The Effect of 8 weeks Resistance Training with submaximal intensity on Muscle Fitness in 16-18 Years Old Male Soccer Players

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ABSTRACT

The purpose of the present research was to determine the effects of 8 weeks resistance training with submaximal intensity on Muscle Fitness in 16-18 Years Old Male Soccer Players. The research was quasi-experimental and the population consisted of all the 16-18 Years Old male soccer players. Twenty soccer players invited to a local team’s camp in Minudasht were selected as sample. The subjects were randomly divided into two groups—one experimental groups and a control group (Experimental group: 17.19±0.73 years, 59.49 ± 9.82 kg, 171.50 ± 6.93cm; and the control group: 17.40 ± 0.42 years, 52.64± 4.41 kg, 170.10 ± 6.93 cm). The independent variables of the research were 8 weeks resistance training with submaximal intensity and the dependent variables were lower-body muscle endurance, maximum lower-body strength and abdominal muscle endurance. First, the subjects took the pretest, and then the experimental group performed the selected exercises along with technical soccer exercises, while the control group only performed the technical soccer exercises for 8 weeks. Finally, all the subjects took the posttest. The obtained data were analyzed using descriptive and inferential (correlated t-test) statistics. The results showed that resistance training led to change in lower-body muscle endurance, maximum lower-body strength and abdominal muscle endurance. Thus, considering the results of the research, resistance training is probably effective for improving lower-body muscle endurance, maximum lower-body strength and abdominal muscle endurance in 16-18 Years Old male soccer players.

Key words: resistance training, muscle fitness, strength.

Introduction

Physical education and sport, as one of the branches of human knowledge, has evolved tremendously and each day we witness dramatic changes in theories and advent of new methods, and the outcome of these advances is achieving unbelievable records and performances [3 & 4]. Conditioning and preparing a team to enter the playing field requires different factors. Technique, tactic, mental readiness, and physical fitness are important elements and negligence toward any of these can burden sport teams with considerable costs. Although technical and tactical aspects can be trained using the athletic and coaching experiences of trainers, successful physical fitness training certainly requires the scientific background of the trainer [6]. The main focus of the training process is improving performance. In fact, improved performance is a process that leads to adaptation [18]. Many adaptations occur in the neuromuscular system as a result of physical exercises. The level of adaptation depends on the type of the training program [2&7]. Strength is the necessary ability for performing most physical movements and activities. The biological foundation of strength is the musculature which is the largest bodily system. About 35% of women’s and 45% of men’s body weight is made up of muscle tissue [4 & 16]. A great body of research has been carried out over the last fifty years, providing a firm scientific grounding for resistance training and its application in health and sports [11]. Advances in the area of muscle strength have perfected training programs in different sports [3]. The scientific findings some of which examine schoolchildren suggest the positive effects of resistance training on the progress of athletes’ performance and progressive strength training can lead to substantial increases in maximal strength and mass of trained muscles, even in older women and men [5, 6, 9, 11, & 14]. US National Strength and Conditioning Association (NSCA) and American Academy of Pediatrics (AAP) have suggested that schoolchildren can benefit from participating in a well-planned
resistance training program. The advantages of such programs involve increased muscle strength, local power and endurance of muscles, reduced injuries in sport and recreational activities, improved performance in sport and recreational activities, muscle hypertrophy, favorable improvement in body composition, reduced blood lipids, reduced blood pressure, and improved cardiorespiratory performance [1 & 13]. Many sports require a combination of physical fitness factors. For instance, for soccer players to succeed in shooting and dribbling, a combination of short-duration strength and endurance training is necessary [6]. Increased muscle strength and endurance depends on the overload on the muscle. The overload can be applied in the following ways: increasing resistance, such as adding weights; increasing the repetitions with a constant weight; increasing exercise sets; and increasing the intensity by reducing rest periods [5]. Strength sports have little effect on aerobic capacity, but lead to increased muscle force, increased activity of glycolytic enzymes, and increased intramuscular phosphocreatine and ATP stores. It can simultaneously cause muscle growth and capillary density [15 & 19]. In most sports, athletes perform strength training differently and soccer players today are more than ever involved in strength training. Although strength training has very valuable, changing strength into power is a more important issue. According to scientific findings, strength plays a significant role in increasing power and speed. Many soccer movements such as tackling, jumping, running, and changing direction are regarded as forceful, explosive activities. During such movements, the power efficiency depends on the strength of the involved muscles. Therefore, having high muscle strength which can be achieved through strength training is valuable to soccer players [6 & 10].

