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

doi: 10.5281/zenodo.1098529 Volume 3 | Issue 12 | 2017

ACUTE EFFECT OF ANAEROBIC EXERCISE ON DYNAMIC BALANCE OF SEDENTARY YOUNG BOYS

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Abstract:
The aim of this study was investigation the acute effect of anaerobic exercise on dynamic balance of sedentary young boys. Totally 30 individuals who are sedentary healthy males participated in this study as a subject. Measurements were done between 14.00 and 18.00 in 4 days. Previously The subject in this study were introduced the procedure of the dynamic balance (Biodex Balance SD, Biodex, Shirley, NY. isokinetic balance device) and Wingate power test (Monark 894E Peak Bike, Monark Exercise AB, Vansbro, Sweden.) and a written approval form was taken from each volunteer. Second day, all subjects were tested dynamic balance test after general warm-up. During the third and fourth days, all subjects were tested Wingate power test without load (empty scale) and 5% load and immediately after that all of them were tested the dynamic balance test. Subjects rested 48 hours between measurements and did not any exercise during the rest time. At the end of the application; overall balance, control trial 1.94±0.85, placebo trial 1.82±0.73, experimental trial 1.92±1.05, anterior-posterior balance, control trial 1.52±0.67, placebo trial 1.37±0.62, experimental trial 1.44±0.93, medial-lateral balance, control trial 0.98±0.53, placebo trial 1.03±0.45, experimental trial 1.06±0.62 there was no statistical significance was not observed dynamic balance after anaerobic exercise ($p>0.05$). In conclusion, we can conclude that anaerobic exercises have no acute effect on dynamic balance in sedentary youth males who are 13-15 ages.

Keywords: anaerobic exercise, balance, Wingate

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1. Introduction

Body balance must be good so that the person's daily life activities can be accomplished successfully and independently. In terms of sports knowledge; For the intended movement, interactions between the central nervous system and the skeletal muscle system are necessary. The balance in our body shows changes with age. These changes are beginning to increase in the pre-school age (3-6 / 7 years) and peak at youth (17-18 for girls, 18-19 for boys) and decrease with age (Muratlı, 2003).

The first important balance forms in human life are sitting and standing. Rotation, bending, reaching up, standing on one foot, are other forms of balance that emerge parallel to the development of the child. Balance is a very important factor for the body in gaining skills such as walking, running and jumping (Özer, 2004). Balance holds an important place among the basic features of sport. Plays an important role in playing, sports, dance and gymnastics.

In our daily life, we need balance to protect from accidents or to be able to do our jobs efficiently. (Gündüz, 1998). Since balance is the key to mobility, it is important in every age. The balance decreases with age and creates a risk factor for falls (Cecel et al., 2007). Anaerobic performance is a term that is of great importance for short-term completed sports or for sports that require explosive force. Although anaerobic performance is important for all kinds of sporting activities, the importance of some sports branches where anaerobic performance is used predominantly increases.

Anaerobic performance is more prominent as it is needed for sudden and high power generation in many sports such as throwing and jumping sports, wrestling, tennis, skiing (alp), gymnastics, in short distance runs (100 m, 200 m), short distance swimming branches (50 m, 100 m), in short-distance running (50 m, 100 m) (Bar-Or, 1987).

2. Material and Method

2.1. Experimental Design

Individuals participating in the study were first introduced with an isokinetic balance device and a Wingate anaerobic power test procedure (Monark 894E Peak Bike, Monark Exercise AB, Vansbro, Sweden) in a dynamic balance procedure (Biodex, Balance, SD, Biodex, Shirley, NY) and written consent documents were obtained from each subject. On the second day, subjects were subjected to a dynamic warming test followed by a dynamic balance test. On the third and fourth day, subjects randomly underwent a dynamic balance test in the Wingate power test immediately after Wingate anaerobic power test with no load (while the plate was empty) and 5% load. Among the applications, subjects were given rest for 48 hours. The subjects were provided with no training during the exercises.

