THE EFFECT OF CONTINUOUS RUNNING AND FARTLEK TRAINING ON MAXIMAL OXYGEN CONSUMPTION CAPACITY

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ABSTRACT

The aim of study was to investigate the effect of continuous running and fartlek training on maximal oxygen consumption capacity. 10 healthy sedentary males, between 14-15 ages, have voluntarily participated the study. Participants was divided into 2 groups, groups of fartlek and continuous running have been formed. Endurance program, in which density and severity of load have been fractionally increased, has been applied for 45-60 minutes three times a week, three days in a week for a month. The maximal oxygen consumption capacity has been determined by applying 12 minutes run and walk test before and after the training program.

For statistical evaluation, Wilcoxson signed rank test has been used in comparison of the pre and post values of the same group's variables. And to compare differences between groups have been used with Mann-Whitney U test. Statically significant level was set at 0,05.

In the study, comparison of pre and post training $MaxVO_2$ values of continuous running group, it was determined that have an increase after the training but it was not statistically significant. On the contrary, it is determined that in the comparison of pre and post test values of fartlek training group, the increase after the training is statistically significant ($p<0.05$).

In conclusion, it has been founded that the maximal oxygen consumption capacity has increased in both training programs but the increase in the fartlek training group is higher.

Key Words: Adolescent, Continuous running, Training, $MaxVO_2$, Fartlek

SÜREKLİ KOŞULAR VE FARTLEK ANTRENMAN UYGULAMALARININ MAKSİMAL OKSİJEN TÜKETİM KAPASİTESİNE ETKİSİ

ÖZ

Sürekli koşular antrenmanı ile değişmeli koşular içeren fartlek antrenman yönteminin $MaxVO_2$ üzerine etkisinin araştırıldığı çalışmaya 14-15 yaş arası 10 sedanter erkek gönüllü olarak katılmışlardır. Katılımcılar iki guruba ayrılarak fartlek ve sürekli koşu antrenman grupları oluşturulmuştur. Guruplara yüklenme yoğunluğu ve şiddetinin kademeli olarak arttırıldığı koşu antrenmanları yaptırıldı. Antrenmanlar 1 ay süre ile haftada 3 gün, günde 45–60 dakika uygulanmıştır. Antrenman programlarından önce ve sonra 12 dakika koş-yürü testi uygulanarak maksimal oksijen tüketim kapasiteleri tespit edildi.

Elde edilen verilerin istatistik değerlendirmesinde, aynı gurubun antrenman öncesi ve sonrası değerlerinin karşılaştırılmasında Wilcoxson signed rank testi kullanıldı. Guruplar arasındaki farklara ise Mann-whitney U test ile bakıldı.

Yapılan çalışmada sürekli koşular gurubunun $MaxVO_2$ değerlerinin karşılaştırmasında son testte artış olmasına karşın bu artışın istatistiksel açıdan almalı olmadığı tespit edilmiştir. Diğer taraftan fartlek antrenman gurubunun son testinde görülen artışın istatistiksel açıdan anlamlı olduğu ($p<0.05$) tespit edilmiştir.

Sonuç olarak yapılan çalışmada her iki antrenman programının da maksimal oksijen tüketim kapasitesini arttırdığı ancak fartlek koşu antrenmanı yapan guruptaki artışın daha yüksek olduğu tespit edilmiştir.

Anahtar Kelimeler: Adolesan, Sürekli koşular, antrenman, $MaxVO_2$, Fartlek

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INTRODUCTION

In today's world, modern and developed countries are having a cutthroat competition in court in terms of both competition and prestige. Besides advertisement and plug, the psychological sides of this competition are crucial. Sport's becoming a giant sector pushes to find a new way, method and approach with the aim of attaining success in sporty preeminently in both national and international levels. This is the most used and debated method and approaches of training. In this context, sports scientists are in search of new and more effective exercises by comparing the applied methods.

