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# The Effects of Two Tapering Methods on Physical and Physiological Factors in Amateur Soccer Players

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**Abstract:** The purpose of this study was to compare the effects of two types of tapering on some physical and physiological factors in amateur soccer players. 20 soccer players of Khoramabad amateur league (mean±SD, age 23.2±3.59 yr¡ height 177.7±5.39 cm¡ body mass.71.95±6.93 kg and $Vo_2max$ 44.29 ml.kgG$^{1}$. minG$^{1}$) participated in this study. Subjects participated in 8 weeks of physical training, 3 sessions per week. After 8 weeks of training, some physiological parameters including aerobic power, anaerobic threshold, strength and flexibility were determined and the subjects were divided into two groups based on these physiological measurements. These measurements were as pretest, which were followed by 10 days of tapering. During 10 days of tapering, the subjects in both groups reduced their training volume by 75% and 50%. After this period, the physiological parameters were measured again (posttest). Data were analyzed using SPSS software version 11.5 and the independent t test was used to compare the data for two groups ($P<0.05$). Results showed that both tapering programs had significant increases in strength, flexibility, aerobic power and anaerobic threshold ($P<0.05$). The tapering with higher reduction in the volume (75%) resulted in higher increases in strength. Although the changes in aerobic power and anaerobic threshold were higher in the group with higher tapering, there were no significant differences between two groups ($P<0.05$). This research suggested that tapering after an intensive exercise period and before competition can be useful for athletes. Therefore, it could be suggested that tapering with high volume of reduction in training might be useful for those sports and activities for which strength is an important component.

**Key words:** Tapering % Aerobic power % Anaerobic threshold % Strength % Flexibility

## INTRODUCTION

Studies show that regular trainings are performed in order to increase body's tolerance or attain a certain level of physical fitness against high intensity physical activities [1]. For this purpose, coaches make appropriate planning for training which could improve athletes' general and specific physical fitness through applying scientific methods. They should also provide effective individual and group plans to prepare athletes and champions by means of scientific findings so that they could reach their maximum performance level for certain prescheduled competitions in the shortest time possible through developing physical, psychological, skilled and physiological preparations specific to each sport [2].

Appropriate planning for physical fitness especially during the period leading to competitions is considered to be one of the factors important for athletes' success. Like physical factors, sporting skills play a key role for athletes to achieve victory [3]. The physical fitness attained is considered an important asset both for athlete and coach and demands great effort to maintain. As it is necessary for athletes to be in their peak performance level in competitions season, most coaches insist a lot on performing training just before competitions in order to compensate for their insufficient familiarity with the subject, which could decrease the athletes' physical fitness and ultimately give rise to their low performance level. Although gradual tapering is practiced worldwide in many sports, particularly in individual sports, a great number of coaches are still afraid of reducing the training volume prior to major sports events and presume that it may harm athletes' physical fitness and reduce their performance level. Optimum performance requires tolerance against mental and physical pressures caused as a result of physical activities. And this comes when the power of muscles and consequently functional capacity of athletes is reduced during high intensity training