2.2. Subjects

A total of 30 sedentary volunteer young men aged between 13 and 15 years participated in the study. Voluntary consent certificate was taken in writing from all participants. Applications were taken from Gaziantep University, 4 days in the performance laboratory and between 14:00 and 18:00 of the day Gaziantep University Clinical Research Ethics Committee approved for the studies.

Table 1: Descriptive Information of Subjects (N = 30)

	Average	**Std. Dev.**
Age (Year)	14.04	0.20
Height (cm)	172.62	6.55
Weight (kg)	61.17	10.47

2.3. Procedures

2.3.1. Dynamic Balance Procedure

Biodex Balance SD isokinetic balance device (Biodex, Balance, SD, Biodex, Shirley, NY) was used for balance measurement. Balance practice consists of one test and three measurements in each test. Tests have a 10-second rest period. All three tests are performed on one leg (dominant foot), with the arms fixed on the sides, the other leg being 20 degrees flex. Dynamic balance is the fixed point on the screen from the subjects during the test; to the front, back, right, left to balance. Each measurement result is scored by Biodex balance system (Wendy et al., 2001).

2.3.2. Wingate Anaerobic Power Test Procedure

The Wingate Anaerobic Power Test is based on maximal pedal cycling in the cycle ergometer against a predetermined constant load, providing the highest mechanical power for 30 seconds. During the test period, the measurements are automatically made for five seconds at six equal time intervals. As a result of these measurements, we obtain some data that allows us to learn about anaerobic performance: Maximum Power (Maximum Anaerobic Power), Average Power (Anaerobic Capacity), Minimum Power (Minimum Power), Fatigue Index**.** There are five different time stages of the Wingate test protocol (Bosco et al., 1983, Inbar and Bar-Or, 1986). These are preparation, recovery, acceleration, Wingate test, and cooling phase, respectively (Adams, 2002). On the third and fourth day of the Wingate power test (Monark 894E Peak Bike, Monark Exercise AB, Vansbro, Sweden) measurement subjects were randomly assigned to a dynamic balance test immediately after the Wingate anaerobic power test with no load in the Wingate power test (with the plate empty) and 5% load. Among the applications, subjects were given rest for 48 hours.

2.4. Statistical analysis

SPSS version 22.0 (SPSS Inc., Chicago, IL) program was used for statistical analyses. The data were expressed as the mean, standard deviation, and percentage of mean difference. Significance was defined as $p < 0.05$.

3. Results

On the third and fourth day of studying the Wingate power test (Monark 894E Peak Bike, Monark Exercise AB, Vansbro, Sweden) subjects randomly measured in the Wingate power test were unloaded (with the pan open) and 5% load. The measurement results are given in Table 2 as mean and standard deviation.

Table 2: Wingate Anaerobic Power Test and Balance Test Analyzes

	Average	**Standard Deviation**
Peak power (W)	2090.99	8024.02
Peak power (W/kg)	7.39	1.21
Average power (W)	1428.66	5667.97
Average power (W/kg)	4.45	0.39
Minimum power (W)	683.59	2819.45
Minimum power (W/kg)	103.43	498.11
Fatigue index (W)	359.42	1390.83
Overall Balance	1.94	0.85
Anterior-posterior balance	1.52	0.67
Medial-lateral balance	0.98	0.53

Peak power (W) 2090.99 ± 8024.02, Peak power (W / kg) 7.39 ± 1.21, Average power (W) 1428.66 ± 5667.97, Average power (W / kg) 4.45 ± 0.39, Minimum power (W) 683.59 ± 2819.45, Minimum power (W / kg) 103.43 ± 498.11 Fatigue index (W) was measured as 359.42 ± 1390.83. Overall balance scores were measured as Overall Balance 1.94 ± 0.85, Anterior-posterior balance 1.52 ± 0.67, and Medial-lateral balance 0.98 ± 0.53.

