($p<0.001$ and $r=0.83$) (Figure 2).

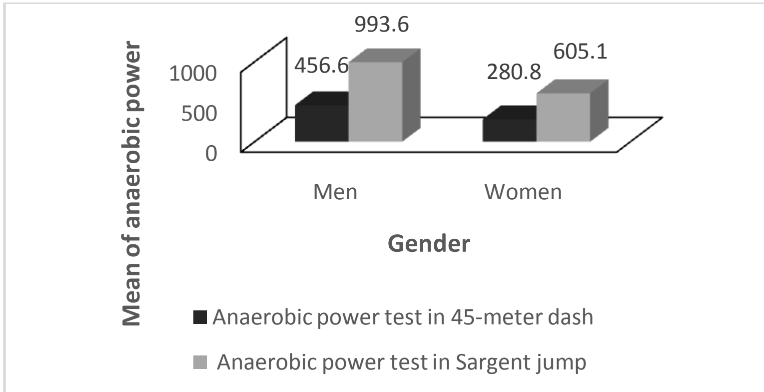

Fig. 1. Comparison of anaerobic power test mean in Sargent jump and 45m run separately for genders.

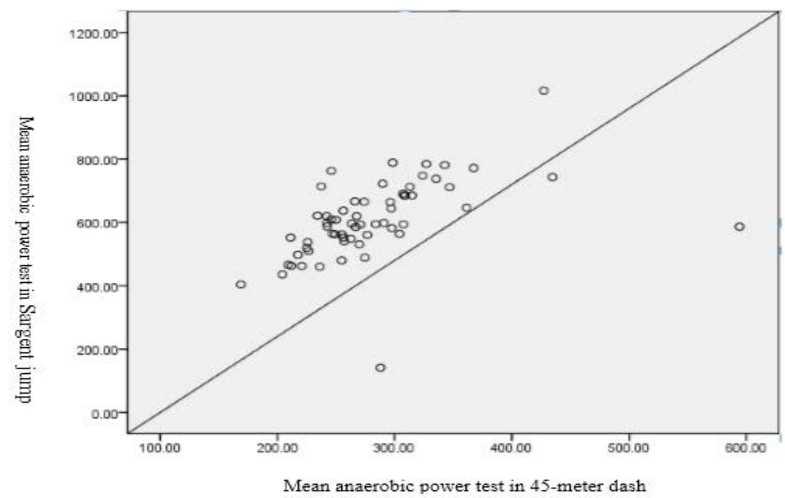

Fig. 2. Relationship between mean anaerobic Sargent jump and 45m dash.

Since little research is done on the correlation between the two methods of Sargent jump and 45-meter dash, conducting more studies to further study the relationship between these two methods and to determine different parameters affecting these tests seem necessary. Thus, the main aim of this study was to compare the two methods of Sargent jump and 45-meter dash and the relationship of mean anaerobic power obtained from these two methods with factors such as gender, age, height, weight, body mass index, smoking, and the amount of exercise per week. The results of this study in accordance with figure 1 show that the mean anaerobic power is the greater among men compared to women. That can be due to differences in the physical structure of men (effects anthropometric dimensions on fitness) and so the growth and development of the skeletal-muscular system and cardio-pulmonary function of men compared with women. The impact of each independent variable on the mean anaerobic power in accordance with Table 2 shows that the means of anaerobic power are correlated with sex, weight, height and body mass index in Sargent jump test, and gender and weight are significantly correlated in 45-meter test. Significance of gender in both tests, as stated above, could be due to differences in body composition such as weight, body size and physiological responses between men and women.

Significance of height and weight and consequently body mass index in Sargent jump test can be attributed to type of test and parameters required for the measurement of anaerobic Sargent jump, because weight and height are directly related to anaerobic power and are among the factors affecting the level of high jump. Baker and Davis (2004) found a relationship between the vertical jump test and body mass index (Baker, 2004). Due to the direct connection of weight to the estimation of anaerobic power in 45 meters dash, it can be expected that with weight increase, the person power increase due to increased energy consumption, as has been noted in other studies. Mikolich et al. in their study in 2009 stated that with increase in age the amount of muscle mass increases as the amount of anaerobic power will enhance as well. In fact, height and weight are two factors that can directly affect the amount of muscle mass (Mikulić et al., 2009). The lack of significance of body mass index in 45-meter dash test may be due to non-application of height in anaerobic in the calculation of anaerobic power test.

Figure 2 shows a significant positive correlation between the mean anaerobic power in 45-meter dash and Sargent jump. This shows that the results of these two tests in estimation of anaerobic power are somehow the same, and by using one of them, one can measure anaerobic power in people. Examining the correlation of other estimation methods can also be seen in other studies. In a study, Minasian et al (2009) gained a significant correlation between Argo jump and Margarya Kalamn devices (Minasian, 2013). In their research, Fox and Mathews showed that 45-meter dash test is the appropriate test to assess anaerobic power (Fox, 2007). Kalaman also found a significant correlation between 45-meter dash test and Kalaman-Margarya test (Mayhew et al., 1994). Hoffman et al. (2000) also attempted to estimate the anaerobic power using jump tests and found a positive and significant correlation between vertical jump tests and mean and maximum power from the Wingate test (Hoffman, 2000).

