The Effect of 8 weeks Detraining on Static and Dynamic Muscle Endurance

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Abstract

The purpose of this study was effect of 8 weeks detraining on the static and dynamic muscle endurance, on upper and lower body in students. Maintain the consistency of practice and continuing to improve the compatibility of them in different seasons of racing is important concern of the coaches and athletes in various sports. In this study, all physical education students who had passed physical fitness lesson participated in 8 weeks isometric and isotonic endurance training. Before the training was used for homogenization Beck physical activity questionnaire and finally, the 27 student volunteers participated in the experiment. The dependent T test was used to analyze the data. All statistical operations are significant in alpha 5% and 95% confidence interval. The results of this study showed that the dynamic and static muscle strength after 8 weeks of detraining significantly reduced. Average dynamic upper body muscular endurance reduced from 94.6 ± 06.15 to 41.5 ± 12.13 after 8 weeks of detraining that represented significant difference (p <0.05). In the muscles of the lower body, muscular endurance reduced of 15.6 ± 68.25 to 24.13 ± 81.16 which showed significant decreased after 8 weeks of detraining (p <0.05). In upper body muscles was observed also reducing the static endurance from 88.17 ± 43.37 to 32.10 ± 18.31 (p <0.05). Static endurance, in lower body muscles after 8 weeks of detraining is decreased of 14.13 ± 25.57 to 06.20 ± 37.43, which indicates a significant difference (p <0.05). The negative effects of detraining on micronutrients, macronutrients, minerals such as calcium and magnesium, sex hormones such as estrogen, decreasing lipoprotein helpful and increasing harmful lipoproteins, decreasing aerobic enzyme activity and maximal oxygen consumption, reduction of liver enzymes, heart rate, systolic and diastolic blood pressure, reduce the diameter of the aortic end diastolic volume decreased aerobic capacity and muscular endurance.

Keywords: Detraining, Static endurance, Dynamic endurance, Upper trunk and lower trunk muscles, Students.

Introduction

Every athlete needs to exercise to achieve his purposes, whether he is a speed, endurance runner, a weight lifter and / or other sport fields, he should enjoy physiological and biochemical consistency obtained from training. Athlete's effort in the practice insures his / her success in future, according to this verse that for human, nothing is considered unless his / her effort. In training plans, consistencies occur in physical fitness factors, that these consistencies play an important role in purposes realizations in a sport field. At the same time, maintain consistencies obtained from training and continuing to optimizing these consistencies in pre-racing, racing, racing and post-racing seasons is one of the most important concerns of coaches and athletes in various sports, because if these consistencies which are obtained by regular training and in a long-term period, are suddenly are removed due to detraining, they should spend much time and do long-term practice to re-obtain these consistencies which leading losing much time and energy. Static and
dynamic endurance training is considered as one of the most important common methods to improve endurance, and strength in all sports.

Zarifi et al (2008) studied the effect of short- time detraining after endurance training in non-athletes male students. It was concluded that, in short-time detraining, regardless of strength, endurance practices and parallel practices has a similar trend. Incorporating endurance and strength practices does not result in any difference in maintain obtained consistencies however, long-term detraining effect should be studied. According to the findings of this research, short-time endurance detraining can be affect in eccentric strength or muscles sizes of type II or fast twitch. Also, during detraining, hormones changes may raise metabolism process. Studies indicated that decreasing in muscle activity to pre- training period was resulted from low intensity of movement in this period, because doing movements with maximum speed leads to maintain physiological consistencies due to training.

In a semi-empirical research performed a detraining period within 7 weeks, after 8 weeks training on exclusive strength and speed of athletes legs. When training is finished, they tested by speed and vertical jump tests, and then, 7 weeks detraining in running was enforced, and eventually, final test was held for three times. The results of research showed that there was a significant difference after 8 weeks training a 7 week detraining in athletes speed. But there was no significant difference in explosive strength of athlete’s legs.

