ABSTRACT

The purpose of this study was to investigate the effect of high intensity intermittent training on aerobic capacity of obese adolescent school children. To achieve the purpose twenty four (24) male obese subjects having BMI 30.0 – 39.9 were selected for the study. Their age ranged between 11 to 14 years. These subjects were randomly distributed in two groups namely HIIT (12) and CG (12). All subjects undergo serious health check up prior to the study to avoid death during training or testing. Each subject reported to the Department of Physical Education, E. R. Higher Secondary School, Trichy and they were tested aerobic capacity before and after training. Aerobic capacity was measured by one mile run and walk test. Aerobic training was given for 3 days per week (Monday, Wednesday and Friday). The formula proposed by Gerbeaux et al., (1991) was used to calculate Maximal aerobic speed (MAS). The MAS was used as a criterion velocity to set running paces for high-intensity short intermittent exercises. The finding implies that the post testing data is influenced significantly by pre testing data on the difference between groups on aerobic capacity. Furthermore, it is found that though the effect of pretesting is removed, the difference on aerobic capacity between HIIT and CG is statistically established. It is inferred that aerobic capacity increased 7.27% in HIIT was implemented as compared with their pre test data. Similarly, in CG 0.86% of changes is observed. It is inferred that HIIT for 8 weeks improved aerobic capacity of obese adolescent school children.

INTRODUCTION

Obesity is recognized as a major global burden to health (Wearing, et al., 2006). In India when the child reaches adolescence their level of physical activity declines. There is evidence (Wang, et al., 2002) that children and adolescents of urban families are more overweight than rural, possibly because of decreased physical activities, sedentary lifestyle, altered eating patterns and increased fat content of the diet. Increase in sedentary activities, such as television viewing and computer games, is suspected to be responsible for the decline in physical activity levels.

Obesity contributes to the progression of cardiovascular disease, such as endothelial dysfunction, hypertension, inactivity and poor exercise capacity. Moreover, a number of well-established blood markers, such as cholesterol, triacylglycerols (triglycerides), creatinine, glucose and insulin resistance, are also used to complement the risk assessment. In general, exercise, in particular endurance exercise training, decreases cardiovascular risk, but an optimal training programme has not yet been identified. Similarly, criteria for the minimum protective exercise programme against overweight and obesity have not been established. Although the recommended exercise intensity spans the range 40–90 % of VO₂ (maximal oxygen uptake), most studies indicate that high-intensity exercise, i.e. toward the upper end of the range, results in larger aerobic and cardiovasculard adaptations (Rognmo, et al., 2004), and many rehabilitation programmes advocate the use of low-to-moderate-intensity exercise. Physical exercise is a key strategy in the management of obesity. Numerous health-related benefits have been observed in overweight and obese people who participate in exercise training programs, even in those without significant weight loss (ACSM, 2009; Ciolac and Guimaraes, 2004). Aerobic capacity improves in overweight and obese subjects following exercise training programs (Church, et al., 2007; Irving, et al., 2008; Mennisikova, et al., 2005).

In order to eradicate obesity it is therefore important to encourage sustainable physical activity habits in children, and further reinforcing these habits in adolescents, which will help establish desirable healthy lifestyle patterns that continue into adulthood. The purpose of this study was to investigate the effect of high intensity intermittent training on aerobic capacity of obese adolescent school children.

METHODS

Subjects and variable

A total of twenty four (24) male obese subjects having BMI 30.0 – 39.9 were selected for the study. Their age ranged between 11 to 14 years. These subjects were randomly distributed in two groups namely HIIT (12) and CG (12). All subjects undergo serious health check up prior to the study to avoid death during training or testing. Each subject reported to the Department of Physical Education, E. R. Higher Secondary School, Trichy and they were tested aerobic capacity before and after training. Aerobic capacity was measured by one mile run and walk test.
**Aerobic training Programme schedule**