4. Conclusion

In general, the results of this study showed a high correlation between the two methods. Moreover, variables such as sex and weight in both tests showed significant correlation for mean.

Acknowledgments

This study was prepared and conducted in the gymnasium of the University Of Medical Sciences Of Qazvin, so the authors thank the officials of the training organizations and university students who cooperated in this research.

References

Baker, J.S.B.D., 2004. Interrelationship between laboratory and field measures of performance. J. Exerc. Physiol. 7(5), 44-51. http://www.ncbi.nlm.nih.gov/pubmed/12585617

Fox, M.D., 2007. Exercise Physiology. Tehran, Institute of Tehran University Press. http://www.adinehbook.com/gp/product/9640341274

Gharakhanlou, R., 2000. The status quo and development of indicators of talent in football. Institute of Physical Education and Science, 4(6), 381-394. http://oeppa.sbu.ac.ir/article/view/3127

Hoffman, J.E.S., 2000. Acomparison between the wingate anaerobic powers test to both vertical jump and line drill tests in basketball players. J. Strength. Condition. Res., 14(3), 2610-2626. http://journals.lww.com/nscajscr/Abstract/2000/08000/A_Comparison_Between_the_Wingate_Anaerobic_Power.4.aspx

Khaledan, A., Abkar A.R., 2002. Evaluation of philosophical mindedness and relationship coach with some personal characteristics. 301-306. http://mbsp.sbu.ac.ir/article/view/3921

Latin, R.W., 1992. The relationship between isokinetic power and selected anaerobic power tests. Isokinetics and Exercise Science, 2(2), 56-59. DOI: 10.3233/IES-1992-2203

MacDougall, J.D., Wenger, H.A., Green, H.J., 1991. Physiological testing of the high-performance athlete, Champaign, Ill.: Human Kinetics Books.https://books.google.com/books/about/Physiological_Testing_of_the_High_perfor.html?id=t98LAQAAMAAJ

Mayhew, J.L., Bemben, M.G., Rohrs, D.M., Bemben, D.A., 1994. Specificity among anaerobic power tests in college female athletes. J. Strength. Condition. Res., 8(1), 43-47. http://journals.lww.com/nsca-jscr/Abstract/1994/02000/Specificity_Among_Anaerobic_Power_Tests_in_College.6.aspx

Mikulić, P., Ružić, L., Marković, G., 2009. Evaluation of specific anaerobic power in 12–14-year-old male rowers. J. Sci. Med. Sport., 12(6), 662-666. http://search.proquest.com/docview/216675930?pq-origsite=gscholar

Minasian, V., L.S., 2013. Effect of sodium bicarbonate supplementation on anaerobic power and blood lactate level futsal players. J. Sport. Sci., 1(16), 5-19. DOI:10.1016/j.jsams.2008.05.008

Robert Rocznioka, M.A., Pietraszewski Przemysława, Arkadiusz Stanulaa, Gołaśb, A., 2014. On-ice special tests in relation to various indexes of Aerobic. Soc. Behav. Sci., 475-481. DOI:10.1016/j.sbspro.2014.02.248

Rokhsati, S., Salimi, A., 2015. Comparison of hard and soft surfaces volleyball six weeks dedicated to anaerobic, vertical jump, agility and body fat percentage volleyball players. 56-86. http://oeppa.sbu.ac.ir/article/view/3127

Stauffer, K.A., 2005. The comparison of the Max Jones Quadrathlon with the vertical jump and Wingate cycle tests as a method to assess anaerobic power in female Division I college basketball players, University of Pittsburgh. http://d-scholarship.pitt.edu/9907/1/DISSERTATION12205.pdf

Szmatlan-Gabrys, U., Langfort, J., Stanula, A., Chalimoniuk, M., Gabrys, T., 2006. Changes in aerobic and anaerobic capacity of junior ice hockey players in response to specific training. J. Hum. Kinetic., 15, 75. https://www.researchgate.net/profile/Arkadiusz_Stanula/publication/258217456_Changes_in_Aerobic_and_Anaerobic_Capacity_of_Junior_Ice_Hockey_Players_in_Response_to_Specific_Training/links/0deec5274d81b1dd2a000000.pdf

How to cite this article: Shokri, S., Varmazyar, S., Heydari, P., Dazi, H., 2016. Correlation between Sargent jump and 45-meter dash in the estimation of the anaerobic power. Scientific Journal of Review, 5(5), 423-429.