Zarifi et al (2008) studied the effects of short-time detraining after strength, endurance and parallel practices on performance readiness and body composition in non-athletes male students. The results showed that reduction in the mentioned variables in short-time detraining regardless of strength, endurance and parallel practices had a similar trend. Incorporating endurance and strength trainings didn’t make any difference in maintaining obtained consistencies. However, long-term effects should be studied.

Researchers of National Strength and Conditioning Association in their studies on endurance athletes stated that after 84 days detraining, any change in enzymatic glycolytic activities was not observed, but about 6% reduction was revealed in aerobic enzymes activities. In fact, muscles capacities in anaerobic activities for longer time are maintained than their capacities in aerobic activities. This case can be almost explained that why endurance performance may be considerable decreased after 3 weeks detraining.

Bozorgzadeh and DabidiRoshan (2012) studied the effects of 4 weeks detraining following 12 weeks aerobic training on Alanine Aminotransferase (ALT), Aspartate aminotransferase (AST), Alkline phosphatase (ALP) and blood fats levels. Experimental analysis of ALT, ASL, ALP levels was performed by automatic analyzer and blood fats study was done by enzymatic method. In two groups, ALT, AST, ALP were significantly reduced after 4 weeks detraining compared to 6 and 12 weeks training (P = 0.001) but ALT and AST in both groups in detraining step were significantly higher than pre-test step. In addition, LDL-C values after 6 and 12 weeks continuity and intermittent aerobic training were significantly reduced compares to control group. Liver enzymes levels after 4 weeks detraining following 12 weeks aerobic training were significantly decreased. Additionally, after 6 and 12 weeks continuity and intermittent aerobic training, LDL-C levels were significantly reduced and HDL-C level were significantly increased compared to control group, C, was significantly increased (P = 0.001).

In training plans, some consistencies are occurred in physical fitness factors, that these consistencies play an important role in purpose realizations in a port field. At the, some time, maintaining consistencies obtained from training and optimal continuity of these consistencies in pre-racing and post-racing reason in one of the important factor for coaches and athletes in various sport fields; because these consistencies are obtained by regular training and in a long-term period. If it is agreed that after these efforts and spent time all these consistencies are suddenly removed by stop in training (Volunt are or involunt are), we should spend much time and perform long-term training to re-obtain these consistencies which leading time and energy losses. Improvement in physical fitness factors in physical training students in bachelor, as a fundamental and effective factor in other sport fields is a very important.

Methodology

The main purpose of this semi-empirical research was to study the effect of 8 weeks detraining after 8 weeks training on isometric and isotonic endurance in girl students in Nahavand University. Therefore, among all volunteer girl students who passed physical fitness lesson 2, after homogenization via back physical activity questionnaire and awareness of healthy in special diseases and muscular and structural disorders, 27 volunteer students participated in training plan. Students participated in an 8 weeks training plan, 3 times in a week for 45 min dynamic and static endurance and resistance training on upper and lower trunk muscles. In the end of this training plan, pre-test on isotonic and isometric muscular endurance of upper(Horizontal bar) and lower muscles (Scat) and after 8 weeks detraining, post-test were performed. First, forms are given and some information such as age, height, weight, special disease background and mass index of body was obtained. To measure body mass index, weight (kg) / height (m²) equation was used. To analyze data, T-test was applied. Before T-test, to test normality, Kolmogorov- Smirnov test was used. All statistical operations were significantly in alpha 5% and 95% confidence interval.
Results