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period. That is why athletes reduce the volume of training before the competitions to reach their ideal physical and mental conditions. Decreases in the training volume in this period let the damaged fibers (overuse through high intensity training) prepare and body energy sources replace [4]. Reducing the training volume is related to a period (tapering) usually few weeks before the competitions [1, 5]. Within a period of balancing the training sessions in order to attain the best performance and maintain physical and mental capabilities, different variables could be foreseen. These variables include repetitions, volume, intensity, duration and method of training [6, 7]. Based on Bompa and Hoper (2003) findings, the best variable, the reduction of which has optimal effects on athletes' performance is reduction of training volume [6]. Researches done on swimmers, cyclists and runners revealed that reduction of training volume not only decreases athletes' physical fitness but also improves muscle power, mental attitude as well as sporting performance [1, 5]. There exists numerous researches indicating that balancing and reducing the training volume one to three weeks before the competitions results in ideal exercise performance [7-9]. Homard *et al*. (1991) proved that endurance athletes can maintain their aerobic power by reducing the training volume to 70%-80% within a period of 10-28 days [5]. Zarkadas *et al*. (1994) showed that two periods of reduction in the number of training sessions, one in the middle of the season for 10 days and another, after few weeks from the first set for 13 days, increase power and anaerobic threshold in triathlon athletes. In another research, by 30% and 50% decrease in the training volume instead of reducing the number of training sessions, he showed that aerobic power and anaerobic threshold increased 50% in the group that reduced the training volume [6]. In another study, Conell *et al*. (1997) found that a 4-week period of reduction in training volume and intensity, aerobic power and anaerobic threshold maintained [8]. Another research conducted by Neary *et al*. (2003) showed that reduction of training volume for respectively 30%, 50% and 80% within a period of seven days maintained the aerobic power in athletes [9]. A research by Papoti *et al*. (2006) on swimmers revealed that 10 days of reduction in training volume increased aerobic power and anaerobic threshold by 65% [10]. Coutts *et al*. (2006) also came up with the result that reduction of training to seven days resulted in an increase in flexibility of chest and abdomen as well as power of rugby players [11]. Trappe *et al*. (2001) and Trinity *et al*. (2006) in their work came to conclusion that reduction of training volume leads to an increase in power especially in type IIa muscle fibers of swimmers [12, 13]. Many researches have been carried out on balancing training level within the past few decades. However, it is difficult to come to a general conclusion because of great number of physical and physiological factors involved in athletes' performance [14-16]. Besides, little information is available on the effect of gradual tapering on sporting performance of athletes in team sports namely football, volleyball, basketball and …) and endurance sports like cycling and marathon. Therefore, it is proposed that more extensive research be conducted before planning for athletes' preparations in such sports (team events) [4]. In this research, it was attempted to find out if balancing the training level by reducing the training volume for 75% and 50% within 10 days leaves any effects on certain physical or physiological factors of amateur football players. There remains another issue under discussion as to which of the methods mentioned is more effective? And whether the performance level of athletes undergoes any changes after training?

## MATERIALS AND METHODS

**Subjects:** Subjects in this research consisted of 20 amateur soccer players (mean age 23.2±3.59 yr, height 177.7±5.39cm and weight 71.95±6.93 kg) of Khoramabad city, Iran.

**Method of Research:** The subjects submitted their written consent forms for participation in this research after being fully informed of the procedure and probable risks involved. Prior to this research, they participated in a training program for three months, 3 sessions a week on average and after 8 weeks of regular preplanned training and undergoing pretests [Cooper test to measure aerobic power, Conconi test to measure anaerobic threshold, special dynamometer (BASELINE) to measure the power of leg muscles and a sit and reach test to measure flexibility]. The subjects were divided into two identical groups and underwent tapering (including 10 days of reduction in training volume by 75% for the first group and 50% for the second group with similar intensity for both groups). At the end of tapering period, both groups underwent posttests.

**Tools and Tests:** In order to determine the subjects' VO2max, Cooper standard test was administered. After warming up for 10 minutes, the subjects started running on the track for 12 minutes on an optional basis and at the end, their VO2 max was calculated based on the following formula:

Table 1: Comparison of changes in aerobic power, anaerobic threshold, muscular strength and flexibility in two groups with 50% and 75% reduction of training volume

| | | Statistics | | | | |
|---|---|---|---|---|---|---|
| Variable | | 0 | SD | t | df | P |
| Changes of aerobic power) ml/kg/min) | 50% reduction of training volume | 0.86 | 0.96 | 1.314 | 18 | 0.205 |
| | 75% reduction of training volume | 1.41 | 0.92 | | | |
| Changes of anaerobic threshold (b.min) | 50% reduction of training volume | 1.10 | 0.88 | 0.983 | 18 | 0.339 |
| | 75% reduction of training volume | 1.60 | 1.35 | | | |
| Changes of muscular strength (kg) | 50% reduction of training volume | 9.10 | 8.37 | 2.136 | 18 | 0.047 |
| | 75% reduction of training volume | 17.90 | 9.98 | | | |
| Changes of flexibility (cm) | 50% reduction of training volume | 1.40 | 1.17 | 0.387- | 18 | 0.703 |
| | 75% reduction of training volume | 1.20 | 1.14 | | | |

$$VO2max = \frac{\text{Distance covered in Meter - 504.9}}{44.73}$$

In order to measure anaerobic threshold, Conconi test was used in laboratory method on a treadmill. At the beginning, the subjects had 5 to 10 minutes of warm-up and then underwent the test on the treadmill which came to its end by recording their data.

