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EFFECT ON CARDIORESPIRATORY FITNESS RESPONSE AFTER 4 WEEKS OF WHOLE BODY TABATA INTERVENTION IN UNDERGRADUATE STUDENTS – AN EXPERIMENTAL STUDY

[1]Samiksha Mahendra Thada .

Intern PES Mordern College Of Physiotherapy, Pune, Maharashtra, India.

[2]Dr. Jahnvi Panwar.

Assistant Professor, PES Modern College Of Physiotherapy, Pune, Maharashtra, India.

Abstract:

Background: Cardio-respiratory fitness is a trait and is defined as the ability of the circulatory, respiratory, and muscular systems to supply oxygen during prolonged moderate-to-vigorous dynamic exercise. The prevalence of cardiovascular disease has increased substantially over the past two decades in younger population. Reduced cardiorespiratory fitness is associated with getting prone to overweight, obesity, reduced body flexibility which later may lead to many cardiovascular problems. Tabata training is a training method introduced by Prof. Izumi Tabata in 1996, that can improve physical ability, aerobic, and anaerobic. Collectively this study shows the effectiveness of whole body tabata training on V02 max in undergraduate students that can assist the therapists in improving Cardio-repsiratory fitness.

Aim: To study the effect on cardiorespiratory fitness after 4 weeks of whole body Tabata intervention in undergraduate students.

Methodology: Undergraduate students between 18-24 years of age with BMI between 18-25kg/m^2 of Pune were included in this study.6 min walk test was performed and pre and post readings were taken on that basis pre and post VO2max was calculated and compared.

Outcome measures: VO2 max.

VO2 MAX (ml/kg/min) ={70.161+ (0.023 x SMWD)-(0.276 x weight)–(6.79 x gender)–(0.193 x rest HR)–(0.191 x age)} (male=0 ; female=1)

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Results: The effectiveness of cardio respiratory fitness after 4 weeks of whole body TABATA intervention in undergraduate students was extremely significant as the P value was <0.0001. The pre treatment mean was 37.663930 with SD 2.726190 while post treatment mean was 40.919057 with SD 2.550643 T value was 17.8313. The mean of Pre and post intervention is -3.255127.

Conclusion: Tabata has significant effect on cardiorespiratory fitness after 4 weeks in undergraduate students.

Keywords: Undergraduates, Cardiorespiratory fitness, Tabata, BMI, VO2max

Introduction: Cardio-respiratory fitness is a trait and is defined as the ability of the circulatory, respiratory, and muscular systems to supplyυ oxygen during prolonged moderate-to-vigorous dynamic exercise (1).Physical fitness especially cardiovascular fitness is one of the important factors in medical students academic achievement which has been neglected by in majority of the students(2). Despite the known benefits of regular physical activity, research shows a significant decline in physical activity participation and an increase in sedentary behavior during young adulthood during the college years (3). Reduced cardiopulmonary fitness is associated with increased cardiovascular disease. Low cardio respiratory fitness in young adults has emerged as an important factor for developing cardiovascular comorbidies later in middle age(4) It also remains unclear what type of program, type of exercise, duration, and volume constitute optimal training for inducing theυ desired changes in adolescents. The results of a few studies have indicated that high-intensity interval training (HIIT) may be appropriate. The training is based on a short intervention time (up to several minutes) of very intensive effort (from 75% HRmax for inducing the desired changes in adolescents[5].Tabata training is a training method introduced by Prof. Izumi Tabata in 1996, he concluded that the method can improve physical ability, aerobic, and anaerobic. Basically, Tabata training method is a method of HIIT workout or interval training with high intensity. Meanwhile, the execution was Tabata training method takes four minutes with eight intervals. Each interval takes 20 seconds with high intensity. Physical exercise at a high intensity for 20 seconds and then rest 10 seconds. Repeat this pattern until eight times with a total time of four minutes . The benefit of Tabata training is burning body fat, increase metabolism during exercise, increase metabolism after exercise,υ practice fast and time is short, increasing the aerobic system, this method is the study of coaches' athletes Olympic, improve mental toughness and strength, the method is versatile, you can choose from various activities [6].Importantly, this whole-body Tabata protocol does not necessitate the use of specialized equipment, thereby alleviating the need for access to facilities, while still providing a time-efficient alternative to MICT or VICT for achieving similar training induced adaptations.(7)

