



# Education Quarterly Reviews

---

**Yıldırım, Y., & Yıldırım, D. (2022). The Relationship Between Anaerobic Power, Back Strength and Balance in Elite Wrestlers. *Education Quarterly Reviews*, 5(4), 406-411.**

ISSN 2621-5799

DOI: 10.31014/aior.1993.05.04.673

The online version of this article can be found at:  
<https://www.asianinstituteofresearch.org/>

---

Published by:  
The Asian Institute of Research

The *Education Quarterly Reviews* is an Open Access publication. It may be read, copied, and distributed free of charge according to the conditions of the Creative Commons Attribution 4.0 International license.

The Asian Institute of Research *Education Quarterly Reviews* is a peer-reviewed International Journal. The journal covers scholarly articles in the fields of education, linguistics, literature, educational theory, research, and methodologies, curriculum, elementary and secondary education, higher education, foreign language education, teaching and learning, teacher education, education of special groups, and other fields of study related to education. As the journal is Open Access, it ensures high visibility and the increase of citations for all research articles published. The *Education Quarterly Reviews* aims to facilitate scholarly work on recent theoretical and practical aspects of education.



ASIAN INSTITUTE OF RESEARCH  
Connecting Scholars Worldwide



# The Relationship Between Anaerobic Power, Back Strength and Balance in Elite Wrestlers

Yahya Yıldırım<sup>1</sup>, Duygu Yıldırım<sup>2</sup>

<sup>1,2</sup> Department of Common Courses, Bursa Technical University, Bursa, Turkey

Correspondence: Yahya Yıldırım, School of Management, Department of Common Courses, Bursa Technical University, Bursa, Turkey Tel: 90 546 278 20 25. E-mail: yahya.yildirim@btu.edu.tr

## Abstract

The aim of this study is to examine the relationships between anaerobic power, back strength and dynamic balance, which play an important role in wrestler performance. 14 male freestyle elite wrestlers (age =  $19.07 \pm 0.99$  years, height =  $1.70 \pm 0.04$  m, body weight =  $74.67 \pm 8.48$  kg, BMI =  $25.57 \pm 2.31$  kg/m<sup>2</sup>) voluntarily participated in the study. Anaerobic power, back strength and dynamic balance measurements of the participants were taken. Pearson Correlation test was performed to determine the relationship between these features. A statistically significant positive correlation was found between anaerobic power and back strength, between back strength and right and left leg balance, between left leg balance and right leg balance. As a result, it can be said that back strength is effective on dynamic balance in wrestlers and anaerobic power affects back strength.

**Keywords:** Wrestling, Anaerobic Power, Balance, Strength

## 1. Introduction

Wrestling is a sport in which physical fitness elements such as speed, strength, flexibility, balance, muscular and cardiovascular endurance, coordination are effective on performance (Kilinc & Ozen, 2015). Anaerobic power is very important for wrestlers, as wrestling requires sudden and explosive movements in short periods of time. Anaerobic power can help differentiate between successful and less successful wrestlers (Yoon, 2002). In order for the techniques to be applied easily during the wrestling match, a high level of muscular strength is required as well as anaerobic power (Bulgay and Polat, 2017). In evaluations based on body weight, wrestlers are shown among the strongest athletes, and strength is necessary for wrestlers both in defense, attack and counter-attack (Cicioglu et al., 2007).

On the other hand, wrestlers have to maintain their static and dynamic postures throughout the match, because the techniques in this sport are based on constant displacement, pushing, pulling and disrupting the balance of the opponent (Perrot et al., 1998). Balance is a sensorimotor process aimed at maintaining, achieving or restoring a state of stability during activity. Balance; it includes harmony between the proprioceptive, somatosensory, vestibular, visual and neuromuscular systems (Tao et al., 2020). For this reason, the development of an athlete's

