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EFFECTS OF VARIED COMBINATIONS OF RESISTANCE TRAINING AEROBIC TRAINING AND YOGIC PRACTICES ON AEROBIC CAPACITY AND CARDIOVASCULAR PARAMETERS OF OBESE ADOLESCENT CHILDREN

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ABSTRACT

The purpose of this study was to investigate the effect of varied combinations of resistance training, aerobic training and yogic practices on cardiorespiratory fitness of obese adolescent children. To fulfill the purpose of this study forty five (45) male obese subjects having BMI 30.0 – 39.9 were selected for the study. Their age ranged between 10 to 14 years. These subjects were randomly distributed in three groups namely resistance aerobic training group (RATG), resistance and yoga training group (RYTG) and control group (CG) each group consisting of 15 subjects each. All subjects undergo serious health checkup 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. Prior to the formal study sessions, a pilot study was conducted to validate research procedure and the initial capacity of the participants to design the training programme. The RATG and RYTG group underwent 8 weeks of training. The result showed that adjusted post test of aerobic capacity, resting heart rate and systolic blood pressure found to be significant. However, diastolic blood pressure showed no significant difference among the groups. The covariate is significant, indicating that aerobic capacity, resting heart rate and systolic blood pressure before training had a significant improvement after 8 weeks of training. RATG is better than RYTG in improving cardiorespiratory fitness of obese children.

Keywords: Obese, Cardiorespiratory fitness, One mile run and walk test, Resting heart rate, Systolic blood pressure, Diastolic blood pressure, Adolescent

Introduction

Obesity is recognized as a major global burden to health [1]. In India when the child reaches adolescence their level of physical activity declines. There is evidence [2] 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.

Poor cardiorespiratory fitness (CRF) and muscle strength and abnormalities in the autonomic nervous system (ANS) are important predictive factors of morbidity and mortality associated with obesity [3-7]. 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 [8]. For example, CRF improves in overweight and obese subjects following exercise training programs [9-11].

The normal heart rate depends upon your age, gender and health and can vary greatly for both athletes and non-athletes. In general, a person's resting heart rate indicates their basic fitness level. The stronger the heart, the more blood it can pump during each contraction, and the less frequently it needs to beat to get adequate blood flow (circulation) and oxygen to the body tissues. A well trained athlete can have a very low resting heart rate and pump more blood than an unconditioned individual.

The amount of blood pumped out of the left ventricle of heart with each contraction is called the stroke volume. Although some conditions can affect a person's stroke volume, endurance and high intensity cardiovascular exercise training often increases stroke volume [12]. A larger stroke volume results in a lower (resting) heart rate [13]. However, longer diastole influences the resting heart rate in athletes. 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 aim of this study was to investigate the effect of varied combinations of resistance training, aerobic training and yogic practices on aerobic capacity and cardiovascular parameters of obese adolescent children.

Methods

Subjects and variable

A total of forty five (45) male obese subjects having BMI 30.0 – 39.9 were selected for the study. Their age ranged between 10 to 14 years. These subjects were randomly distributed in three groups namely resistance aerobic training group (RATG), resistance and yoga training group (RYTG) and control group (CG) each group consisting of 15 subjects each. All subjects undergo serious health checkup 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 cardiorespiratory fitness before and after training. Aerobic capacity, resting heart rate, systolic blood pressure and diastolic blood pressure was measured. Aerobic capacity was measured by one mile run and walk test and Omron blood pressure monitor was used to measure cardiovascular parameters.

Pilot Study

Prior to the formal study sessions, a pilot study was conducted to validate research procedure and the initial capacity of the participants to design the training programme. For the purpose, twelve participants (n=10) were selected at random, who had BMI 30.0 – 39.9 were selected (ACSM, guidelines, 2000). The selected subjects underwent combination of resistance and aerobic training group (n=10). This group underwent 5 session of training under the watchful eyes of the investigator. The initial loads of the participants were fixed and the training programme for both groups were designed separately based on the performance in the pilot study.

Resistance training Programme schedule

Resistance training was administered to obese subject for 90 min/workout. The equipments used are free weights and exercise meachines available in E.R. Higher Secondary School, Trichy. The load designed for these subjects as intensity between 60-85% 1RM, 6-12 repetitions, 3-4 sets and 1 min rest between tri-sets. The training load was increased by 5% every week. These subjects performed resistance training 3days/week (Monday, Wednesday & Friday) for eight weeks.

Aerobic training Programme schedule

Aerobic training was given for 2 days per week (Tuesday and Thusday). We used the formula proposed by Gerbeaux *et al*., (1991) 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. The training schedule followed for eight weeks.