Table 1, shows averages height, weight, and body mass index in students. From this table, average height was 162.12 ± 4.22 cm, average weight was 54.00 ± 4.9 kg and body mass index was 20.50 ± 1.63.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Pre test</th>
<th>Post test</th>
<th>p</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>Height(cm)</td>
<td>Weight(kg)</td>
<td>BMI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>162.12 ±4.22</td>
<td>54.00 ±4.09</td>
<td>20.50 ±1.63</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 indicates averages pre-test and post-test in dynamic and static endurance on upper and lower trunk muscles. Average of dynamic muscle endurance on upper trunk was reduced from 15.06 ±9.4 to 13.12 ±5.41 after 8 weeks detraining which indicates a significant difference. (P=0.031). On lower trunk muscles, muscle endurance was reduced from 25.68 ±6.15 to 16.81±13.24 which indicates a significant difference after 8 weeks detraining (P=0.016). Static endurance on upper trunk muscles was reduced from 37.43±17.88 to 31.18±10.32 which indicates a significant difference after 8 weeks detraining (P=0.024). Static endurance on lower trunk muscles was reduced from 57.22±13.14 to 43.37±20.06 which indicates a significant difference after 8 weeks detraining (P=0.028).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre test</th>
<th>Post test</th>
<th>p</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic muscle endurance on upper trunk</td>
<td>15.06 ±6.94</td>
<td>13.12 ±5.41</td>
<td>0.031</td>
<td>-1.27</td>
</tr>
<tr>
<td>Dynamic muscle endurance on lower trunk</td>
<td>25.68 ±6.15</td>
<td>16.81 ±13.24</td>
<td>0.016</td>
<td>2.72</td>
</tr>
<tr>
<td>Static muscle endurance on upper trunk</td>
<td>37.43 ±17.88</td>
<td>31.18 ±10.32</td>
<td>0.024</td>
<td>1.68</td>
</tr>
<tr>
<td>Static muscle endurance on lower trunk</td>
<td>57.22 ±13.14</td>
<td>43.37 ±20.06</td>
<td>0.028</td>
<td>2.42</td>
</tr>
</tbody>
</table>

Discussion and Conclusion

Current research results showed that dynamic and static muscle endurance after 8 week detraining was significantly reduced on upper and lower trunk muscles (P<0.05). The results of this research are consistent with studies that performed by Bozorgzadeh and DabidiRoshan (2012), zarifi et al (2008). But they are not consistent with studies performed by Vilmor et al (2002). Researchers in their study reported that after 84 days detraining was not observed any change in glycolytic enzymatic activities but about 0.06% reduction in aerobic activities of enzymes was revealed. In fact, muscles capacities for anaerobic activities for longer time are more maintained than aerobic activities. This case can almost explain that why athlete's records in speed fields don't indicate any change after 1 month detraining, but endurance performance abilities may be considerably reduced after 3 weeks detraining. The results of this study regardless of method are consistent with current research.

The effect of sever training on increasing liver enzymes has been shown, but the effect of detraining on these enzymes are not completely known. Studying the effect of 4 weeks detraining after 12 weeks aerobic training on ALT, AST, ALP enzymes and blood fats levels showed that these enzymes were significantly reduced after 4 weeks detraining and HDL values of liver enzymes levels were significantly reduced. The effect of 2 weeks detraining in CPK and LDH enzymes changes after gathering information from two processes, sampling blood and implementing statistical operation was observed, which 2 weeks detraining had a negative effect on CPK and LDH enzymes level. In addition, after 2 weeks detraining CPK and LDH enzymes levels in two groups showed a significant difference (Bozorgzadeh & DabidiRoshan, 2012).

Research (zarifi et al., 2008) in determining the effect of short-time detraining after endurance, resistance and parallel training on aerobic and anaerobic power of maximal power in untrained male students reported that reduction in the mentioned variables in short-time detraining regardless of resistance, endurance and parallel training has a similar trend. Combination endurance and resistance training did not lead to any difference in maintaining obtained consistencies. However, the effect of long-term detrain should be studied.