balance feature allows the whole body to move simultaneously (Erdogan et al., 2017). Studies show the importance and contribution of trunk stability in the generation, transfer and control of force in integrated kinetic chain activities while producing effective trunk and limb movements in human movements (Okada et al., 2011). In a current study, muscular activation in whole body movements was examined and it was observed that some trunk stabilizers (ie, transversus abdominus, multifidus, rectus abdominus, internal and external obliques) are continuously activated before any limb movement (Hodges and Richardson, 1997). These findings support that the control and stability of movement progresses from the core to the limb and from head to tail (Okada et al., 2011). The core muscles, located in the center of the body, such as the back, pelvic and abdominal muscles, are the muscle groups that produce all the strength and mobility of the human body (Yoon et al. 2015). Anaerobic power in wrestling is related to the ability of the athlete to attack and resist the attacks of his opponent. Athletes who do not have a high degree of lower body muscle strength or explosiveness may need to adjust their wrestling style to compensate (Callan, 2000). A good sports performance occurs when the athlete uses the complex structure of the body effectively against the conditions he will encounter during the competition. This is an issue that necessitates the maximum use of the athlete's motor functions, that all the factors affecting the sport branch are in harmony with each other and that should be emphasized during the preparation period of the athlete (Sterkowicz & Starosta, 2005).

It is seen that studies examining the relationships between factors such as balance, anaerobic power and strength that affect the performance of athletes in wrestling are limited. It is thought that these characteristics develop in parallel with each other and are influenced by each other in wrestlers. In the light of this information, the aim of the present study is to examine the relationships between anaerobic power, back strength and dynamic balance, which play an important role in wrestler performance.

## **2. Method**

### *2.1 Participants*

14 male freestyle elite wrestlers (age =  $19.07 \pm 0.99$  years, height =  $1.70 \pm 0.04$  m, body weight =  $74.67 \pm 8.48$  kg, BMI =  $25.57 \pm 2.31$  kg/m<sup>2</sup>) voluntarily participated in the study. It was paid attention that the participants did not take a break from the training in the last 6 months due to injury, etc. In addition, they were asked not to consume beverages containing alcohol, caffeine, etc. in the last 24 hours before the tests. The volunteer consent form prepared according to the Declaration of Helsinki was signed by the participants, after informing them about the tests and study protocols. Ethics committee approval was obtained for the study from the Clinical Research Ethics Committee of the University of Health Sciences Bursa Yuksek İhtisas Training and Research Hospital (Decision No: 2011-KAEK-25 2022/11-01, Date: 30.11.2022).

### *2.2 Measurements*

The tests were carried out between 14:00 and 18:00 on the hardwood floor in the gym. Athletes did not do any strenuous physical activity in the last 24 hours before the tests and did not consume any food or drink other than water in the last 3 hours. All tests and measurements were made on the same day, and 15 minutes of warm-up and stretching were done before the tests.

#### *2.2.1 Height Weight and Leg Length*

The body weights of the participants were measured using a scale with an accuracy of 0.1 kg, with bare feet and wrestling jerseys, and their heights were measured with a metallic tape measure with an accuracy of 0.1 cm fixed to the scale. Leg lengths are; it was measured with a tape measure from above the iliac bone (spina iliaca anterior superior) to the heel level (medial malleolus) while the participant was standing (Uygur et al., 2013).

#### *2.2.2 Anaerobic Power*

The vertical jump performances of the wrestlers were measured with the 0.1 cm precision “Sport Expert TM, MPS-501” (Tumer Elektronik LTD) device. Knees bent approximately 90 degrees, hands fixed on hips, and maximum jump without spring action at the beginning. The test was repeated 2 times with an interval of 2 minutes and the best value was recorded. Vertical jump performances were converted into anaerobic power using the Lewis Formula.

$$\text{Anaerobic Power} = \sqrt{4.9 \times \text{body weight (kg)} \times \text{vertical jump distance (m)}}$$

### 2.2.3 Back Strength

Back strength was measured with Takkei Back and Leg Dynamometer. Participants pulled the dynamometer stick upwards with knees and arms stretched, back straight, and body bent slightly forward. The test was repeated 2 times with an interval of 2 minutes and the best value was recorded as kg.