Need of study: It is proven that undergraduates neglect physical fitness especially cardiorespiratory fitness due to increase in their sedentary′ behavior during college years despite of known benefits of regular physical activity which leads to reduced cardiorespiratory fitness. The prevalence of cardiovascular disease has increased substantially over the past two decades in younger population. Reduced cardiorespiratory fitness fitness is associated with getting prone to overweight, obesity, reduced body flexibility which′ later may lead to many cardiovascular problems. There is lack of evidence in proving the effectiveness of tabata training on V02 max in undergraduates, hence the need arises to Study the effectiveness of tabata training assisting therapists in improving Cardio-repsiratory fitness .

Aims: To study the effect on cardiorespiratory fitness after 4 weeks of whole body Tabata intervention in undergraduate students.

Objectives:1) To assess cardiorespiratory fitness in undergraduate students. 2)To find the effect of Tabata on cardiorespiratory fitness after 4 weeks Tabata intervention in undergraduate students.

Hypothesis:

Null hypothesis : Ho – Tabata training does not have significant effect on cardiorespiratory fitness after 4 weeks in undergraduate students.

Alternative hypothesis: H1 -Tabata has significant effect on cardiorespiratory fitness after 4 weeks in undergraduate students.

Methodology:

Sample Size: 60

Study design: Experimental study

Sampling method: Convenient sampling

Study population : Undergraduate students

Study setting: Colleges in and around Pune

Study duration: 6 months

Intervention : 4 weeks

Criteria:

INCLUSION CRITERIA:

Students who are undergraduate.

Age Group - 18-24years.

Students with BMI between 18-25kg/m^2.

Students who are non-smoker.

Students who are not involved in a training program at the time of study.

Students having grade less than 3/10(Moderately dyspneic) on modified borg scale, post 6 minute walk test.

VO2 max : Male(35-40 mL/kg/min),Female(27-30mL/kg/min)

EXCLUSION CRITERIA:

Any recent musculoskeletal injury of upper limb, spine and lower limb for atleast 6 months.

Students with previous history of cardiometabolic disease, taking any medication.

Students with disorder of neurological system.

Materials and tools:

Sphygmomanometer, Stopwatch, Chair, Cones for marking hallway, Pulse oximeter, Weighing machine, Tape stature meter, Data Collection Sheet, Measuring tape, Pen, Paper.

Outcome measures:

VO2 max.

VO2 MAX (ml/kg/min) ={70.161+ (0.023 x SMWD)-(0.276 x weight)–(6.79 x gender)–(0.193 x rest HR)–(0.191 x age)} (male=0 ; female=1)

Procedure: The project started with the presentation of synopsis and Ethical clearance from the ethical committee of Modern College of Physiotherapy was taken. Participants were selected according to inclusion and exclusion criteria.The study was explained to participants and consent was taken from them. Demographic data, height ,weight ,BMI was recorded for data collection. 6 min walk test was performed and pre and post readings were taken . VO2 was calculated. Data was collected and analysed.

Protocol: Participants performed four weekly supervised training session over a four-week period. Each training session began with a standardized warm-up (walking down, and then up, 4 flights of stairs; ~2 minutes totalwarm-up time). Participants in the Tabata group completed a total of eight, 20-second intervals of "all-out" exercise separated by 10-second rest periods, for a total exercise duration of 4 minutes. Briefly, each training day was consist of four different whole-body exercises: burpee push-ups, mountain climber push-ups, jumping jacks, and squat. During exercise, HR was measured each minute using radiotelemetry.

Statistical analysis: Statistics were performed for all baseline characteristics like Age, Gender, BMI. Data was checked for normalcy.The level of significance of < 0.05 was considered to be statistically significant with 95% confidence interval. The study data was statistically analyzed using GraphPad Instat 3.1. For all analyses, paired t test was used and the threshold of the p value considered as significant set at < 0.05 .