Yoga training

The yoga group practiced a mixed set of yoga techniques daily, in the form of asana. They performed two asanas every week and keep on adding two asanas for six week and last two week they performed sixth week schedule. The asanas are Ekpada Uttan Asana, Uttanpada Asana, Bhujanga Asana, Shalabha Asana, Santulan Asana, Pawanmukta Asana, Suryanamaskar Asana, Dhanur Asana, Ardha Vakra Asana, Paschimottan Asana, Supta Vajra Asana, Matsyendra Asana. After practicing asana they rest is shava Asana for the sipulated period. They practice yoga daily.

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

It is clear from the table 1 that the pre test and post test showed no significant difference in aerobic capacity, resting heart rate, systolic blood pressure and diastolic blood pressure. However, adjusted post test mean value showed significant difference in aerobic capacity ($F = 9.515$, $p < 0.05$), resting heart rate ($F = 4.904$, $p < 0.05$), systolic blood pressure ($F = 4.107$, $p < 0.05$). The covariate is significant, indicating that aerobic capacity, resting heart rate and systolic blood pressure before training had a significant improvement after 8 weeks of training. Since, adjusted post test mean is significant Scheffé S post hoc was applied and presented in table 2.

Table 1
Summary of ANCOVA on Aerobic capacity and Cardiovascular parameters

Variable	Groups	Tests			F value		
		Pre	Post	Adjusted	Pre	Post	Adjusted
Aerobic capacity	RATG	32.30 ±7.95	38.10 ±7.42	37.79	0.032	3.082	9.515*
	RYTG	31.90 ±7.90	32.41 ±8.02	32.43			
	CG	31.58 ±7.73	31.79 ±7.58	32.08			
Resting heart rate	RATG	78.20 ±7.29	72.80 ±8.85	72.76	0.128	2.922	4.904*
	RYTG	77.40 ±9.04	72.26 ±9.26	72.87			
	CG	78.86 ±7.43	79.13 ±7.5	78.56			
Systolic blood pressure	RATG	117.67 ±6.27	113.24 ±6.50	113.34	0.016	0.834	4.107*
	RYTG	118.05 ±7.47	115.17 ±8.94	114.90			
	CG	117.60 ±7.90	117.04 ±8.52	117.21			
Diastolic blood pressure	RATG	82.18 ±6.40	80.88 ±7.47	81.17	0.155	0.171	2.004
	RYTG	83.25 ±6.71	81.95 ±7.28	81.14			
	CG	81.95 ±7.28	82.46 ±7.76	82.98			

The tabulated *F* ratio for: 0.05 level (df 2 & 42 = 3.220; df 2 & 41 = 3.226)

From Table 2, the Scheffé S post hoc test showed significant difference between the groups on aerobic capacity at 0.05 level of confidence. Thus, it is concluded that 8 weeks of RATG found to be better than RYTG in improving aerobic capacity, resting heart rate and systolic blood pressure among adolescent male obese childrens.

Table 2
Scheffé S test for difference between paired means on Aerobic capacity and Cardiovascular parameters among RATG, RYTG and CG

Variables	RATG	RYTG	CG	MD	CI
Aerobic capacity	37.79	32.43		5.36*	2.326
	37.79		32.08	5.71*	2.326
		32.43	32.08	0.35	2.326
Resting heart rate	72.76	72.87		0.11	2.66
	72.76		78.56	5.8*	2.66
		72.87	78.56	5.69*	2.66
Systolic blood pressure	113.43	114.90		1.47	1.71
	113.43		117.21	3.78*	1.71
		114.90	117.21	2.31*	1.71

*Significant at 0.05 level.

Discussion findings

It is evident in this study that significant improvement in cardiorespiratory fitness noticed in combined training effect of resistance and aerobic training. These results were also in line with the previous literature that endurance training

improves both aerobic capacity [14-16] and endothelial function, and is now increasingly recommended in the prevention and treatment of overweight and obesity [17]. Scientific evidence and clinical observations support the contention that participation in strength- building activities gives obese children and adolescents a chance to experience success and gain confidence in their abilities to be physically active [18-20].

Although, endurance training can increase stroke volume. A larger stroke volume results in a lower (resting) heart rate and lowered systolic blood pressure.

In addition to enhancing muscular strength and local muscular endurance, appropriately prescribed and competently supervised resistance training programs may also positively influence bone mineral density, cardiorespiratory fitness, blood lipids, and psychosocial well-being [21].

Conclusion

RATG for 8 weeks is better than RYTG in significantly altering improving aerobic capacity, resting heart rate and systolic blood pressure of obese children.

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