**Conconi Test:** The subject started running with an initial speed of 8 km per hour with an increase of speed of about 0.5 km/r for each 200 meters. The time spent and the heart rate at the end of each 200 meters was registered. The test was performed in a distance range of about 2.5 to 4 km and continued as long as the subject was able to increase his speed after covering 200 meters. In this test, the appeared score on the chart determined the subject's anaerobic threshold.

To measure the range of motion in hip joint, sit and reach test was applied. At first, the subjects sat against the box with their legs and knees stretched and with their palms downwards equal to their shoulder width, bent forward and moved their hands forward so as to touch the spot in the middle of the ruler and pause. This action was done for three times and the best result was recorded on the score sheets.

**The Implementation of Tapering Program:** The program included 10 days of reducing the training volume by 75% for the first group and 50% for the second group with constant intensity for both groups in such a way that the subjects first had 8 weeks of regular training subsequent to which they underwent pretests and were divided into two groups based on strength and aerobic power. Then, the training volume was reduced for 10 days and at the end of the tapering period, posttests were carried out.

**Statistical Analysis:** In this research, descriptive statistics (mean and standard deviation) was used to describe data and for the research hypotheses and data comparison of two groups, t test was designed for independent groups and for data comparison between pretests and posttests in groups, dependent t test with significant level of $p<0.05$ was used.

## RESULTS

The results showed no significant differences in pretest between the two groups. This means that these two groups were similar in four variables of aerobic power, anaerobic threshold, muscle strength and flexibility. After comparing pretest and posttest and clarifying that reduction of training volume to 50% and 75% affected aerobic power, anaerobic threshold, strength and flexibility, the effect of comparing these two methods on the measured variables came into consideration.

Table 1 showed that there was no significant difference in aerobic power between the two groups. In other words, there was no significant difference between the effects of 50% and 75% reduction of training volume ($p=0.205$, $df=18$, $t=1.314$) (Fig. 1).

In Table 1, the results indicated no significant difference in anaerobic threshold between the two groups. In other words, there was no significant difference between the effects of 50% and 75% reduction of training volume ($p=0.339$, $df=18$, $t=0.983$) (Fig. 2).

Results in Table 1 showed that the effect of 75% reduction of training volume on muscle strength was significantly higher that 50% reduction in training volume ($p=0.047$, $df =18$) (Fig. 3).

Based on Table 1, it was concluded that there was no significant difference between the effects of 75% and 50% reduction of training volume on flexibility level. However, the effect of 50% reduction of the training volume was higher than the effect of 75% reduction of the training volume. ($p=0.703$, $df=18$, $t=0.387$) (Fig. 4).

