Physiological Outcomes of Short-Term Interval Training in Primary School Students

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ABSTRACT

Interval training has effectively improved physiological and metabolic parameters in the adult and sporting populations, as substantiated by many researchers in different research studies. The same has been given less focus on the children due to many probable factors such as age, load capacity, lack of control, etc. Some conditions demand more innovative ways to keep our children fit and healthy for their proper growth and development. Objective: The research investigation looked into how short-term interval training affected a few physiological metrics, including body mass index and body fat percentage. Techniques: The Tanita TBF-300 Body Composition Analyzer was used to collect the data. 32 randomly chosen volunteers, ages 8 to 10, participated in the study. Sixteen participants were split into the experimental and control groups at random. The participants underwent the training program for 12 weeks, thrice a week. Analysis of covariance was conducted to examine differences between groups, whereas the performance of the individuals before and after the treatment was compared using paired t-tests. The results showed that The pre-test and post-test results for the group being tested varied statistically considerably ($p<0.05$). Findings: The control and experimental groups' post-test scores differed significantly from one another. In particular, those in the treatment group showed better body mass index readings than those in the control organization. Conclusion: Short-term interval training improves children's fat percentage and body mass index phenomena.

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1. INTRODUCTION

Regular physical activity has improved metabolic parameters like lipid metabolism, glucose tolerance and insulin resistance. These factors are the determinants of the cardiometabolic risk profile among children. So, it may be inferred that the cardiovascular risk among children also decreased (Barge B. et al., 2004). In a study conducted by Danish children, it was found that there is a negative relation between physical activity levels and symptoms of metabolic syndrome. The indicators of metabolic syndrome include blood pressure, insulin, glucose, HD2 lipids, triglycerides, and the sum of the four skin folds (Brage B., et.al. 2004).

BMI is a crucial measure of morphological fitness. Healthcare professionals widely use it to assess body weight and identify obesity in children. Children with elevated BMI levels face increased risks of serious medical disorders, such as type 2 diabetes, cardiovascular disease and hypertension. According to recent statistics, 16.2% of kids and teens in the United States are considered obese, while 31.8% are overweight. There is a strong relationship between these BMI categories and levels of sporting activity (brage B. et.al.,2004)

According to research findings, consistent engagement in physical activity results in to enhancement in health-related fitness. The physiological systems respond to the stimulus, which results in children's health-related fitness development. (Salis JF, et.al., 1997). Regular exercise in childhood is accompanying with decreased latter phases of cardiovascular risk of life (Steinberger J. and Denials S.R., 2013). The quality of life has been evidenced to be improved due to participation in physical activity (Fanelli et al., et al. 2007; Gates PE, 2012; Dwyer et al., 2011)

Although the existing research indicates that exercise has proven benefits for children, it is less important than investigations conducted on adults (Whitewell S., Tueton J., 2010). It refers to the sequence of repeated exercises alternating with a recovery period of light-intensity work. Short-term the literature review demonstrates that high-intensity interval training causes numerous physiological and biochemical alterations in the body. However, it has been noted that administrative and practical considerations prevented the application of interval training at high intensities to children. Short-term intense interval training was specially administered to the children in this study in order to assess its effects on the selected physiological parameters.

2. METHODOLOGY

32 male students from Jyothis Central School in Kazhakuttom, Thiruvananthapuram, were chosen for this study. The participants, who ranged in age from 8 to 10, were split into two groups at random: 16 people each for both the experimental and control groups. Body Mass Index and fat percentage were the two dependent variables that were the focus of the investigation. These variables were measured using a Body Composition Analyser (Tanita TBF-300).

3. EXPERIMENTAL DESIGN

Experimental design refers to the system of formulating the selection procedure, testing methods, training administration, etc. It is the designed framework of the whole study, which helps avoid threats to the study's conclusions. A pre-test and post-test design was employed in the investigation. The following is how the experimental design manifests itself:

- TREATMENT (S1-S16)
- CONTROL (S1-S16) (O = OBSERVATIONS, S = SUBJECTS)

Various statistical tools, such as SPSS Statistical software, were employed for data analysis. To characterize the type of data, the mean and standard deviation, among other descriptive statistics were calculated. The study employed several statistical methods to analyze the data (Meyji, 2015). A matched (reliant) t-test was used to determine whether there was a statistically significant distinction between the means of both the control and the experimental groups. A one-way ANOVA was used to look at differences in post-test scores across groups. By incorporating pre-test scores as a covariate in an Analysis of Covariance, potential impacts were also taken into account.