Sportive performance can be defined as the whole of exerted effort for success during performance of athletic task to be done[25]. Although there are lots of factors affecting performance in sports, endurance remains in the forefront especially in long-distance running[1,3]. After all, many researchers frequently suggest endurance trainings with the aim of physical activity due to its benefits in preventing diseases and healing disease[2,8,9]. Besides preventing diseases, they emphasize the importance of exercise in increasing the life quality related to health and healing the diseases[9,12,14].

Maximal oxygen consumption ($MaxVO_2$) is the amount of oxygen (O_2) in highest rate which can be received and used by body during a maximal exercise. It is one of the most important factors that affect the aerobic power performance in branches of sports both requiring long, medium and short duration endurance and long and medium anaerobic endurance. For this reason, almost in all branches of sports, endurance trainings are considered as an important part of training plan especially in the beginning of the season. On the other hand, aerobic power has importance in terms of providing recovery in a shorter time in acyclic sports like football, basketball, tennis[6]. Furthermore, more oxygen consumption may have contributed to the cleaning of lactic acid, entering the oxidative phosphorylation process earlier in proportion to the increased amount of O_2 in cells[22]. The athlete's maintaining the effort in high severity has a strong correlation with maximal aerobic capacity. In order to deliver great performance in sports that require endurance athletes need to have a high oxygen consumption capacity. Maximal aerobic capacity is considered as the best criteria of cardiorespiratory endurance capacity or condition and it is known that respiratory and circulatory system works together[20].

Many studies defined the correlation between $MaxVO_2$ and aerobic performance. The higher maximal oxygen consumption capacity of an athlete is, the longer endurance capacity of him is. That's why, $MaxVO_2$ measurement is an important criterion in endurance performance[26]. Especially in untrained individuals' endurance trainings give rise to notably adaptation in operating muscle, blood volume increase, extra capillary, lower heart rate in exercise of the same severity, anaerobic threshold increase and increase in maximal oxygen consumption as a result of increasing oxygen stories[16,23]. During all stages of development; the required tissue compatibility for working in situations like oxygen deficiency, excessive carbon dioxide formation, accumulation of lactic acid showing up in training of the organism

emerges when the athlete exhausted. Continuous running training method in flat area is defined as work carried out without any interruption, but fartlek training unlike planned interval training, it is a condition with unplanned different tempo[6].

The aim of the conducted study is to analyze the effect of the continuous running and fartlek training on maximal oxygen capacity on sedentary people who have similar qualifications over the same training program.

METHOD

14 healthy sedentary male individuals between 14-15 ages have been taken into the study. Due to various negative situations during training, 4 participants have been eliminated from the study. After the participants controlled medical examination, the report of no inconvenience has been taken for them to participate in training. Parent permission form and form about attending of voluntary have been signed. Participants have been divided into two groups by randomized controlled trial. First group has formed the fartlek training group (FT), the second one formed the continuous running group (PT).

Endurance training load was applied to the gradual increase of the intensity and severity of the Group. The trainings have been conducted with the accompaniment of trainers for 45-60 minutes three times a week for a month. The continuous runnings have been applied in stadium and fartlek trainings have been applied in determined rough. Run durations and distances have been kept the same in both trainings. In the beginning of the trainings, warm-up stretching exercises have been done for 10-15 minutes. Resting heart rate of the participants was recorded in a seated position. Intensity of load has been determined based on this pulse. Participants' training intensity of load has been determined by observing exhaustion scale criterion in each trainings[7].

Cooper test has been applied with the aim of measuring the aerobic capacity pre and post- training program. MaxVo2 values of the participants have been calculated with Balke formula. ($MaxVO_2$ $^{ml/kg/min}$= 33,3+(X-150)x0,178 (X: distance in 1 min.)[13]

In the statistical evaluation of the gathered data, Wilcoxson signed rank test has been used in comparison of the pre and post values of the same group's variables, and to compare differences between groups have been used with Mann-Whitney U test. Statically significant level was set at 0,05.