The results of the balance test measurements are given in table 3. According to these values; Overall balance control was 1.94 ± 0.85, placebo was 1.82 ± 0.73, and experiment was 1.92 ± 1.05. Anterior-posterior balance control was 1.52 ± 0.67, placebo was 1.37 ± 0.62, and test was 1.44 ± 0.93. Medial-lateral balance control application 0.98 ± 0.53 placebo application 1.03 ± 0.45 test application 1.06 ± 0.62.

Table 3: Balance Test Analysis

		Ort ± SS	**f**	**p**
	Control trial	1.94 ± 0.85		
Overall Balance	Placebo trial	1.82 ± 0.73	0.293	0.747
	Experimental trial	1.92 ± 1.05		
	Control trial	1.52 ± 0.67		
Anterior-posterior balance	Placebo trial	1.37 ± 0.62	0.127	0.578
	Experimental trial	1.44 ± 0.93		
	Control trial	0.98 ± 0.53		
Medial-lateral balance	Placebo trial	1.03 ± 0.45	0.039	0.772
	Experimental trial	1.06 ± 0.62		

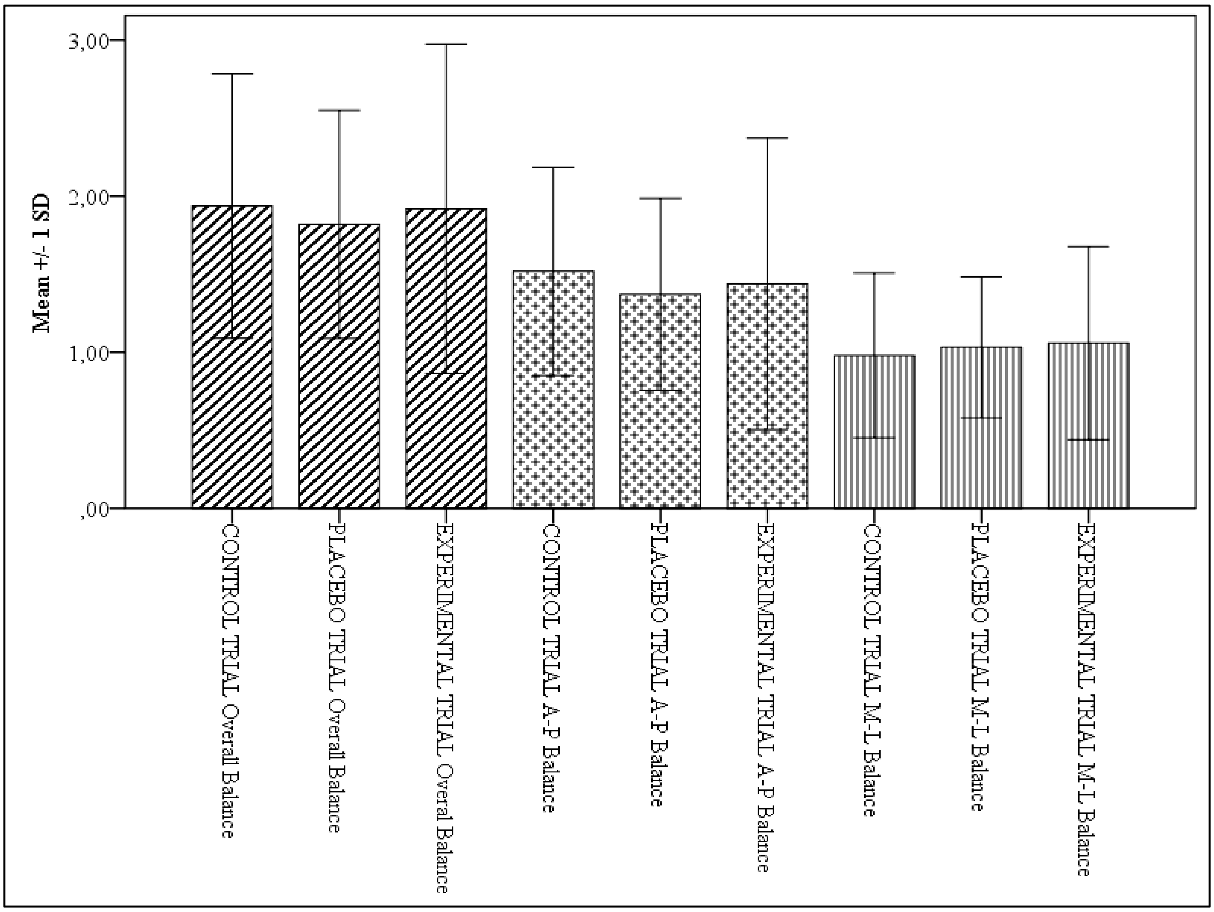

Figure 1: Balance values between trials
(A-P = Anterior-posterior; M-L = Medial-lateral; SD = Standard deviation)

4. Discussion

In our study, changes in anaerobic exercise and dynamic balance performance were investigated acutely. Although there was a decrease in balance performance in both placebo and experiment, this change was not statistically significant.

Increased or decreased balance performance with acute anaerobic exercise and warming or fatigue effect is expected result (Özdal, 2015). It is known that fatigue in the flexor and extensor muscles of the lower extremity joints results in an increase in both medial-lateral and anterior-posterior planes of oscillation, resulting from the slowing of efferent signal production required for stability as a result of reduced afferent signaling due to fatigue (Mahmood et al., 2017, Gribble and Hertel, 2004, Gribble et al., 2004, Nardone et al., 1997, Johnston et al., 1998, Rozzi et al., 1999). In addition, muscle fatigue causes proprioceptive and kinesthetic impairments in the joints, resulting in increased muscle spindles discharge threshold due to reduced afferent signal transmission following fatigue and this will result in a change in joint sensitivity (Gandevia, 2001).