Aerobic training was given for 3 days per week (Monday, Wednesday and Friday) for eight weeks. The formula proposed by Gerbeaux et al., (1991) was used to calculate Maximal aerobic speed (MAS). The MAS was used as a criterion velocity to set running paces for high-intensity short intermittent exercises. The MAS of the obese subjects are 2.70 m/s and intensities are fixed from 100 to 130%. Each session was preceded by a standardized warm-up: 1× (10×10s), (7× 15s), (5× 20s) at 100% of MAS (one set of 10 repetitions of 10 s or 7 repetitions of 15s or 5 repetitions of 20 s of running at 100% of MAS, punctuated by 10s, 15s, 20s of recovery). Between each set, the recovery was of 3 min. Exercise time was 30min for each session.

**Statistical analysis**

For this study Analysis of Covariance (ANCOVA) was used. The proposed hypothesis was tested at 0.05 level of confidence. Beside this mean and standard deviation were also calculated. SPSS statistic software package (SPSS Company, America, version 17.0) was used.

**RESULTS**

Levene’s test was not significant, $F (1,22) = 1.969$, $(p = 0.175)$, indicating that the assumption of homogeneity of variance has not been violated. Table 1 clearly shows that aerobic capacity between the groups was significant, $F (1,21) = 4.907$, $p = 0.038$, indicating that after adjusting pre-test scores, there was a significant difference between the two groups on post-test scores on aerobic capacity.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate</td>
<td>24441.784</td>
<td>1</td>
<td>24441.784</td>
<td>412.53</td>
<td>.000</td>
</tr>
<tr>
<td>Groups</td>
<td>64.023</td>
<td>1</td>
<td>64.023</td>
<td>4.907</td>
<td>.038</td>
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<tr>
<td>Error</td>
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<td>21</td>
<td>13.048</td>
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<td></td>
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<tr>
<td>Total</td>
<td>25843.250</td>
<td>24</td>
<td></td>
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</tbody>
</table>

The findings of the study show that aerobic capacity tends to increase as a result of high intensity intermittent training. It is obvious from table 1 that covariate pre testing significantly determines the difference between HIIT and CG on aerobic capacity as obtained $F(1,21) = 412.53$ $(p = 0.000)$. This finding implies that the post testing data is influenced significantly by pre testing data on the difference between groups on aerobic capacity. Furthermore, it is found that though the effect of pretesting is removed, the difference on aerobic capacity between HIIT and CG is statistically established. From table 2 it is inferred that aerobic capacity increased 7.27% in HIIT was implemented as compared with their pre test data. Similarly, in CG 0.86% of changes is observed. It is inferred that HIIT improved aerobic capacity of obese adolescent school children.

<table>
<thead>
<tr>
<th>Table 2 Descriptive statistics of HIIT and CG on aerobic capacity before and after training</th>
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</thead>
<tbody>
<tr>
<td>Testing periods</td>
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<tr>
<td>Pre-test</td>
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<tr>
<td>Post-test</td>
</tr>
<tr>
<td>Mean Difference</td>
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<tr>
<td>Percentage of changes</td>
</tr>
</tbody>
</table>

**DISCUSSION FINDINGS**

It is evident in this study that significant improvement in aerobic capacity noticed in high intensity interval training. These results were also in line with the previous literature that endurance training improves both aerobic capacity (Rognmo, et al., 2004; Wisløff, et al., 2007) and endothelial function (Wisløff, et al., 2007; Meyer, et al., 2006), and is now increasingly recommended in the prevention and treatment of overweight and obesity (Haskell, et al., 2007). Scientific evidence and clinical observations support the contention that participation in aerobic and strength-building activities gives obese children and adolescents a chance to experience success and gain confidence in their abilities to be physically active (Shabi, et al., 2006; Sothern, 2001; Sothern, et al., 2000).

**CONCLUSION**

High intensity intermittent training for 8 weeks elicited 7.27% of improvement in aerobic capacity of male obese adolescent school children.

**References**