Table 1. Table of mean, average, standard deviation, and the dependent "t" test of fat percentage for the control and experimental groups before and after the test

Collection	Examination	N	Mean	SD	MD	T-ratio
Resistor Group	Pre-test	16	15.35	4.51	.010	.050
	Post-test		15.34	4.18		
New Collection	Pre-test	16	12.74	3.44	.931	9.40
	Post-test		11.81	3.31		

The table above indicates that for the fat percentage test items, Pre-test mean and standard deviation are 15.34±4.18, 15.35±4.51, and 15.34±4.18, accordingly, for both respondent categories. The post-test means for the group doing the experiment and the control group are 11.81±3.31 and 12.74±3.44, respectively. Additionally, the table shows that there is no significant distinction between the pre-test and post-test averages of the control group members because the obtained t ratio (.050) is lower than the critical table value, or 1.69, indicating that the control group members have not demonstrated significant enhancements. Additionally, the results show that Because the calculated t ratio (9.40) is higher than the significant table value, there is a significant difference between the experiment's pre-test and post-test median values, or 1.69, indicating that the hypothetical group's participants' percentage of fat significantly decreased.

Table 2. Ancova for pre-test, post-test, and adjusted post-test scores of fat percentage for control and untried group

Test		**Control collection**	**Exp Collection**	**Sov**	**Figure of squares**	**df**	**Malicious square**	**F Ratio**
Pre-test	**Mean**	**15.35**	**12.74**	**B**	**54.49**	**1**	**54.49**	**3.37**
	S.D	**4.51**	**3.44**	**W**	**484.15**	**30**	**16.13**	
Posttest	**Mean**	**15.34**	**11.81**	**B**	**99.75**	**1**	**99.75**	**6.99**
	S.D	**4.18**	**3.31**	**W**	**427.94**	**30**	**14.26**	
Adjusted post-test	**Mean**	**14.13**	**13.02**	**B**	**8.82**	**1**	**8.82**	**24.13**
				W	**10.60**	**29**	**.366**	

*Important at 0.05 equal.

At the 0.05 near, the essential F-value for statistical importance is 4.41 with 1 and 30 degrees of freedom and 4.47 with 1 and 29 degrees of freedom. The analysis examines fat percentage measurements between control and experimental groups across different testing phases. The initial pre-test measurements showed mean values (± standard deviation) of 15.35 ± 4.51 for the control group and 12.74 ± 3.44 for the experimental group. The resulting F-ratio of 3.37 was statistically inconsequential at the 0.05 confidence level, falling below the critical F-value of 4.17 (df = 1, 30).

Post-test measurements revealed mean values of 15.34 ± 4.18 for 11.81 ± 3.31 11.81 ± 3.31 for the control group and 11.81 ± for the experimental group. The F-ratio of 6.99 exceeded the critical F-value of 4.17 (df = 1, 30) and demonstrated a difference of statistical importance at the 0.05 confidence level. Further analysis revealed the improved post-test averages for the intervention and oversight classes, were 14.13 and 13.02, respectively. At the 0.05 confidence level, the resulting F-ratio of 24.13 exceeded the threshold F-value of 4.20 (df = 1, 29) and was statistically significant. These results are graphically represented in the accompanying figure, which shows the evolution of mean values for both groups during the pre-test, post-test, and corrected post-test phases.