From the perspective of muscle fatigue, the result is that not only at the level of muscle but also because the central nervous system cannot perform enough motor-drive, the reduction and deterioration of anticipated return from the sense of joint position are the main effects (Gandevia, 2001, Lepers et al., 1997, Seliga et al., 1991, Forestier et al., 2002). The situation mentioned was the possible reasons for the fatigue end result. In addition, warming effects could also occur with anaerobic exercise, which could be shown as decrease in joint stiffness (Wright and Johns, 1961), increase in neurotransmission rate (Karvonen and Lemon, 1992), change in power-acceleration relationship (Ranatunga et al., 1987) and increase in glycolysis / phosphate breakdown (Febbraio et al., 1996).

However, the above-mentioned Cinstein results have not been observed in our study. As a result of the dynamic balance performance not changing in the anaerobic exercise result, general warming in both control and placebo and test applications before equilibrium test may have resulted in similar results in all applications. The reason for not experiencing fatigue during the experiment is that it is caused by the application of a load of 5% due to the age range of the applied group being 13-15.

As a result, anaerobic exercise affects dynamic balance performance with warming effect but it can be said that anaerobic exercise applied with 5% load in young men aged 13-15 years does not have a different effect than general warming.

References

1. Adams, G. M. (2002) *Exercise physiology, laboratory manual*. New York: McGraw-Hill company
2. Bar-Or. (1987) The Wingate anaerobic test: an update on methodology reliability and validity. *Sports Medicine*; 4:381-394.