### 2.2.4 Dynamic Balance

Dynamic balance was measured with the Y Balance test. Before the test, 3 trials were made from the anterior, posterolateral and posteromedial directions for the right and left legs, and then 2 measurements were taken, and the longest reach distance was recorded. To determine the balance score, the sum of the 3 access directions was multiplied by 100 and divided by 3 times the leg length (cm) (Plisky et al., 2006).

### 2.3 Statistical Analyses

Data were analyzed with the statistical program SPSS for Windows 23.0 (SPSS Inc, Chicago, USA). Pearson Correlation test was performed to determine the relationship between anaerobic power, back strength and balance. For statistical significance level,  $p < 0.05$  was accepted.

## 3. Results

The anaerobic power, back strength and left-right leg dynamic balance average and standard deviation values of the wrestlers participating in the study are given in Table 1. The statistical relationships between the measurements are given in Table 2.

Table 1: Descriptive statistics (N=14)

	Mean	Std. Deviation
Anaerobic Power (kg/m/sec)	107.78	16.89
Back Strength (kg)	141.93	27.12
Left Leg Balance	101.76	3.63
Right Leg Balance	99.67	3.63

According to Table 1; The average anaerobic power of the participants was  $107.78 \pm 16.89$  kg/m/sec, back strength was  $141.93 \pm 27.12$  kg, left foot balance score was  $101.76 \pm 3.63$  and right foot balance score was  $99.67 \pm 3.63$ .

Table 2: The relationship between anaerobic power, back strength and dynamic balance

		Anaerobic Power	Back Strength	Left Leg Balance
Back Strength	r	.795*		
	p	.001		
Left Leg Balance	r	.413	.671*	

	p	.142	.009	
	r	.419	.568*	.889*
Right Leg Balance	p	.136	.034	.000

\*. Correlation is significant:  $p < 0.05$

According to Table 2; no significant relationship was found between anaerobic power and left leg balance ( $p=0.142 > 0.05$ ) and right leg balance ( $p=0.136 > 0.05$ ). Between anaerobic power and back strength ( $p=0.001 < 0.05$ ), between back strength and left leg balance ( $p=0.009 < 0.05$ ) and right leg balance ( $p=0.034 < 0.05$ ), between left leg balance and right leg balance ( $p=0.000 < 0.05$ ) statistically significant positive correlation was found.

#### 4. Discussion

In the current study, when the BMI values of the athletes were examined (25.57), it was seen that they were in the overweight class according to the World Health Organization (WHO) BMI table. However, BMI norms in athletes differ according to fat, bone and muscle mass values. Therefore, BMI values of athletes and non-athletes are not evaluated in the same class (Garrido-Chamorro et al., 2009). In a study similar to our study, it was observed that the BMI values of young elite wrestlers with an average age of 19.53 were 25.29 (Uzun et al., 2010). In another study, the BMI values of elite wrestlers were found to be 23.75 (Koyunlu et al., 2020). The current study is similar to the studies in the literature in terms of BMI values.

As a result of the findings obtained in the study; It was determined that there is a statistically positive relationship between anaerobic power and back strength and between back strength and balance. When the studies in the literature were examined, Senel et al. (2009) found that there is a positive relationship between isometric leg-back strength and anaerobic power parameters of wrestlers in their study. In another study, it was reported that upper extremity strength parameters of wrestlers had a positive effect on balance parameters (Alper and Kolayis, 2020). While Erkilic and Senel (2019) found a relationship between the body composition of wrestlers and their anaerobic performance in their study, they did not find any relationship between balance values and other variables. In another study, it was stated that strength and balance performances of elite freestyle wrestlers were positively related to each other (Bulgay & Polat, 2017). Again, the findings in a study showed that anaerobic performance plays a decisive role on balance (Aydın, 2020). In another study, when the pre-test and post-test values of the freestyle and greco-roman style wrestlers were compared as a result of the strength training program, it was determined that the left foot vertical jump and leg strength post-test values of the greco-roman wrestlers were higher than the freestyle wrestlers (Cura, 2020). Studies in the literature mostly support the current study.