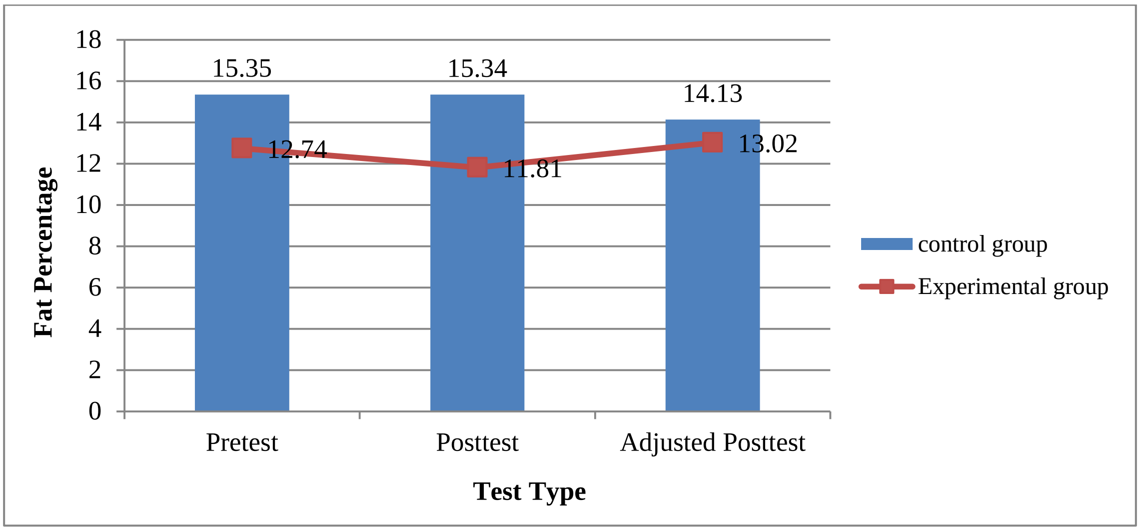

Figure 1. Graphical representation of mean scores of pre-test, post-test, and attuned post-test scores of fat percentage for control and untried group

Table 3. For the control and investigational clutch, the table of before and post-test means, average difference, and dependent "t" test of the body mass percentage

Assembly	Check	N	Mean	SD	MD	T-ratio
Switch Collection	Pre-test	16	15.81	2.10	.145	.763
	Post-test		15.95	2.36		
Experimental Collection	Pre-test	16	34.81	7.17	1.73	4.65
	Post-test		33.07	5.90		

The above table shows 15.81±2.10 and 15.95±2.36 respectively, the pre-test mean and baseline control deviations of the body mass index test item for the experimental group, the post-test mean and the norm control variations for their therapy group, which were 34.81±7.17 and 33.07±5.90, respectively. Given that the calculated t ratio (.763) is below the critical table value of 1.69, which denotes no discernible change in the percentage of control group's participants, the table also shows that There is no discernible difference between the mean pre-test and post-test results for the control group. The findings also show that the mean pre-test and post-test values for the investigational group are greater than the critical table value, as indicated by the t ratio of 4.65 differ significantly, i.e., 1.69. This suggests that the experimental group participants' body mass index has increased significantly.

Table 4. Ancova for pre-test, post-test, and adjusted post-test scores of bmi for control and experimental collection

Test		**Control clutch**	**Exp Clutch**	**Sov**	**Sum of squares**	**df**	**Mean square**	**F Ratio**
Pre-test	**Mean**	**15.81**	**18.89**	**B**	**75.98**	**1**	**75.98**	**7.09**
	S.D	**2.10**	**4.11**	**W**	**321.09**	**30**	**10.70**	
Post-test	**Mean**	**15.95**	**17.64**	**B**	**22.78**	**1**	**22.78**	**2.15**
	S.D	**2.36**	**3.94**	**W**	**317.68**	**30**	**10.58**	
Adjusted post-test	**Mean**	**28.51**	**25.31**	**B**	**17.55**	**1**	**17.55**	**39.41**
				W	**12.91**	**29**	**.445**	

During the pre-test phase, the mean for the experimental group was 15.81 (SD = 2.10), whereas the control team's was 18.89 (SD = 4.11). The resulting F-ratio of 7.09, which was more than the critical F-value of 4.17 (df = 1, 30) at the 0.05 probability level, suggested a significant distinction between the groups at starting. During the post-test stage, the control group scored 17.64 (SD = 3.94), while the experimental group's average rating was 15.95 (SD = 2.36). The F-ratio of 2.15 indicated that there was not a significant difference between the two groups because it was less than the necessary F-value of 4.17 (df = 1, 30) at the 0.05 level.

Following correction for baseline disparities, the control group's post-test mean was 25.31, while the experimental group's was 28.51. The comparison's F-ratio of 39.41 performed significantly better than the necessary F-value of 4.20 (df = 1, 29) at the significance level of 0.05. This suggests a statistically significant variance between the adjusted post-test results for the baseline and exploratory groups. An example of how BMI values evolved during the pre-test, post-test, and improved post-test stages for both groups provides a visual representation of this results.

