

The effect of home Tabata Protocol on health-related physical fitness parameters during Covid 19 process

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Abstract

Objective: the aim of this study was to investigate the effect of home-based Tabata applications on health-related physical fitness parameters during the COVID 19 pandemic. **Method:** sixteen athletes who played football at Kastamonuspor U16 team voluntarily participated in the study. The athletes were randomly divided into two groups: Tabata group (8) and control group (8). Athletes who were in the Tabata group participated in training sessions online and under the leadership of a coach 3 days a week for 4 weeks. The athletes who were in the Tabata group also continued their trainings with the team. The athletes in the control group trained only with their team for 4 weeks. Before the start of the training and at the end of the training, a 20-meter shuttle running test, Wingate anaerobic power test, and a sit-down test were performed. Back leg strength was calculated by dynamometer, and muscle endurance was calculated according to the number of push-up and sit-ups. In the calculation of body fat percentages, skinfold thicknesses taken from certain areas with the help of skinfold caliper were placed in the related formula and the calculation was performed. The analysis of the data was carried out with the IBM SPSS 21. The normality of the data was tested with the skewness and kurtosis values and Shapiro-Wilk test and descriptive statistics were used for the characteristic features of the participants. In order to compare the performances of the Tabata and control groups in the measurements, the Independent Samples T-Test was used and the Dependent Samples T-Test was used to compare the performances of each group. The significance level was $p < 0.05$. When the preliminary and final test results of the parameters measured in the in-group tests were examined. **Results:** a significant difference was found between the BFP (Body Fat Percentage), sit-ups, push-ups, leg strength, Wingate peak power, average power, and MaxVO₂ values of the athletes in the Tabata group ($p < 0.05$). In the control group, a significant difference was found in the performance of sit-ups and leg strength ($p < 0.05$). Significant differences between groups were observed only in muscle endurance and MaxVO₂ parameters ($p < 0.05$). **Conclusion:** as a result, it was concluded that the

inclusion of the Tabata protocol in normal training programs can contribute positively to the development of some performance parameters.

Keywords: sport training, exercise, football, Covid19, Tabata protocol.

Introduction

Due to the Covid 19 pandemic, which affected the whole world and limited the freedom of life of all people, people had to stay in their homes. With the measures taken by the countries they live in, disruptions occurred in both their social and athletic lives. In particular, it became necessary to change the training structures of sports branches (Basketball, Football, Wrestling, etc.). For this reason, the athletes had to turn to alternative training methods in order to prevent and protect their performance. Tabata training, on the other hand, was accepted as a part of the high-intensity interval training method of the Tabata protocol applied by Izumi Tabata and her colleagues working at the Tokyo Institute of Sports. The high-intensity interval training method (HIIT), which increases anaerobic and aerobic capacity, is a method used to increase endurance. At the same time, HIIT provides an advantage in terms of the duration of the exercise, while adapting effectively and quickly. This method is frequently used for athletes as it provides rapid development of metabolic functions and the cardiovascular system, and it is also preferred for individuals who do sports as a sedentary (Scrivener 2014).

In this context, it was aimed to apply Tabata exercises, which will last for 4 weeks, in order to observe the change between the performances of football players aged 16 who experience disruptions in their athletic lives, online and in a way that each individual would do in their own home and under the supervision of a coach. It was thought that examining the development of the physical fitness capacities of the Tabata protocol to be applied to these athletes will contribute significantly to the literature.

Material and method

This study was arranged for 3 days a week for 4 weeks, and the measurements were made with the experimental modeling method by taking the pre-test and post-test. Participants consist of experimental (Tabata) and control groups consisting of 8 randomly selected people. While the control group continued their normal football trainings 3 days a week, the experimental group additionally carried out their Tabata trainings online, in front of their computers, and accompanied by a trainer. The athletes were licensed sportsmen for at least two years. Athletes practiced football at least 3 days a week. Kastamonu University Faculty of Medicine Clinical Research Ethics Committee approval was obtained for the study to be implemented. Performance measurements of the participants were made. Questionnaires were applied to collect demographic information.

Table 1. Age, height, and body weight values of the participants.