Results: The effectiveness of cardio respiratory fitness after 4 weeks of whole body TABATA intervention in undergraduate students was extremely significant as the P value was <0.0001. The pre treatment mean was 37.663930 with SD 2.726190 while post treatment mean was 40.919057 with SD 2.550643 T value was 17.8313. The mean of Pre and post intervention is -3.255127.

Discussion: This study was intended to see the effectiveness of cardio respiratory fitness after 4 weeks of whole body Tabata training in undergraduates. The study was conducted on 60 undergraduates based on inclusion and exclusion criteria. Participants performed four weekly supervised Tabata(HIIT) training session over a four-week period ,pre and post 6 minutes walk test were taken of each subject and VO2 max was calculated. The results showed that there is significant effect of Whole body Tabata training on cardio respiratory fitness. Importantly, this whole-body Tabata protocol does not necessitate the use of specialized equipment, thereby alleviating the need′ for access to facilities, while still providing a time-efficient alternative to MICT or VICT for achieving similar training induced adaptations. Moreover, we found that individual response changes in the outcomes examined, with Tabata eliciting more favorable response′ profiles for indices of cardiorespiratory fitness and for push-up performance.Recent systematic reviews and meta-analyses have reported HIIT, compared to MICT, can significantly increase peak oxygen uptake in individuals with lifestyle induced cardiometabolic diseases and to stimulate modest improvements in VO2 max compared to pretraining values in active nonathletic and sedentary individuals. Batcan et all in their study of 'Effects of high- intensity interval training on cardiometabolic health' found that ST-HIIT′ increased VO2 max by a large effect in normal weight populations and increased VO2 max by a medium effect in overweight/obese populations, with no significant heterogeneity across studies. The ability of ST-HIIT and LT-HIIT has clinical applications in individuals that need to improve their aerobic fitness as HIIT is able to increase VO2 max rapidly via increasing mitochondrial density, resulting in the generation of more ATP for working muscles, thereby producing greater force generation for a longer duration. HIIT is also able to increase stroke volume induced by increased cardiac contractility and increase skeletal muscle diffusive capacity, thus improving aerobic capacity Carl Foster et al in their study 'Effects of High Intensity Interval Training vs Steady State Training on Aerobic and Anaerobic′ Capacity' found that VO2max changed significantly in all three groups ,they also mentioned that the logic behind HIIT training models is that they may produce a large adaptive response by virtue of recruiting a broader population of muscle fibers (Gollnick et al., 1974) and by providing a larger cardiorespiratory signal to adapt (Buchheit and Laursen, 2013a; 2013b). In studies with an appropriate steady-state control group, interval training has usually produced a larger increase in VO2max than nominally similar steady state-training. Indeed, studies like that of Gillen et al. (2010) suggest that even very brief high intensity training protocols can produce substantial increases in markers of cardiometabolic health. Using an animal model of Tabata training, Hasegawa et al. observed that Tabata training decreased central arterial stiffness′ (assessed by arterial pulse wave velocity) to the same level as conventional aerobic training through the same arterial signal mechanism. Izumi Tabata et al in their experiment on 'Tabata training: one of the most energetically effective high-intensity intermittent′ training methods' concluded that improvements of both the aerobic and anaerobic energy releasing systems after Tabata training are comparable to those provided by conventional aerobic and anaerobic training, including other types of HIIT, suggesting that Tabata training is useful to enhance sports performances that depend on both the aerobic and anaerobic energy releasing systems for resynthesizing the ATP used during the specific sports.(10) Hence Tabata training has significant effect on cardio respiratory fitness.

Conclusion: Thereby we accept alternative hypothesis that is tabata has significant effect on cardiorespiratory fitness after 4 weeks in undergraduate students.

Limitation: 1.The short duration of the training period.

2.Menstrual phase in females may have impacted our findings due to potential of sex differences in the adaptive responses to Tabata.

Clinical implications: Tabata training can be implemented in settings outside of clinical trials for improving cardio respiratory fitness and it may offer an additional strategy to assist with adipose reduction in overweight/obese populations

Future scope: Future work examining physiological adaptations to training in females should consider and control for the potential impact of′ menstrual cycle phase on trainability. The study considering longer period of Tabata durations.

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