Estrogen is one of important gender hormones in women. In aerobic training, this hormone is increased. From this case, it can be concluded that detraining has a significant effect on endurance efficiency in girl athletes with effect on estrogen secretion level (Alijani & Gheibi, 2002). According to performed studies, detraining can considerably affect girl's performances due to its effect on cratin phosphate and lipid profile. During detraining, hormones changes may raise metabolism process (Fax & Matius, 1994). Dabidi Roshan and Ravasi (2010) observed a significant increasing in cratin phosphate after 4 weeks detraining. Phosphate cratin is an effective factor on speed performance increasing, and this factor has no considerable effect on resistance performance increasing. LeMura et al (2000) showed reduction in persistence performances in young women after 6 weeks detraining due to non-change or decreasing in suitable lipoprotein in their research groups.
Study on effect of 4 weeks detraining after 12 weeks continuity and intermittence aerobic training on reactant protein C with high sensitivity (HS-CRP) indicates insignificant increasing in HS-CRP during training and significant increasing within 4 weeks detraining. This difference in HS-CRP values after 6 and 12 weeks training and 4 weeks detraining was only significant in two training groups (Dabidi Roshan & Ravasi, 2010).

From these results, it can be said that continuity and intermittence aerobic training can control informed inflamed respond, and values for this index during detraining period were not affect by training type. Study the effect of resistance activity and then 1 period of detraining on peroxidation (MDA) and anti-oxidant device respond (FRAP, uric acid, Bili robins, protein) indicates that one period of endurance training does not result oxidation stress, although relative consistencies in anti-oxidation device were created (Gaeni, 2011). Harsen (1993) found that high magnesium ion in muscle, when athlete was tired plays’ a role in being tired during long-term training which is resulted from delay in releasing calcium from sarcoplasmic. In addition, changes in minerals and electrolytes can reduce persistence capacity. Also, considerable changes in resistance capacity without changes in maximal consumed oxygen are supposed.

In long-term aerobic training after detraining, main reduction in performance in maximal and sub-maximal training is occurred, one also, considerable reduction in maximum consumed oxygen and aerobic enzymes after 2 to 4 weeks detraining is observed (Gheysarbeigi, 2004). 8 weeks training compared to pre-training, doesn’t change the diameter of diastolic in left ventricle and insignificantly reduce the diameter of systolic in left ventricle; 4 weeks detraining after training didn’t change the diameter of diastolic in left ventricle and insignificantly increase the diameter of systolic in left ventricle. Insignificant reduction in the diameter of systolic in left ventricle after aerobic training indicates remaining blood volume reduction after systole in left ventricle and it was affected by voluminal overload activities over left ventricle (Oakley, 2001).

In addition, significant increasing in the diameter of systolic in left ventricle after 4 weeks detraining indicates return effects obtained from training on left ventricle near pre-training state. 8 weeks training compared pre-training, can significantly increase shortening of left ventricle muscles fibers and injection fraction level in left ventricle (Wisloff et al., 2007). 4 weeks detraining after training can significantly reduce shortening of fibers in left ventricle muscles and injection fraction level in left ventricle. Increasing in shortening fibers in left ventricle muscles ad injection fraction level may be affected by reduction in the diameter of systolic in left ventricle and / or increasing the diameter of diastolic in left ventricle after training and a systematic respond for shock volume increasing. Increasing in shortening of fibers in left ventricle muscles and injection fraction level in left ventricle shows better systolic performance in left ventricle after training and reduction in shortening of fiber in this muscle, and injection level reveals reduction in systolic performance after 1 period detraining.4 weeks detraining after training can significantly increase wall thickness between two ventricles, and insignificantly increase posterior wall thickness in left ventricle. In addition, detraining after training can insignificantly increase the diameter of left ventricle and insignificantly reduce the diameter aortic (Gaeni, 2011). Deteraining after training can insignificantly reduce heart rate and diastolic blood pressure and insignificantly increase systolic blood pressure. Insignificant reduction in the diameter of aortic, heart rate and diastolic end volume are considering factors of resistance performance reduction.

Therefore, it can be concluded that detraining can reduce endurance performance via negative effects on micro-nutrients, macronutrients, minerals such as calcium and magnesium, sex hormones such as estrogen, reduction helpful lipoproteins and increasing harmful lipoproteins, decreasing in aerobic enzymes activities, and maximal consumed oxygen, reduction of liver enzymes, heart rate, systolic and diastolic blood pressure, reducing the diameter of aortic and end diastolic volume.

References