Variable	Tabata (n=8)	Control (n=8)
Age (years)	16,0±0,0	16,0±0,0
Height (m)	1,68±0,06	1,72±0,03
Body Height (kg)	61,1±7,9	58,2±7,2

Data collection techniques

Performance measurements of the participants were performed at Kastamonu University Faculty of Sport Sciences research laboratory. Before starting the study, questionnaires were applied to collect the general health and demographic information of the participants. Muscle endurance was measured according to the number of push-ups and sit-ups in 1 minute. To determine the resting heart rate (HR_{Rest}) of the participants, the Polar Team2 (Finland) multi-pulse measurement set, which can record each beat, was used. Again, the body fat percentages of the participants were measured by taking subcutaneous fat measurements from the biceps region, sub scapula and suprailiac regions with a skinfold device. Aerobic capacities were determined with the 20-meter shuttle run protocol, and anaerobic parameters were determined with the 894E Wingate Bicycle Ergometer (Monark).

Tabata Training Test Protocol

Table 2. Training program.

Week	Movements	Number of Days	Repetitions and Rest	Rest Between Sets
1	Sprint-Crunch-Squat-Push-up.	3	20s-10s	1min
2	Sprint-Mountain Climber. Jump Squat-Diamond Push Up-Lunge.	3	20s-10s	1min
3	Sprint-Leg Raise-Sumo Squat. Push Up-Plank-Burpee.	3	20s-10s	1min
4	Sprint-Crunch-Side Squat. Diamond push up-Plank-Jumping Jack-Calf. Raise.	3	20s-10s	1min

The trainings were designed according to the principle of increasing loading as 4 movements in the 1st week, 5 movements in the 2nd week, 6 movements in the 3rd week, and 7 movements in the 4th week (Bompa & Haff, 2009).

Analysis of data

Data was analyzed with IBM SPSS 21 (IBM Corporation Inc. Armonk, NY, USA). The normality of the data was tested using the Shapiro-Wilk test and skewness and kurtosis values (Mishra et al. 2019). Descriptive statistics were used for the characteristics of the participants. While the Independent

Samples T-Test was used to compare the performances of Tabata and control groups on the measurements, the Dependent Samples T-Test was used to compare the performances of each group on both measures. The significance level was set at $p < 0.05$.

Findings

Table 3. Intra-Group BFP change rates and results of the participants.

BFP (%)	First Measurement	Last Measurement	Rate of Change	t	p
Tabata (n=8)	11,2±2,2	10,5±2,0	6,24	2,886	0,023
Control (n=8)	12,4±3,0	11,8±2,7	4,83	1,626	0,148

As seen at Table 3, there was a significant difference in the results of BFP measurement in the Tabata group, but no significant difference was found in the control group ($p > 0.05$).

Table 4. Anaerobic power output changes within groups.

Variable	First Measurement	Last Measurement	Percent of Change	t	p
Tabata (n=8) — Peak power (W/kg)	7,4±0,9	8,0±0,7	8,10	- 2,979	0,021
— Average power (W/kg)	4,4±0,8	5,0±0,7	13,63	- 3,279	0,013
Control (n=8) — Peak power (W/kg)	8,2±0,5	8,2±0,4	0	- 0,147	0,887
— Average power (W/kg)	5,1±0,5	5,3±0,4	3,92	- 1,283	0,240

The variables related to the Wingate performances of the athletes are presented in Table 4. While a statistically significant difference was found in the peak power and average power values in the Tabata group, no significant change was observed in both the peak and average power values in the control group ($p > 0.05$).

Discussion and conclusion

In our study, the aim was to determine the effect of Tabata training applied for 4 weeks in addition to normal football training on some physical fitness parameters of 16-year-old male football players.

Regarding the body fat percentage, when the findings between the first measurement and the last measurement were evaluated, a statistically significant decrease of 6.24% was observed in the Tabata group, and the same decrease was observed in the control group at the rate of 4.83%, but this result was not statistically significant. The reason for the decrease in the control group is thought to be that they continued their routine football training.

In a study conducted by Kurban (2021) to determine the physical and physiological effects of exercises performed according to the Tabata protocol in overweight and obese children, a total of 24 (Male=12, Female=12) participants between the ages of 12-14 were randomly divided into experimental and control groups. While the control group continued their daily lives, the experimental group performed Tabata training 3 days a week for 8 weeks. It was determined that the BFP values of the subjects participating in the experimental group decreased from 26.29 ± 2.85 to 25.35 ± 2.73 and this was found to be statistically significant. It was concluded that the control group participants had a significant increase in BFP. Baynaz (2017) applied Tabata training on 11 sedentary volunteer men for 3 days a week for 6 weeks and found that BFP decreased from $11,569 \pm 1.414$ to $11,084 \pm 1.753$, and this 4.20% decrease was statistically significant.