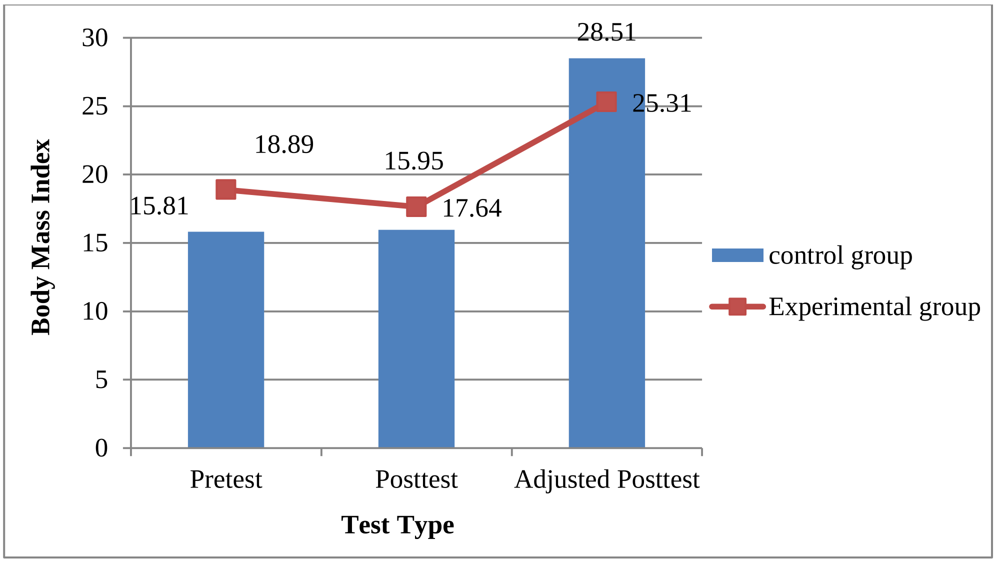

Figure 2. Graphical representation of body mass index mean scores for governor and untried group pre-, post-, and adjusted post-test

4. DISCUSSION OF FINDINGS

Fat Percentage:

The short-term HIIT exercise caused the findings of the covariance analysis showed a significant difference in the fat percentage between the control and experiment groups. The study's results are substantiated by D. S. Butchen et al. (2011), who found that the fat percentage in the adolescent participants decreased due to High-Intensity Interval training activities. Stephen F. Burns (2012) also found that fat oxidation increases post-exercise and was considerably greater in the group that exercised than in the group that did not.. G. Racil T. (2013) also found that the body fat percentage level decreases due to applying high-intensity interval training. The significant decrease in fat percentage levels might have occurred due to increased fat metabolism. High-intensity interval training exhausts the existing carbohydrate stores, and fat becomes an energy source after the exercise. The oxidation of the fat also increases after enzymatic activity increases is increased.

Body mass index

The findings of the research showed that during a brief period of the BMIs of the two control groups varied considerably after high-intensity interval training. The trial group's members' body mass index was positively modified by the training regimen. A parallel study by G. Racil et al. (2013) and M. Wewege and R. Van Den Berg (2017) revealed that high-intensity interval training led to a significant improvement in people's Body Mass Index, supporting the improvement in BMI brought about by the particular exercise system (Dhaliwal, 2018). In their study, Catia Martins, Irina Kazakova, and Marit Ludviskon (2015) found that due to the implementation of the HIIT program, fat mass was significantly lost in participants. The significant change in BMI in the experimental group might have occurred due to overall enhancement of the utilization of energy due to increased metabolic rate and enhanced atrophy

5. CONCLUSION

According to the study's findings, short-term High-Intensity Interval Training (HIIT) significantly enhances a number of physiological markers in elementary school students, most notably Body Mass Index (BMI) and Fat Content. The results of this investigation align with past studies that demonstrate the efficacy of HIIT is at lowering fat percentage and raising BMI, including studies by D. S. Butchen et al. (2011), Stephen F. Burns (2012), G. Racil T. (2013), and others. Because of the energy needs and increased enzyme functioning during and after intense exercises, the control group's decreased fat percentage may have been caused by greater fat oxidation after exercise. Similarly, the significant improvement in BMI in the experimental group can be explained by the enhanced utilization of energy and increased metabolic rate facilitated by HIIT, leading to fat loss and muscle development. These findings suggest that incorporating short-term HIIT programs into the physical education routines of primary school children could contribute to healthier body composition and improved fitness outcomes.

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Conflict of Interest: The researchers declared that there is no conflict of interest.

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