# Effects of Tabata Training on Fitness and Health of Sports Coaching Education Students

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# Effects of Tabata Training on Fitness and Health of Sports Coaching Education Students

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**Abstract**

Sports physical training is a physical activity that has a good effect on health, fitness and performance. Currently, many physical exercises have been developed, especially physical exercises using high intensity. The purpose of this study was to see the effects of high-intensity training on fitness and health in Sports Coaching Education students. In this study, the experimental pre-test post-test method was used with the category of 7 untraining men and 9 training men as samples participating in this study, they are Sports Coaching Education (SCE) students who are active in physical activity 3 to 4 times a week. This study was conducted 3 times a week, in 4 weeks. The test used is the Shapiro-Wilk normality test and the Wilcoxon test is used to see the normality of the data, T-test to see the difference in pre-test and post-test after the sample gets high-intensity training treatment for 4 weeks. The results of this study are there are differences in post HR Max, post body weight, post BMI, post sum recovery, and post HR rest because (p = 0.05). On the results of N-gain, tabata training quite effective given to the group of training students than the untraining group. The conclusion in this study shows that the application of high-intensity training requires an adaptation process in the unfit student group to have a positive effect on the health and fitness of SCE students.

**Keywords:** physical fitness; student activity; sport modification; tabata

## 1. Introduction

Since long ago, physical fitness is one part of a healthy lifestyle, especially in physical health and mental health. So that everyone must have a schedule or activity to support their fitness. In addition, previous researches Redondo-Flórez et al., 2022; Wu, 2022; Zhai et al., (2022) found that there is a relationship between decreased academic grades and low physical activity of students. Students at the beginning of the semester have high academic activities, so they assume they do not have enough time to do physical activity (Hariyanto et al., 2023). This is the reason why they have low fitness.

High-intensity physical activity can increase energy expenditure characterized by increased muscle contraction and is carried out with a measurable program such as volume, intensity and frequency (Thivel et al., 2018). Physical exercise can strengthen muscles, increase flexibility, endurance and the cardiovascular system (Adamu et al., 2007; Atakan et al., 2021; Bompa & Buzziechelli, 2015). Regular physical exercise is needed to improve fitness so that it is not easy to experience fatigue and rapid energy loss (Hernawan et al., 2021). One of the physical fitness that must be possessed is cardiovascular endurance. Cardiovascular endurance is the ability of the heart, lungs and blood vessels to circulate oxygen to tissues throughout the body (Husnul & Nida, 2021).

High-intensity interval training or commonly referred to as high-intensity exercise with relatively short intervals. This sport is very often done by adults, especially students. It is proven by Lu et al. (2023) that HIIT is very effective in a university environment. In a study conducted by Lan et al. (2022) on

university students, it was found that they preferred to use HIIT training because it was greater in increasing aerobic capacity. Based on the literature above, researchers focus on developing HIIT exercises using the tabata method.

The tabata method is recognized as the most efficient form of HIIT. This study is important to conduct because it will support academic improvement through improved fitness. Tabata performed for 4 weeks can increase $VO_2$max in adults. The exercise also resulted in significant improvements in cardiovascular function (Bahtra et al., 2023; Guo et al., 2023; Kranen et al., 2023; Martin-Smith et al., 2020). In this study using a modified tabata exercise method with an exercise duration of 4 minutes consisting of a work and rest ratio of 20 seconds : 10 seconds (Pambudi Rilo et al., 2021). Therefore, this study aims to determine the effects obtained from modified tabata training on fitness and health in Sports Coaching Education students.

## 2. Method

was an experimental study involving students majoring in Sport Coaching Education (SCE). Nine students who were active in physical activity and seven students who were not active in physical activity were gathered. Students who were active in physical activity were observed from the weekly activities of these students by doing 3 sports exercises for at least 45 minutes each exercise. Aerobic capacity was measured using the Harvard Step Test. The data source in this study was collected by applying a test instrument for 4 weeks, done 3 times in a week. The data collection technique in this study was direct observation around the environment of the Faculty of Sport and Health Sciences.