RESULTS

Table 1. Descriptive Statistics of participants

Variables		Minimum	Maximum	Mean	Std. Deviation
Years	Fartlek Gr.	14.00	15.00	14.30	.55
	Continuous Gr.	14.00	15.00	14.78	.67
Height (cm)	Fartlek Gr.	156.00	170.00	164.60	5.37
	Continuous Gr.	145.00	167.00	156.00	10.51
Weight (kg)	Fartlek Gr.	47.00	60.00	54.00	4.74
	Continuous Gr.	48.00	61.00	54.60	4.72

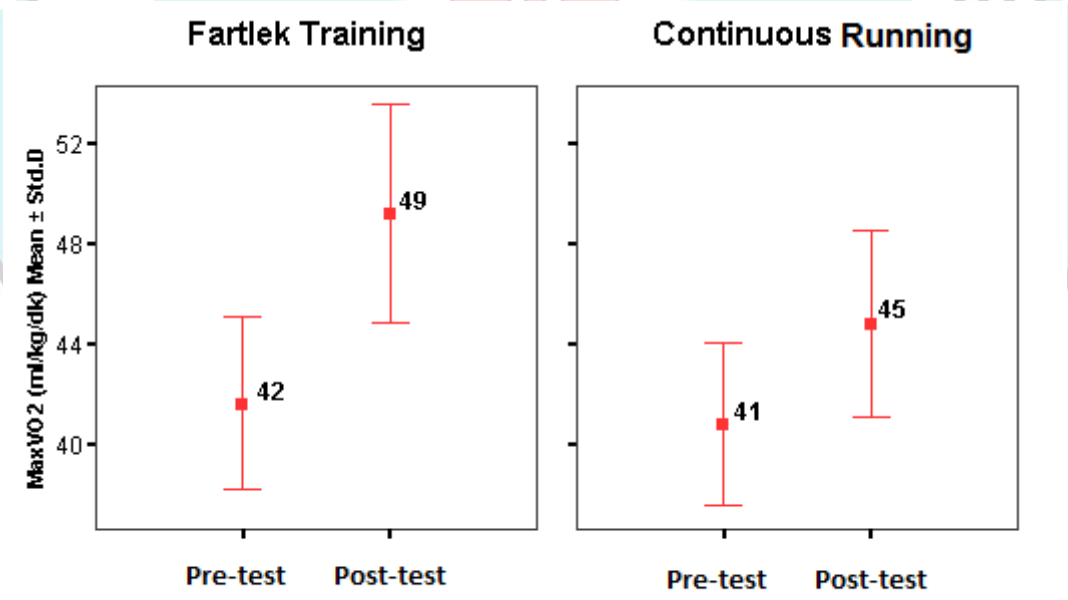
In the conduced study, it is stated that there is no significant difference among age, height and weight of the groups.

Table 1. Comparison of Pre and Post $MaxVo_{2(ml/kg77/min)}$ Values of Continuous and Fartlek Training

Variables	Time	Minimum	Maximum	Mean	S.D	z	p
Fartlek Gr.	Pre-Training	36.00	46.00	41.60	3.84		
	Post-Training	42.00	55.00	49.20	4.86	-2.023	.043*
Continuous Gr.	Pre-Training	36.00	44.00	40.80	3.63		
	Post-Training	40,00	50,00	44,80	4,14	-.736	.461

*p<0.05

In the conduced study, when analyzed the comparison of pre and post training $MaxVO_2$ values of continuous running group, it was determined that have an increase after the training but it was not statistically significant; on the contrary, it is determined that in the comparison of pre and post training values of fartlek training group, the increase after the training is statistically significant (p<0,05). In the study, it was determined no significant differences between the pre and post-tests of both groups, The difference between the post and pre-test measurements of the groups' values insignificant. But the increase of posttest in fartlek groups is statically significant than pre-test values.