3. Bosco, C., Komi, P.V., Tihanyi, J., Fekete, G., Apor, P. (1983) Mechanical power test and fiber composition of human leg extensor muscles. *Eur. J. Appl. Physiol*; 50:273-282.
4. Cecel E, Kocaoğlu S, Güven D, Okumuş M, Gökoğlu F, Yargancıoğlu R. Geriatrik hastalarda denge, yaş ve fonksiyonel durum ilişkisi. Turkish Journal of Geriatrics, 2007; 10(4): 169-172.
5. Febbraio MA, Carey MF, Snow RJ, Stathis CG, Hargreaves M. Influence of elevated muscle temperature on metabolism during intense, dynamic exercise. Am J Physiol Regul Integr Comp Physiol. 1996;271(5):R1251-R1255.
6. Forestier N, Teasdale N, Nougier V. Alteration of the position sense at the ankle induced by muscular fatigue in humans. Medicine and Science in Sports and Exercise, 2002;34(1):117-122.
7. Gandevia SC. Spinal and supraspinal factors in human muscle fatigue. Physiological Reviews, 2001;81(4):1725-1789.
8. Gribble PA, Hertel J, Denegar CR, Buckley WE. The effects of fatigue and chronic ankle instability on dynamic postural control. Journal of Athletic Training, 2004;39(4):321-326.
9. Gribble PA, Hertel J. Effect of lower-extremity muscle fatigue on postural control. Archives of Physical Medicine and Rehabilitation, 2004;85(4):589-592.
10. Gündüz N. Antrenman Bilgisi. İzmir, Saray Tıp Kitapevi, 1998; 193-194.
11. Inbar, O., Bar-Or, O. (1986) Anaerobic characteristics in male children and adolescents. *Medicine and Science in Sport Exercise*; 18: 264-269
12. Johnston 3rd RB, Howard ME, Cawley PW, Losse GM. Effect of lower extremity muscular fatigue on motor control performance. Medicine and Science in Sports and Exercise, 1998;30(12):1703-1707.
13. Karvonen J, Lemon PWR. Medicine in Sports Training and Coaching. Basel, Karger Pub.1992:190-213.
14. Lepers R, Bigard AX, Diard JP, Gouteyron JF, Guezennec CY. Posture control after prolonged exercise. European Journal of Applied Physiology and Occupational Physiology, 1997;76(1):55-61.
15. Mahmood MH, Özdal M, Mayda MH, Biçer M. Acute effects of anaerobic exercise with different intensities on dynamic balance performance. European Journal of Education Studies. 2017, 3(8), 357-370.
16. Muratlı S. Çocuk ve Spor Antrenman Bilimi Yaklaşımıyla. Ankara, Nobel Yayın Dağıtım, 2003; 197–219.
17. Nardone A, Tarantola J, Giordano A, Schieppati M. Fatigue effects on body balance. Electroencephalography and Clinical Neurophysiology / Electromyography and Motor Control, 1997;105(4):309-320.

18. Özdal M. Acute effects of aerobic and two different anaerobic exercises on respiratory muscle strength of well-trained men. European Journal of Sport and Exercise Science. 2015;4(4):7-12.
19. Özer DS, Özer K. Çocuklarda motor gelişim. Ankara, Nobel Yayınları, 2004; 125.
20. Ranatunga KW, Sharpe B, Turnbull B. Contractions of human skeletal muscle at different temperatures. J Physiol. 1987;390(1):383-395.
21. Rozzi SL, Lephart SM, Fu FH. Effects of muscular fatigue on knee joint laxity and neuromuscular characteristics of male and female athletes. Journal of Athletic Training, 1999;34(2):106-114.
22. Seliga R, Bhattacharya A, Succop P, Wickstrom R, Smith D, Willeke K. Effect of work loan and respirator wear on postural stability, heart rate, and perceived exertion. The American Industrial Hygiene Association Journal, 1991;52(10):417-422.
23. Wendy JC, Cachupe Bethany Shifflett, Leamor Kahanov & Emily H. Reliability of Biodex Balance System Measures, Measurement in Physical Education and Exercise Science, Wughalter 2001; 5:2, 97-108.
24. Wright V, Johns RJ. Quantitative and qualitative analysis of joint stiffness in normal subjects and in patients with connective tissue disease. Ann Rheum Dis, 1961;20(1):36-46.