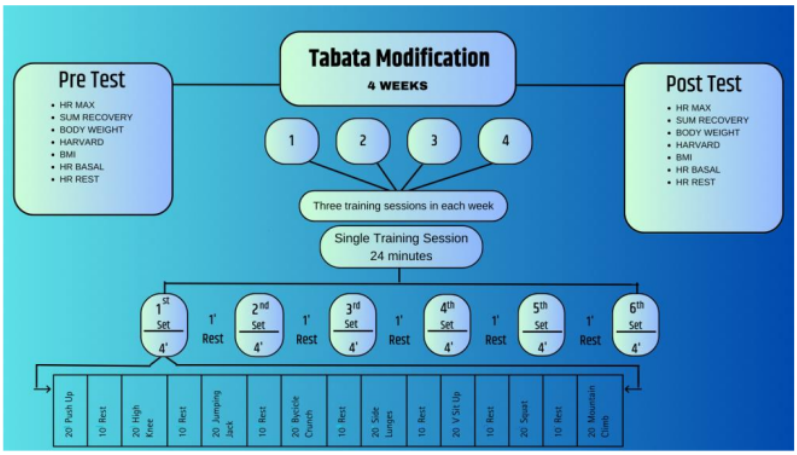


**Figure 1. Tabata Modification**

In Figure 1 is a modified tabata exercise programme that was carried out for 4 weeks. In week-1 there were 3 training sessions and in 1 session with 24 minutes. The 24 minutes was divided into 6 sets, each set lasting 4 minutes with a 1-minute rest period for each set change. The 4-minute exercise duration consisted of a work and rest ratio of 20 seconds: 10 seconds for 85% from DNM. Measurement of heart rate (HR) exercise or HR max, sum recovery, harvard, bodyweight, body mass index (BMI), HR basal, and HR rest were taken in the first week before tabata and the fourth week after tabata.

## 3. Result

**Table 1. Description of pre test – post test of SCE students**

| Variable | Measurement | *Mean* | SD |
|---|---|---|---|
| HR Exercise | Pre | 154.06 | 25.94 |
| | Post | 142.56 | 35.19 |
| Sum Recovery | Pre | 108.37 | 20.46 |
| | Post | 96.12 | 21.22 |
| Harvard | Pre | 80.06 | 12.65 |
| | Post | 90.81 | 20.23 |
| Bodyweight | Pre | 60.78 | 9.51 |
| | Post | 60.00 | 9.04 |
| BMI | Pre | 22.19 | 3.31 |
| | Post | 21.89 | 3.16 |
| HR Basal | Pre | 69.68 | 12.46 |
| | Post | 68.43 | 24.05 |
| HR Rest | Pre | 87.75 | 17.18 |
| | Post | 79.12 | 10.50 |

Table 1 describes the mean and standard deviation of pretest and posttest data on SCE students after doing modified tabata training there are changes in pre-post HR Max 154.06 ± 142.56, pre-post recovery 108.37 ± 96.12, pre-post Harvard 80.06 ± 90.81, pre-post body weight 60.78 ± 60.00, pre-post BMI 22.19 ± 21.89, pre-post basal HR 67.68 ± 68.43, pre - post HR rest 87.75 ± 79.12.

**Table 2. Shapiro Whilk test results**

| Variable | Measurement | *Saphiro-Wilk* | | |
|---|---|---|---|---|
| | | Statistic | df | p-value |
| HR Exercise | Pre | 0.818 | 16 | 0.05 |
| | Post | 0.895 | | 0.67 |
| Sum Recovery | Pre | 0.857 | | 0.17 |
| | Post | 0.980 | | 0.966 |
| Harvard | Pre | 0.948 | | 0.459 |
| | Post | 0.882 | | 0.42 |
| Bodyweight | Pre | 0.947 | | 0.440 |
| | Post | 0.922 | | 0.185 |
| BMI | Pre | 0.923 | | 0.188 |
| | Post | 0.940 | | 0.349 |
| HR Basal | Pre | 0.909 | | 0.114 |
| | Post | 0.580 | | 0.000 |
| HR Rest | Pre | 0.820 | | 0.005 |
| | Post | 0.959 | | 0.646 |

Table 2 tests the normality of all variables, namely HR exercise, Sum Recovery, Harvard, Bodyweight, BMI, Basal HR, and HR Rest. The explanation of the descriptive table above is that bodyweight and BMI are declared normally distributed because p>0.05.

**Table 3. Wilcoxon test results**

| Test Statistic | |
|---|---|
| **Variable** | **p-value** |
| Post HR Exercise | 0.036 |
| Post Harvard | 0.005 |
| Post Body Weight | 0.008 |
| Post BMI | 0.008 |
| Post HR Basal | 0.229 |
| Post Sum Recovery | 0.021 |
| Post HR Rest | 0.011 |

It can be seen in table 3 that p-value of post HR Max was 0.036, Harvard was 0.005, post bodyweight was 0.008, post BMI was 0.008, post sum recovery was 0.021, and post HR rest 0.011, declared significant because the p<0.05. This means that there is a difference after the modified tabata exercise.