Graphic 1. Comparison of Different Training Program

DISCUSSION

There are studies notifying that intensive interval training method generates substantial increase related to sportive performance[18,19]. After all, continuous run in continuous method (150-170 step/min) has been preferred as it increases both physiological adaptation and

psychological resistance by providing sustainability in its technique due to development of aerobic capacity and stability of output[6]. In a study, it is determined that continuous running and game form trainings have positive effect on football players' aerobic capacity and respiration parameters[21]. In a study conducted by Huttenrott and his friends (2012), high-intensity interval training and continuous running training's effect on active females and males' aerobic powers have been compared; and both training methods make similar impacts[15]. In a study conducted by Bartlett and his friends (2012), effect of high-intensity interval training and continuous running training on mitochondrial biogenesis have been analyzed and it is stated that both trainings methods make similar impacts[4]. But in our study, unlike in fartlek running method group $MaxVO_2$ increase around the %16.67, although the increase in continuous running group is around % 9. While the increase in continuous running group is not statistically significant, the increase in fartlek running group is statistically significant. Runs over with ups and downs terrain made it attempted to maintain the same tempo is being increase the density of loading in the areas where the slope is increased, causing the density to decrease in the areas where the slope is decreasing. This situation requires adaptation in the organism to the constantly changing stress situation. There are studies notifying that both training methods increase $MaxVO_2$[17,18,19]. After all, due to fartlek training's variable load effect on organism, there are studies reporting that it is a more efficient way[5]. However, it is stated that fartlek training combined with circular training have higher impact on endurance parameters more than absolute fartlek training and absolute circular training[24]. In a study conducted with middle aged sedentary people, fartlek trainings have higher impact on resting pulse and respiratory parameters[11]. In another conducted study in which the effect of fartlek training on female athletes' oxygen consumption capacity and resting pulse, 12-weeks training process increases the oxygen consumption and it is stated that it causes meaningful decrease in resting heart rate.

In conclusion, in the conducted study, it is stated that both training program increase maximal oxygen consumption capacity but the increases in continuous running is not meaningful; however, the increase in fartlek run training group is significant.

REFERENCES

1. Aslan, A., Açıkada, C., Güvenç, A., Gören, H., Hazır, T., & Özkara, A. (2012). Metabolic demands of match performance in young soccer players. *Journal of Sports Science and Medicine*, *11*(1), 170-179.
2. Alpay, B., Altuğ, K., & Hazar, S. (2007). İlköğretim okul takımlarında yer alan 11-13 yaş grubu öğrencilerin bazı solunum ve dolaşım parametrelerinin spor yapmayan öğrencilerle karşılaştırılarak değerlendirilmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, *8*(17), 22-29. [In Turkish]
3. Álvarez-Herms, J., Julià-Sánchez, S., Hamlin, M. J., Corbi, F., Pagès, T., & Viscor, G. (2015). Popularity of hypoxic training methods for endurance-based professional and amateur athletes. *Physiology & behavior*, *143*, 35-38.
4. Bartlett, J. D., Joo, C. H., Jeong, T. S., Louhelainen, J., Cochran, A. J., Gibala, M. J., ... & Morton, J. P. (2012). Matched work high-intensity interval and continuous running induce similar increases in PGC-1α mRNA, AMPK, p38, and p53 phosphorylation in human skeletal muscle. Journal of applied physiology, 112(7), 1135-1143.
5. Begum, A., & Hussain, I. (2013). Effect of fartlek training on selected physical and physiological varialbles of inter district women athletes. International journal of creative research thoughts, 1(3).
6. Bompa, T. O. (2003). Dönemleme–Antrenman Kuramı ve Yöntemi.(2. Baskı). Çev. İ. Keskin ve Ark. Ankara: Bağırgan Yayımevi. [In Turkish]