One of the ways for improving strength and endurance is the use of isotonic methods. The number of repetitions for increasing power differs in different sources. Some sources have considered the number to be between 6 and 10 and others deem 6 repetitions to be more appropriate. Meanwhile, endurance training is categorized into short-duration, medium-duration, and long duration. Short-duration endurance training increases strength and at the same time increases the ability of athletes to endure against a relatively high resistance. The number of repetitions in short-duration endurance training is 15 to 25 times [8 & 17].

Considering the importance of resistance and endurance training in soccer and the lack of research that would extensively study the benefits of this type of training, an attempt was made to examine the effect of 8 weeks resistance training with submaximal intensity on muscle fitness of 16-18 years old male soccer players.

Materials And Methods

Methodology:

The present research is quasi-experimental carried out as pretest-posttest with one experimental groups and a control group.

Population:

The population of the research consists of 16-18 years old male soccer players who are members of local sport teams. This population is of limited type and a questionnaire is used to determine their health, medical, nutritional, and medicinal condition and record.

Sampling:

20 boys from the population voluntarily participated in the research and were randomly divided into two groups of 10 subjects—one experimental groups and a control group. The sampling method was convenience sampling.

Variables:

Independent variables: selected resistance exercises with submaximal intensity,(50-60% of one repetition maximum)

Dependent variables: lower-body muscle endurance, maximum lower-body strength, abdominal muscle endurance.

Methods and Instruments:

1. A Beurer Personal Scale (PS07), made in Germany, with the ability to measure up to 150 kg and the precision of 0.1, used to measure the subjects’ weight
2. A piece of chalk, 30-m tape measure, adhesive tape
3. A 3-m long, 1-cm wide, millimeter-precision tape measure for determining the subjects’ height
4. A written consent form
5. A questionnaire for determining the qualified volunteers
6. A form for recording demographic and statistical information, such as age, height, weight, and test scores
7. SPSS 18 for analyzing the descriptive and inferential data
8. Jumping endurance test for measuring lower-body muscle endurance
9. Squat test for measuring maximum lower-body power
10. Sit-ups test for measuring abdominal muscle endurance.
Statistical Method:

After collecting the data related to subjects’ strength training performance in the pretest and the posttest, the data were analyzed using SPSS 18. Data analysis was done in two stages. First, the data is described using descriptive statistics, including mean and standard deviation along with tables and graphs. Second, data analysis and hypothesis testing is carried out using inferential statistics, Kolmogorov-Smirnov is applied to examine the normal distribution of the subjects of the three groups, correlated t-test is used to compare the records in the pretest and posttest.

Findings:

The descriptive data are provided in the table below.

Table 1: Mean and standard deviation of height, weight, and age of the subjects in the three groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Height (cm)</th>
<th>Weight (kg)</th>
<th>Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>170.10 ± 6.93</td>
<td>52.64 ± 4.41</td>
<td>17.40 ± 0.42</td>
</tr>
<tr>
<td>Experimental</td>
<td>171.50 ± 6.93</td>
<td>59.49 ± 9.82</td>
<td>17.19 ± 0.73</td>
</tr>
</tbody>
</table>

According to table 1, the mean height of the subjects in the two groups is very similar and the difference between the groups was not statistically significant. Thus, the two groups are almost homogeneous.

Table 2: Mean variance of the subjects in different stages of the study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t-Value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
<td>M ± SD</td>
<td>M ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower-Body Muscle</td>
<td>Experimental A</td>
<td>37.91 ± 2.64</td>
<td>36.03 ± 2.91</td>
<td>5.762</td>
<td>0.000*</td>
</tr>
<tr>
<td>Endurance</td>
<td>Control</td>
<td>37.05 ± 1.94</td>
<td>36.79 ± 2.05</td>
<td>1.015</td>
<td>0.337</td>
</tr>
<tr>
<td>Maximum Lower-Body</td>
<td>Experimental A</td>
<td>65.30 ± 10.14</td>
<td>77.20 ± 11.72</td>
<td>-8.488</td>
<td>0.000*</td>
</tr>
<tr>
<td>Strength</td>
<td>Control</td>
<td>66.60 ± 9.32</td>
<td>67.50 ± 10.48</td>
<td>-1.044</td>
<td>0.324</td>
</tr>
<tr>
<td>Abdominal Muscle</td>
<td>Experimental A</td>
<td>46.60 ± 6.41</td>
<td>54.20 ± 5.55</td>
<td>-9.960</td>
<td>0.000*</td>
</tr>
<tr>
<td>Endurance</td>
<td>Control</td>
<td>49.00 ± 5.88</td>
<td>48.90 ± 5.40</td>
<td>0.161</td>
<td>0.876</td>
</tr>
</tbody>
</table>