In the present study, a significant positive correlation was found between right and left leg dynamic balance scores. In a previous study, it was reported that there was a significant positive correlation between the dominant and nondominant leg dynamic balance scores of 35 participants from different sports branches (Erkmen et al., 2007). This study supports the current study.

As a result, when the findings obtained from the research and the literature are examined, it can be said that back strength is effective on balance in wrestlers and anaerobic strength affects back strength. On the other hand, disruption of balance can not only affect performance but also increase the risk of injury. We think that strength and balance training should be managed well during the preparation period of the wrestlers. Thus, in addition to the positive effect on the performance of the athlete, injuries can also be prevented. It should be kept in mind that anaerobic power, strength and balance characteristics are related to each other and a disorder in one can negatively affect the other.

#### Acknowledgments

I would like to thank the athletes, coaches and club managers who contributed to the research.

## References

- Alper, E., Eroglu Kolayis, I. (2020). Yıldız gurescilerde gures performansi ile govde stabilitesi, dinamik denge ve fonksiyonel hareketlilik degerleri arasındaki iliskinin incelenmesi [Investigation of the relationship between wrestling performance and trunk stability, dynamic balance and functional mobility values in junior wrestlers]. *CBU Beden Egitimi ve Spor Bilimleri Dergisi*, 15(1), 48-66.
- Aydin, R. (2020). Dengenin belirlenmesinde anaerobik performansin rolu [The role of anaerobic performance in determining balance]. *Uluslararası Guncel Egitim Arastirmalari Dergisi*, 6(2), 303-314. Retrieved from <https://dergipark.org.tr/tr/pub/intjces/issue/59193/778519>.
- Bulgay, C. & Cimen Polat, S. (2017). Elit seviyedeki gurescilerin bacak kuvvetleri ve denge performanslari arasindaki iliskinin incelenmesi [Examination of the relationship between leg strength and balance performance of elite level wrestlers]. *Inonu Universitesi Beden Egitimi ve Spor Bilimleri Dergisi*, 4(3), 59-67.
- Callan, S. (2000). Physiological profiles of elite freestyle wrestlers. *Journal of Strength and Conditioning Research*, 14(2), 162-169.
- Cicioglu, I., Kurkcu, R., Eroglu, H. & Yuksek, S. (2007). 15-17 Yas grubu gurescilerin fiziksel ve fizyolojik ozelliklerinin sezonsal degisimi [Seasonal changes in physical and physiological characteristics of 15-17 age group wrestlers]. *SPORMETRE Beden Egitimi ve Spor Bilimleri Dergisi*, 5(4), 151-156. DOI: 10.1501/Sporm\_0000000085
- Cura, E. (2020). *Elit gurescilere uygulanan kuvvet antrenman programinin performansa etkisi* [The effect of the strength training program applied to elite wrestlers on performance]. Karamanoglu Mehmetbey Universitesi, Sosyal Bilimler Enstitusu, Master Thesis, Karaman.
- Erdogan, C. S., Er, F., Ipekoglu, G., Colakoglu, T., Zorba, E., & Colakoglu, F. F. (2017). Farkli denge egzersizlerinin voleybolcularda statik ve dinamik denge performansi uzerine etkileri [The effects of different balance exercises on static and dynamic balance performance in volleyball players]. *Journal of Sports and Performance Researches*, 8(1), 11-17. <https://doi.org/10.17155/spd.63957>
- Erkmen, N., Suveren, S., Goktepe, A.S. & Yazicioglu, K. (2007). Farkli branslardaki sporcularin denge performanslarinin karsilastirilmesi [Comparison of balance performances of athletes in different branches]. *SPORMETRE Beden Egitimi ve Spor Bilimleri Dergisi*, 5(3), 115-122. DOI: 10.1501/Sporm\_0000000080