7. Borg, G. A. (1982). Psychophysical bases of perceived exertion. Med sci sports exerc, 14(5), 377-381.
8. Buchner, D. M., Cress, M. E., de Lateur, B. J., Esselman, P. C., Margherita, A. J., Price, R., & Wagner, E. H. (1997). The effect of strength and endurance training on gait, balance, fall risk, and health services use in community-living older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *52*(4), M218-M224.
9. *Burgomaster KA, Howarth KR, Phillips SM, Rakobowchuk M, Macdonald MJ, McGee SL & Gibala MJ (2008). Similar metabolic adaptations during exercise after low volume sprint interval and traditional endurance training in humans. J Physiol 586, 151–160.*
10. Eleckuvan, M. R. (2014). Effectiveness of fartlek training on maximum oxygen consumption and resting pulse rate. International Journal of Physical Education, Fitness and Sports, 3(1), 85-88.
11. Fahmi, B. S., Omar, A. H., & Hamid, D. T. A. (2014). The Effects Of Fartlek Training In Improving Cardiorespiratory Fitness Among Elderly. *MoHE 2014*.
12. *Gibala MJ & McGee SL (2008). Metabolic adaptations to short-term high-intensity interval training: a little pain for a lot of gain? Exerc Sport Sci Rev 36, 58–63.*
13. Günay, M., Tamer, K., & Cicioğlu, İ. (2010). *Spor fizyolojisi ve performans ölçümü*. Gazi Kitabevi. [In Turkish]
14. *Hood MS, Little JP, Tarnopolsky MA, Myslik F & Gibala MJ (2011). Low-volume interval training improves muscle oxidative capacity in sedentary adults. Med Sci Sports Exerc 43, 1849–1856.*
15. Hottenrott, K., Ludyga, S., & Schulze, S. (2012). Effects of high intensity training and continuous endurance training on aerobic capacity and body composition in recreationally active runners. *Journal of Sports Science and Medicine*, *11*, 483-488.
16. Kubukeli, Z. N., Noakes, T. D., & Dennis, S. C. (2002). Training techniques to improve endurance exercise performances. Sports Medicine, 32(8), 489-509.
17. Kurz, M. J., Berg, K., Latin, R., & Degraw, W. (2000). The Relationship of Training Methods in NCAA Division I Cross-Country Runners and 10,000-Meter Performance. The Journal of Strength & Conditioning Research, 14(2), 196-201.
18. Laursen, P. B., & Jenkins, D. G. (2002). The scientific basis for high-intensity interval training. Sports Medicine, 32(1), 53-73.
19. Laursen, P. B., Shing, C. M., Peake, J. M., Coombes, J. S., & Jenkins, D. G. (2005). Influence of high-intensity interval training on adaptations in well-trained cyclists. The Journal of Strength & Conditioning Research, 19(3), 527-533.
20. Leger, L., Aerobic performance, In: Docherty D, editor., Measurement in pediatric exercise science, Champaign, IL: Human Kinetics Pub., 183-223, 1996.
21. Patlar, S. (1999). Futbolcularda sürekli koşular ile oyun formunun dayanıklılık ve solunum parametrelerine etkisi (Doctoral Thesis), Selçuk Üniversitesi Sağlık Bilimleri Enstitüsü. [In Turkish]
22. Polat M, Hazar S, Keskin A (2016). The Effects of Extra Ventilation after Exercise on Recovery Process. Studies on Ethno-Medicine, 10 (2), 119-124
23. Revan, S., et al. "Sürekli ve internal koşu antrenmanlarının vücut kompozisyonu ve aerobik kapasite üzerine etkileri." SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi 6 (2008): 193 [In Turkish]
24. Sankar, M., & Suthakar, S. (2016). Journal of Recent Research and Applied Studies. Vol 2, No 3. 37-38
25. Sevim, Y. (1992). Antrenman Bilgisi Ders Notları. Gazi Büro Kitabevi, Ankara. [In Turkish]
26. Viru, A., & Viru, M. (2000). Nature of training effects. Exercise and sport science, 67-95.