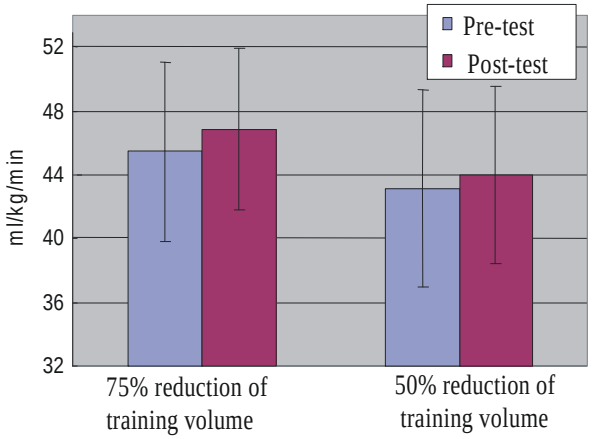


Fig. 1: Changes of Vo2 max in two groups with reduction of training volume

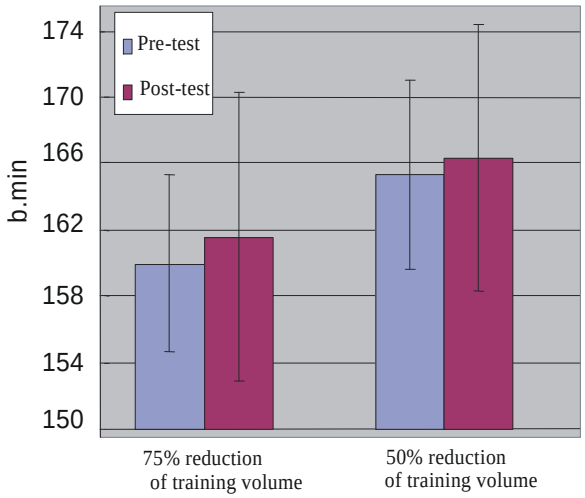


Fig. 2: Changes of anaerobic threshold in two groups with reduction of training volume

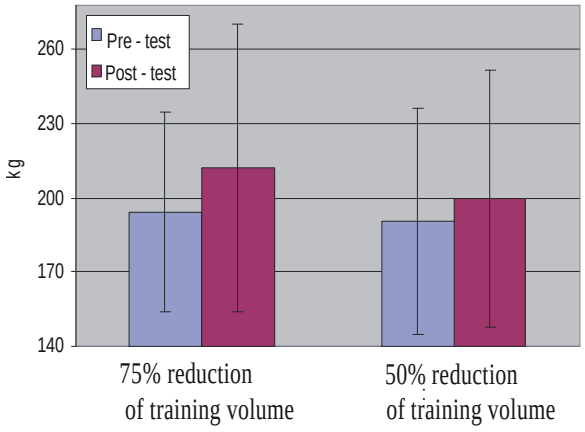


Fig. 3: Changes of muscular strength in two groups with reduction of training volume

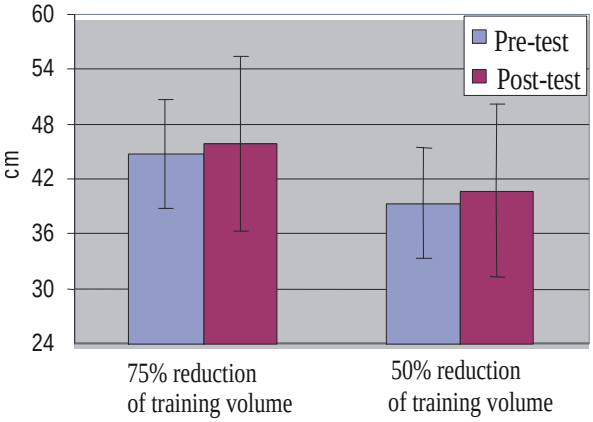


Fig. 4: Changes of flexibility in two groups with reduction of training volume

## DISCUSSION AND CONCLUSION

Results showed that 10 days of reduction in training volume for 50% and 75% leads to a significant increase in aerobic power. Although increase of aerobic power was higher in reduction of training volume for %75, its difference was not significant. This issue was the same as results proved by Hickson *et al*. (1982) [15], Zarkadas *et al*. (1995) [7], Zarkadas *et al*. (1994) [6] and results of Noofer *et al*. [17] and Homard *et al*. (1991) [5] which indicated maintaining this factor. This issue was not in line with results of Neary *et al*. (2003) [9] and Conell *et al*. (1997) [8] which showed that it was not possible for this factor to change as a result of reduction of training volume. It is likely that similar duration of tapering period, reduction of training volume as well as the time spent for preparatory training in researches in which results are the same as the present research are considered as reasons for similarity of results. On the contrary, long time of tapering period (four weeks) in studies where results are not the same as the present study might have ruined the increasing factor of tapering and probably despite an increase in aerobic power within an average period of time, continuation of tapering stage of training has become the factor in question. The reason why this amount of reduction in training volume is enough to affect aerobic power could be related to return of hemoglobin as a result of reduction in training volume and reaching its normal level after high intensity exhaustive training [8], release from muscle fatigue and more muscle efficiency for oxygen intake after tapering [7]. Likewise, positive reactions of blood factors namely creatine kinase, hemoglobin, hematocrit and blood volume as a result of tapering could be considered as another reason why

reduction in training volume affects aerobic power [18]. It is worth mentioning that high reduction of training volume further affects aerobic power. If the reduction ranges of these two programs were longer, there would be this probability tht we observed a significant difference in the effects of two reductions on aerobic power.

