Effect of Strength-Based Training on Anaerobic Power and Fatigue Index among Soccer Players

1Suriya, P., & 2Dr.S.Arunugam
1Research Scholar & 2Assistant Professor
1&2Department of Physical Education and Sports, Manonmaniam Sundaranar University, Abishekappati, Tirunelveli, Tamilnadu-627012
suryasunrise3260@gmail.com & draru1975@gmail.com

Abstract- This investigation post exercise consumption should improve the anaerobic power and fatigue among the intercollegiate soccer players due to the effect of strength-based training programme. The main purpose of this study were to determine whether strength-based training was more efficacious for improving anaerobic power and fatigue index in young players and to examine the difference between changes in anaerobic power and fatigue index among training and control groups. Twenty four male soccer players were voluntarily participated from Anna Stadium, Palayamkottai, Tirunelveli, Tamilnadu, India. A total of 24 active male soccer players aged 22.26 ± 1.64 years and having a BMI of 24.77 ± 1.04 were assigned to one of the two groups as strength-based training (Experimental group) and control (Control group). The training period continued for three days a week for eight weeks period. The initial and the final aerobic power and fatigue index was measured by Running based anaerobic sprint test (RAST) and its unit of measurement in Watts. The experimental groups met 3 days per week for eight weeks of training programme and Control group maintained their usual day to day activity during the course of this study. The collected data was analyzed by using paired t-test and analysis of covariance at the level of significance 0.05. Positive effects of strength training were determined in both tests. Following the training programme, an increase in aerobic power and fatigue index was found in strength-based training group comparison with the control group, that there were differences between the training group and control groups. However, significant increases an anaerobic power and fatigue index was found in strength-based training groups (p < 0.05). The data suggest that our eight week of strength-based training must improve both the anaerobic power and fatigue index among male soccer players.

Keywords: Strength-Based Training, Anaerobic Power, Fatigue Index, Running based anaerobic sprint test, Soccer Players

I. INTRODUCTION

Today athletes prepare themselves for a goal through training physical training endeavors. The objectives of physical training are to increase the athlete’s physiological potential and to develop bio-motor abilities to the highest standards [1]. A program of this article should able to develop strength. The term strength, which require s the body’s musculatures to move against some type of opposing force presented by various types of equipment [2].

Strength training and aerobic conditioning are each induces distinct structural and metabolic adaptations in the body, thus causing opposite training effects [3]. Strength training wide range of types of plyometric training, weight training, own body strength exercises etc., This training improves basic motor skills such as sprinting throwing and jumping and advances in basic motor skills can lead to better performance when racing [4].

Anaerobic power is the ability to overcome heavy resistance with high speed; here, the energy for the muscle contraction is primarily obtained through the breakdown of phosphagens [5]. Fatigue is a physiological state characterized by the decreased ability to work caused by an excess of activity, accompanied by local and general sensations [6]. Fatigue Index indicates the rate at which power declines for the athlete. A low value (<10) indicates the ability for the athlete to maintain anaerobic performance. A high fatigue index value (>10) indicates the athlete may need to focus on improving their lactate tolerance [7].

Football is considered an intermittent activity; the game takes place over an extended time period and is characterized by numerous short periods of high or maximum intensity exercise, interspersed with brief recovery periods. Both aerobic and anaerobic energy systems must be activated to meet the energy demands of the muscles during play [8]. Soccer players, as well as many other athletes on the field and the court, execute multiple sprints during the course of a match. Performance in soccer depends upon a variety of individual skills and the interaction among different players within the team [9]. Technical and tactical skills are considered to be predominant factors, but physical capabilities must also be well developed in order to become a successful player. During the last decade, the focus in soccer-related research literature has shifted from aerobic to
anaerobic demands. Recent studies suggest that elite or professional players have become faster over time, while aerobic capacity has plateau or decreased slightly [10].

II. METHODS

2.1 Subjects and Procedures

Twenty four male soccer players were voluntarily participated from Anna Stadium, Palayamkottai, Tirunelveli, Tamilnadu, India. A total of 24 active male soccer players aged 22.26 ± 1.64 years and having a BMI of 24.77 ± 1.04 were assigned to one of the two groups as strength-based training (Experimental group) and control (Control group). The training period continued for three days a week for eight weeks period. The initial and the final aerobic power and fatigue index was measured by Running based anaerobic sprint test (RAST) and the unit of measurement is Watts. The experimental groups met 3 days per week for eight weeks of training programme and Control group maintained their usual day to day activity during the course of this study. The collected data was analyzed by using paired t-test and analysis of covariance at the level of significance 0.05.

2.2 Strength-Based Training Programme

Strength-based training programme performed three days a week (Monday, Wednesday and Friday) and 60 minutes of duration. The subjects began with the same standardized warm-up each day before the training session. Strength-based exercises include leg extension, leg press, lying barbell extension, unilateral leg extension, barbell lunge, hack squat, unilateral leg press with the weight of three rounds and each round with a 10, 8 and 6 replicates, respectively 70, 75 and 80% of one repetition maximum and the 15 seconds.

2.3 Determination of Anaerobic Power and Fatigue Index

To measure the aerobic power (fatigue index, minimum power, peak power and average power) of the players, the Running-based Anaerobic Sprint Test - RAST was used. The players were run six times 35 m with ten seconds of passive rest between the sprints. The starts of the races were performed in the stop stand position and the time elapsed in each sprint was measured a professional manual chronometer from TIMEX(r), as well as the interval between the sprints. Fatigue Index = (Maximum power - Minimum power) ÷ Total time for the 6 sprints [11].