**Table 4. Paired T-test**

| Paired T-Test | | |
|---|---|---|
| | **t** | **p-value** |
| Pre HR Max & Post HR Max | 2.131 | 0.050 |
| Pre Sum reco & Post Sum Recovery | 2.577 | 0.021 |
| Pre Harvard & Post Harvad | -3.176 | 0.006 |
| Pre Bodyweight & Post Bodyweight | 3.012 | 0.009 |
| Pre BMI & Post BMI | 3.245 | 0.005 |
| Pre HR Rest & Post HR Rest | 2.655 | 0.018 |

It can be seen that the output of table 4 explains that the Paired T-Test of HR Max was 0.050, Sum Recovery was 0.021, Harvard step test is 0.021, body weight was 0.009, BMI is 0.995, HR Rest was 0.018, because the sig.<0.05 value, it could be concluded that there was a difference in modified tabata training.

**Table 5. N-gain test results**

| | **Group** | **N** | **Mean** | **Minimum** | **Maximum** |
|---|---|---|---|---|---|
| **N-gain Tabata** | Untraining | 7 | 49.00 | -320.00 | 350.00 |
| | Training | 9 | 58.03 | 5.56 | 233.33 |

When tabata training was given to students who were not fit they fell into the less effective category because it only reached 49% with a minimum value of -320% and a maximum value of 350%. They need a long adaptation to be able to enter the effective category. As for the group of students who were fit, 58% were included in the moderately effective category. With a minimum value of 5.56% and a maximum value of 233.3%.

## 4. Discussion

This study aims to determine the positive impact obtained from modified tabata training on the fitness and health of SCE students. In this study there are variables of HR max, recovery, Harvard Step Test, Bodyweight, BMI, basal HR, and HR rest. The data collection time of the pre-test variable was before doing the modified tabata, after doing the modified tabata test for 4 weeks, the post test data then was

collected. Only the basal pulse did not have a normal distribution so it could not be continued with a different test. Variables that were normally distributed and continued in different tests were HR exercise, Harvard, Weight, BMI, and HR Rest variables ($p<0.05$). From the data generated, it stated that Ha was accepted because there was an effect of modified tabata training on the fitness and health of SCE students.

There was a significant pretest-posttest difference in mean bodyweight which means that there was a decrease in the sample. It was supported by previous research, that exercising can reduce the risk profile of overweight and obesity compared those who do not exercise (Eather et al., 2019; Ho et al., 2012; Meng et al., 2022; Swift et al., 2014). From observations when modified tabata exercise provides benefits for reducing excess fat and body weight levels and improving cardiovascular fitness. Body Mass Index (BMI) is very influential on body fitness as evidenced by previous researches that overweight or obesity makes physical performance worse, decreases muscle endurance and can make lower cardiorespiratory fitness (D. Mc[illegible]ddle et al., 2015). In addition, being underweight will also affect physical fitness to be worsen (X. Chen et al., 2020; Perissiou et al., 2020).

The lower the resting pulse rate, the better a person's fitness. When doing physical exercise in the body there will be a decrease in heart rate. Regular physical exercise can increase aerobic capacity and oxygen demand at rest will decrease because the heart can meet oxygen demand more efficiently at rest. In studies done by Kourek et al., 2023; Ziemann et al. (2011), tabata can also increase aerobic capacity in university students who are accustomed to regular exercise has a beneficial effect on cardiorespiratory fitness. This observation also suggests that short-duration exercise can improve cardio metabolic risk factors in young men (Fisher et al., 2015). Tabata training for students who are not fit only has an impact of 49% into the category of less effect because this exercise uses high intensity and requires a long adaptation to get a good category. It is important for us to maintain health and fitness because it is one of the factors that support all daily activities. The body is not healthy and fit, it will easily get tired and even fall ill. Fitness is also beneficial for the immune system, according to previous researches physical activity is recommended during the COVID-19 pandemic because it can improve fitness and provide benefits to physical and mental health (P. Chen et al., 2020; De Sousa et al., 2021; Dwyer et al., 2020; Lesser & Nienhuis, 2020; Pinho et al., 2020)

This study indirectly provides a positive effect on high-intensity training on the fitness of sports students. Currently, people are more concerned with interesting physical activities, so modifications to physical exercise are needed, especially for young people. Tabata training with modified movements, intensity and also additional music has more impact on student fitness (Ballmann, 2021; Clark et al., 2012; Cutrufello et al., 2020; Greco et al., 2022). This study only focused on the impact of modified tabata training on the fitness and health of SCE students. The study only included students of the Surabaya State University Sports Coaching Education Department, so the results of this study were limited to that population.

## 5. Conclusion and Recommendation

After 4 weeks of the tabata exercise program, there were significant differences in HR exercise, aerobic capacity, body weight, BMI, and HR rest. From the research conducted, it can be shown that the application of high-intensity training requires an adaptation process in untraining student groups to have a positive effect on the health and fitness of SCE students.

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