Results obtained from statistical analysis of data indicated a significant effect of reduction in training volume (50% and 75%) on anaerobic threshold which are similar with the results of studies conducted by Zarkadas *et al*. (1994) [6], Zarkadas *et al*. (1995) [7], findings by Papoti *et al*. (1995) [10] in freestyle swimming of 100 meters, 200 meters and 600 meters and findings by Noofer *et al*. (1987) [17] with tapering of 3 to 1 training sessions per week, but in contradiction to the results obtained by Papoti *et al*. (2006) [10] which showed no significant difference in anaerobic threshold after tapering program for 300 meters and 400 meters freestyle swimming as well as with findings by Noofer *et al*. (1987) [17] which had no activity during their tapering period. It seems that this amount of reduction in volume of training within a period of 10 days leaves a positive effect on anaerobic threshold. Studies show that more prepared people from aerobic power aspect reach OBLA point later than others and consequently can do more activities with higher intensity [5]. With this assumption, one can conclude that there is a direct correlation between two variables of aerobic power and anaerobic threshold. As a result, increase of aerobic power followed by tapering could somewhat affect anaerobic threshold. As mentioned before, the reasons why the results of studies conducted are similar with the present research are the similarity of training periods as well as the amounts of reduction in training volume whereas results obtained from 300 and 400 meter swimmers are not the same; the reason may be swimming as an aerobic system as well as the long period of tapering which are the reasons for the lack of effect of tapering on anaerobic threshold.

This research indicated that the effect of high reduction of training volume on muscle power is significantly more than average reduction of training volume which is similar with the results of research conducted by Scot Trappe *et al*. (2006) [19], Trappe *et al*. (2000) [12] and Neufer *et al*. (1987) [17] to the effect that reduction of training volume may result in a significant increase in muscle power considering that long training period reduces the size of fast twitch and slow twitch muscle fibers [8] and tapering changes muscle fibers contraction. Thus, seemingly by means of tapering, type Iia muscle fibers are more affected than type I. The increase in size, power, intensity and power in type IIa muscle fibers may be accountable for an increase in overall strength and power of muscle after reduction in training volume [6]. As for further effect of high reduction of training volume in relation to average reduction, it has to be claimed that the reasons which could give rise to such better results are probably enough time for recovery and curing muscle injuries [11]. On the whole, to name a few reasons for the increase of muscle power after reduction of training volume following high intensity exhaustive trainings, we may refer to the existence of damaged fibers which are repaired, replacement of required energy reservoir [9], increase in the number of IIa muscle fibers [8] as well as a significant increase of testosterone hormone coupled with tapering after high intensity exhaustive trainings which has ultimately created muscle strength with tapering.

The comparison of high and average reduction of training volume on flexibility showed that there was no significant difference in the effects of tapering on flexibility between these two programs. Of course, the effect of average reduction of training volume on flexibility was more remarkable. The results of these studies are in line with results of Kats *et al*. (2006). It is likely that similarity of tapering period as well as physical fitness training period of the present research with research done by Kats accounts for identical results of study. Flexibility reduces faster than other factors as a result of detraining [4]. As the reduction in training volume was 75% more than preplanned training sessions, therefore, the duration of flexibility training was excessively reduced and hence had less effect. It is more likely that lack of significant difference in 75% and 50% reduction of training volume on flexibility is the identical tapering volume in these two programs. According to what was mentioned, it could be claimed that tapering after a high intensity training period for recovery and creating positive changes in aerobic power, anaerobic threshold and flexibility is useful. Of course, as mentioned before, further reduction of training volume has more significant effect on muscle strength. Likewise was the effect on anaerobic threshold and aerobic power but not significant and average reduction of training volume had more effect on flexibility which was significant.