- Erklic, A. O. & Senel, O. (2019). Determination of relationships between body composition, anaerobic performance and balance in wrestlers. *International Journal of Sport Culture and Science*, 7(4), 1-10. Retrieved from <https://dergipark.org.tr/en/pub/intjcs/issue/51231/666981>
- Garrido-Chamorro, R. P., Sirvent-Belando, J. E., Gonzalez-Lorenzo, M., Martin-Carratala, M. L., & Roche, E. (2009). Correlation between body mass index and body composition in elite athletes. *Journal of Sports Medicine and Physical Fitness*, 49(3), 278-284.
- Hodges, P. W. & Richardson, C. A. (1997). Contraction of the abdominal muscles associated with movement of the lower limb. *Phys Ther*, 77(2), 132-144.
- Kilinc, F. & Ozen, G. (2015). Comparison of anaerobic power values and heart rate in elite freestyle and greco-roman wrestlers. *Journal of Physical Education and Sport Sciences*, 1(2), 21-34.
- Koyunlu, A., Daglioglu, O. & Ozdal, M. (2020). Comparison of physical fitness and respiratory parameters of elite wrestlers and judokas. *Turkish Journal of Sport and Exercise*, 22(3), 360-365. <https://doi.org/10.15314/tsed.640223>
- Okada, T., Huxel, K. C. & Nesser, T. W. (2011). Relationship between core stability, functional movement, and performance. *Journal of Strength and Conditioning Research*, 25(1), 252-261.
- Perrot, C., Moes, R., Deviterne, D., & Perrin, P. (1998). Postural adaptations during specific combative sport movements. *Science and Sports*, 2(13), 64-74.
- Plisky, P. J., Rauh, M. J., Kaminski, T. W., & Underwood, F. B. (2006). Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players. *The Journal of orthopaedic and sports physical therapy*, 36(12), 911-919.
- Sterkowicz, S. & Starosta, W. (2005). Selected factors influencing the level of general fitness in elite greco-roman wrestlers. *Journal of Human Kinetics*, 14, 93-104. <https://www.researchgate.net/publication/237725650>
- Senel, O., Tas, M., Akyuz, M., Harmanci, H., Zorba, E. & Ozkan, A. (2009). Gurescilerde vucut kompozisyonu, anaerobik performans, bacak ve sirt kuvveti arasindaki iliskinin belirlenmesi [Determining the relationship between body composition, anaerobic performance, leg and back strength in wrestlers]. *Gazi Beden Egitimi ve Spor Bilimleri Dergisi*, 2, 13-22.
- Tao, H., Husher, A., Schneider, Z., Strand, S. & Ness, B. (2020). The relationship between single leg balance and isometric ankle and hip strength in a healthy population. *International Journal of Sports Physical Therapy*, 15(5), 712-721. <https://doi.org/10.26603/ijsp20200712>
- Uygur, R., Ozen, O. A., Bas, O., Toktas, M. & Songur, A. (2013). Yurume sorunu hemiplejik serebral palsili cocuklarda alt ekstremite gelismenin iyi saptanmasiyla cabuk asilabilir [The walking problem can be

- overcome quickly in children with hemiplegic cerebral palsy by detecting the development of the lower extremities well.]. *Firat Tıp Dergisi*, 18(4), 224-229.
- Uzun, A., Akyuz, M., Tas, M., & Aydos, L. (2010). Genç elit güreşçilerde solunum parametrelerinin bazı antropometrik özelliklerle ilişkisinin incelenmesi [Investigation of the relationship between respiratory parameters and some anthropometric characteristics in young elite wrestlers]. *Beden Eğitimi ve Spor Bilimleri Dergisi*, 4(1), 10–17. <https://dergipark.org.tr/tr/pub/bsd/issue/53575/713918>
- Yoon, J. (2002). Physiological profiles of elite senior wrestlers. *Sports Medicine*, 32(4), 225-233.
- Yoon S. D., Sung D. H., Park G. D. (2015). The effect of active core exercise on fitness and foot pressure in taekwondo club students. *Journal of Physical Therapy Science*, 27(2), 509-511.