2.4 Statistical Analysis

<table>
<thead>
<tr>
<th>Criterion variables</th>
<th>Mean</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaerobic Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre test</td>
<td>676.05</td>
<td>671.37</td>
<td></td>
</tr>
<tr>
<td>Post test</td>
<td>838.22</td>
<td>689.42</td>
<td></td>
</tr>
<tr>
<td>t'test</td>
<td>6.75*</td>
<td>1.97</td>
<td></td>
</tr>
<tr>
<td>Fatigue Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre test</td>
<td>10.77</td>
<td>10.75</td>
<td></td>
</tr>
<tr>
<td>Post test</td>
<td>18.82</td>
<td>10.78</td>
<td></td>
</tr>
<tr>
<td>t'test</td>
<td>15.06*</td>
<td>1.22</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05 level. (Table value required for significance at .05 level for ‘t-test with df 11 is 2.20)

From the table 1 the dependent-‘t’-test values of anaerobic power and fatigue index between the pre and post tests means of experimental group was greater than the table value 2.20 with df 11 at 0.05 level of confidence, it was concluded that the experimental group had significant improvement in the anaerobic power and fatigue index between while compared to control group.

2.5 Computation of Analysis of Covariance

The descriptive measures and the results of analysis of covariance on the criterion measures were given in the following tables.

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaerobic Power (Adjusted Post Mean)</td>
<td>846.52</td>
<td>691.21</td>
<td>BG</td>
<td>19225.51</td>
<td>1</td>
<td>19225.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WG</td>
<td>23256.66</td>
<td>21</td>
<td>1107.46</td>
</tr>
<tr>
<td>Fatigue Index (Adjusted Post Mean)</td>
<td>18.86</td>
<td>10.79</td>
<td>BG</td>
<td>7.39</td>
<td>1</td>
<td>7.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WG</td>
<td>3.78</td>
<td>21</td>
<td>0.18</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level. Table value for df 1, 21 was 4.32
The above table indicates the adjusted mean value on anaerobic power and fatigue index of experimental and control groups were 846.52 & 691.21 and 18.86 & 10.79 respectively. The obtained F-ratio of 17.36 and 41.03 for adjusted mean was greater than the table value 4.32 for the degrees of freedom 1 and 21 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on anaerobic power and fatigue index.

![Graph of Anaerobic Power (watts)](image1)
![Graph of Fatigue Index (watts)](image2)

Figure 1 & 2: Pre Test, Post Test and Adjusted Post Test Mean Values of Experimental Group and Control Group on Anaerobic Power and Fatigue Index

III. DISCUSSION ON FINDINGS

The aim of the present study was to observe positive changes in the selected variables such as anaerobic power and fatigue index performance of the young soccer players due to effect of strength-based training program. Our finding of greater anaerobic power and fatigue index has been previously documented. The some other related findings were Aquino, Gonçalves, Oliveira, Tourinho Filho & Puggina, (2016) [12] reports that the effects of 22 weeks of training on functional markers and match performance of young soccer players. Sporis & Fiorentini, (2011) [13] conducted the study on effects of strength training on aerobic and anaerobic power in female soccer players. Hetzler, (1997) [14] determined the study on effects of 12 weeks of strength training on anaerobic power in prepubescent male athletes, Slade, Miszko, Laity, Agrawr & Cress, (2002) [15] analyzed the anaerobic power and physical function in strength-trained and non–strength-trained older adults and Kalinski, Norkowski, Kern & Tkaczuk, (2002) [16] evaluated the anaerobic power characteristics of elite athletes in national level team-sport games. The following studies also supported to the result of my study, such as Kumar, V., & Arumugam, S. (May 2019) [17], Arumugam, S., & Kumar, V. (2019) [18], Arumugam, S., & Kumar, V. (2019) [19], Kumar, V., & Arumugam, S. (December 2018) [20], Thangapandian, S., Sivagnanam, P., & Arumugam, S. (2018) [21], Arumugam, S., & Suriya, P. (2018) [22], Arumugam, S. (2018) [23], Arumugam, S., Suriya, P. & Kumar, V. (2019) [24] & Vigneshwaran, G., (2016). From above those supportive studies I intent to conduct this study, this study shows positive support for strength-based training in young soccer players. However, there were some limiting factors. Strength-based training regimens of the strength training group differed in the training frequency, intensity and volume, as well as in the type of exercises regularly completed. This shows, the result of the my study indicates...
that there was a significant improvement on anaerobic power and fatigue index due to the effect of strength-based training among soccer players when compared to control group.

IV. CONCLUSIONS

Strength training has positive effects on anaerobic power and fatigue index. After eight weeks of strength training, the anaerobic power and fatigue index of male soccer players has enhanced. These data suggest that our strength training programme has caused the positive changes in the sleeted variables among male soccer players. These observations may point to potential changes so the coaches are encouraged to use more strength training with male soccer players.

1. There was significant improvement on anaerobic power and fatigue index due to the effect of strength-based training among soccer players.

2. There was a significant difference between experimental and control groups on anaerobic power and fatigue index due to the effect of strength-based training among soccer players.

3. However the control group had not shown any significant improvement on any of the selected variables.

REFERENCES


[7]. Draper, N. & Whyte, G (1997) here’s a new running based test of anaerobic performance for which you need only a stopwatch and a calculator. Peak Performance, 96, p. 3-5