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## REFERENCES


1. Santhiago,V., S.R. Dasilva and C. Alexander, 2006. Effects of taper in some hormonal and biochemical overtraining markers in high performance swimmers. Med. and Science in Sports and Exercise., 38(5): 237.
2. Joseph, A., R. Houmard and Anderson 1994. Effects of taper on swim performance practical implication. J. Sport Med., 17(4): 224-232.
3. Mujika, I., S. Padilla, D. Pyne and T. Busso, 2004. Physiological changes associated with the pre-event taper in athletes. Sports Med., 34(13): 891-927.
4. Vollaard, N.B., C.E. Cooper and J.P. Shearman, 2006. Exercise-induced oxidative stress in overload training and tapering. J. Med. and sci. in sports and exercise., 38(7): 1335-1341.
5. Houmard, J.A., 1991. Impact of reduced training on performance in endurance athletes. Sport Med., 12(6): 380-393.
6. Zarkadas, Peter, 1994. Optimizing performance in triathletes, Simon Fraser University (Canada), Publication Number AAT MM06878.
7. Zarkadas, P.C., G.B. Garter and E.W. Banister, 1995. Modeling the effect of taprt on performance, maximal oxygen uptake and Advances in Experimental Medicine and Biol., 393: 179-86.
8. Conell, Mc., G.K. Costill, D.L. Widrick, J.J. Hickey, M.S. Tanaka and P.B. Gasthn, 1997. Reduced training volume and intensity maintain aerobic capacity but not performance in distance runners. J. Sports Med., 14(1): 33-7.
9. Neary, J., T. Martin, H. Quinney and P. Arthur, 2003. Effects of taper on endurance cycling capacity and single muscle fiber properties. Med. and science in Sports and Exercise, 35(11): 1875-1881.
10. Papoti, M., A.M. Zagatto, A. Cunha Sergio and B. Eduardo, 2006. Effects of taper on critical velocity, anaerobic work capacity and distance performance in trained swimmers. Med. and Science in Sports and Exercise., 38(5): 234-235.
11. Coutts, A., P. Reaburn, T.J. Piva and A. Murphy, 2006. Changes in selected biochemical, muscular strength, power and endurance measures during deliberate overreaching and tapering in rugby league players. J. Sports Med., 28(2): 116-124.
12. Trappe, S., D. Costill and R. Thomas, 2000. Effect of swim taper on whole muscle an single muscle fiber contractile properties. Medicine and Science in Sports and Exercise., 32(12): 48-56.
13. Trinity, Joeld. Pahnke, Matthew D. Coyl and F. Edward 2006. Effect of taper duration on the time course for changes in maximal power of elite female swimmers. Medicine and Science in Sports and Exercise., 38(5): 246.
14. Fitz, J.R., R.H. Clark and E.W. Banister, 1991. Optimizing athletic performance by influence curves. J. Applied Physiol., 71(3): 1151-1158.
15. Hickson, R.C., C. Kanakis, J.R. Davis, A.M. Moore and S. Rich, 1982. Reduced training duration effects on aerobic power, endurance and cardiac growth. J. of Applied Physiol., 53(1): 225-229.
16. Mujika, I., A. Goya, S. Paoilla, A. Grijalba, E. Gorostiaga and J. Ibanez, 2000. Physiological responses to a 6-d taper in middle-distance runners: influence of training intensity and volume. Medicine and Science in Sports and Exercise., 32(2): 511-517.
17. Neufer, P.D., D.L. Costill, R.A. Fielding and M.G. Flynn, 1987. Effect of reduced training on muscular strength and endurance in competitive swimmers, medicineand science in sport and exercise. 19(5): 486-90.
18. Laurent, B., M. Jonathan, A. Denis and M. Inigo, 2007. Effects of tapering on performance a meta-analysis. Medicineand science in sportsand exercise. 39(8): 1358-1365.
19. Trappe, S., M. Haeber, R.P. Gollaghe and D. Whitsett, 2006. Single muscle fiber adaptation with marathon training. J. App. Physical., 101: 721-727.