Notes: * denotes significance at P ≤ 0.05 level

Considering table 2, 8-week resistance training have had a significant effect on lower-body muscle endurance, maximum lower-body strength, and abdominal muscle endurance of the soccer players (P ≤ 0.05).

Results And Discussion

The importance of physical fitness in success and performance of athletes is clear and undeniable. Achieving physical fitness along with learning and effective performance of techniques and tactics leads to championship and impressive record-breaking. One of the fundamental elements in physical fitness is muscle strength and endurance. Having strength is the basis for success in many sports, for effective use of other physical abilities including agility, power, or even endurance entails having sufficient strength. Moreover, sufficient strength is considered as one of the most important aspects of health-related physical fitness and physiological performance in children and adults. Strength is also an important factor in motor performance of children and adults [10 & 12]. Considering the importance of this issue, the purpose of the present research was to study the effect of 8 weeks Resistance Training with submaximal intensity on muscle fitness of 16-18 years old male soccer players. The results suggested that performing resistance training—i.e low resistance/high repetition—in a period of eight weeks had a significant positive effect on three factors of physical fitness.

The findings of the present research is, to a large extent, consistent with the findings of other studies. Christou et al. (2006) studied the effect of resistance training in adolescent soccer players. This study examined the effects of a progressive resistance training program in addition to soccer training on the physical capacities of male adolescents, and concluded that soccer training alone improves maximum strength of the lower limbs and agility, while resistance training improves maximal strength of the upper and the lower body. Thus, the combination of soccer and resistance training could be used for an overall development of the physical capacities of young boys [20]. In another research, Ronnestad et al. (2008) studied the short-term effects of strength and plyometric training on sprint and jump performance in professional soccer players. They found that strength training leads to significant gains in strength and power-related measurements in professional soccer players [21]. Kotzamanidis (2005) carried out a research on the effect of a combined high-intensity strength and speed training program on the running and jumping ability of soccer players. They concluded that the combined resistance and running-speed program provides better results than the conventional resistance training, regarding the power performance of soccer players [22]. Wisloff et al. (2004) examined the strong correlation of maximal squat strength with sprint performance and vertical jump height in elite soccer players. The results suggested that maximal strength in half squats determines sprint performance and jumping height in
high level soccer players, yet high squat strength does not imply reduced maximal oxygen consumption [23]. Chelly et al. (2009) studied the effects of a back squat training program on leg power, jump, and sprint performances in junior soccer players. Both typical force-velocity relationships and mechanical parabolic curves between power and velocity increased after the strength training program. Leg and thigh muscle volume and cross-sectional area (CSA) of the resistance training group remained unchanged after strength training. They recommended junior soccer players to use dynamic constant external resistance exercises as part of an annual training program in order to improve their performance [24]. Wong et al. (2009) examined the effects of 12-week on-field combined strength and power training on physical performance among U-14 young soccer players. The results suggested that combined strength and power training (CPST) can be performed together with soccer training with no concomitant interference on aerobic capacity and with improved explosive performances. In addition, they suggested that CSPT be performed during the preseason period rather than in-season to avoid insufficient recovery/rest or overtraining [25]. Also in the present research performing an 8-week resistance training improved physical fitness factors and the results are consistent with the findings of Christou, Ronnestad, Kotzamanidis, Wisloff, Chelly, and Wong.

**Recommendations:**

It is recommended that coaches of adolescent soccer players use weight training in the physical fitness program so as to increase their muscle fitness. In case of using weight training for the adolescent age group, it is recommended that the principles be carefully observed in designing the exercises. It is also recommended that the best intensity of the training for this age group is 50-60% of one repetition maximum.

**References**