In his research on sports climbers, Tezer (2019) divided 32 students, 18 female and 14 male, who continued their education and was dealing with sport climbing for at least a year, into two groups as research and control. The research group trained for 3 days a week for 12 weeks in total and asked the control group to continue their routine climbing training. When the measurements related to BFP were evaluated, it was determined that the results within and between groups were not statistically significant.

In another study by Pehlivan (2017) which investigated the effect of endurance trainings performed with Tabata exercise in football players on some parameters, 14 football players in the U19 age group of two professional football teams were determined to be the experimental group, and 14 footballers to be the control group. He compared the BFP values as a result of the Tabata training for 6 weeks and 3 days a week additionally. In the experimental group, the value of 13.413 ± 3.311 in the first measurement, decreased to 12.053 ± 2.430 in the last measurement, and this decrease of 10.13% was statistically significant. It was determined that the decrease of 5.99% in the control group was also statistically significant. In the experimental group, the BFPs of the athletes who additionally applied the Tabata protocol were found to be almost two times higher than the control group in the last measurement.

The significant decrease in the Tabata group was probably due to the fact that the participants consumed more energy with additional trainings; it is considered that the BFP values that occurred in the control group but were not statistically significant may have been a result of routine football training. When our BFP measurement results are compatible with the literature. However, there are studies in the literature stating that Tabata training does not have any effect on BFP. It can be thought that this situation is caused by individual differences, training method differences, or differences in the diet applied.

Looking at the Wingate performances of the athletes; In the Tabata group, the peak power change percentage was 8.10 and the average power change percentage was 13.63, and these results showed a statistically significant increase. In the control group, while the peak power change

percentage was '0', the average power change percentage increased by 3.92, but it was not statistically significant.

Korkmaz (2017) applied Tabata high-intensity interval training protocol to the land and pool group for 8 weeks and 3 days a week in his study, which looked at the effect of high-intensity interval training in Tabata applied in different environments on aerobic and anaerobic performance. The participants in the control group were asked not to do high-intensity training for 8 weeks and to continue their normal lives. As a result of the trainings, increases were determined in the male peak power and average power parameters of the land group and observed that this increase was statistically significant. It was seen that the increase in the peak power values of the male participants in the pool group was significant and the increase in the average power values was not significant.

Koçak (2018) applied the integrated training method including high-intensity interval training (HIIT) for six weeks and three days a week on 10 elite mountain bikers. The positive change in the peak power data of the participants in the study was found statistically significant. The researcher concluded that the average power data also increased positively and was statistically significant.

Koparal (2019) determined that the HIIT training protocol, which was applied on Naval Academy students for 8 weeks, 4 days a week, caused an upward increase in peak power data and average power data, and this result was statistically significant. The peak power and average power results, which are the anaerobic power outputs we obtained in the results of our study, show parallelism with the results of the research in the literature.

According to the results of our research, the maximum oxygen consumption (MaxVO₂) increased from 52.2±0.5 ml/kg/min to 60.5±4.5 ml/kg/min in the Tabata group and recorded a statistically significant increase of 15.90%. It was determined that the 0.56% change in the control group was not statistically significant.

Korkmaz (2017) conducted his study on 91 subjects, 46 female and 45 male, between the ages of 18 and 25. He applied the Tabata high-intensity interval training protocol to the participants in the land group and the pool group, which he separated as the land group, pool group and control group, 3 days a week and for a total of 8 weeks. The participants in the control group were asked to continue their normal lives. As a result of the Tabata training, the authors observed an increase in MaxVO₂ values in the participants in the high-intensity training group, which was statistically significant.

Akinveren (2018) conducted his study on 52 male football players and divided them into three groups as repetitive sprint training group, high-intensity interval training group, and control group. While participating in the training programs of their groups 3 times a week and for a total of 8 weeks, the participants in the control group were asked not to do any training during this period.

He determined that the MaxVO₂ value increased from 47.35±2.21 ml/kg/min to 50.11±3.03 ml/kg/min for the HIIT group, and this difference of 5.83% was statistically significant.

Koçak (2018) applied the integrated training method including high-intensity interval training (HIIT) for six weeks and three days a week to 10 elite mountain bikers. According to the aerobic cycling test data of the participants, the MaxVO₂ values were 59.44±4.02 ml/kg/min in the first test, and 62.25±3.92 ml/kg/min in the post-test. An increase of 4.7% was determined and this increase was statistically significant.

Adıgüzel (2020) conducted his study on 43 men who do sports in the form of leisure activities and divided them into three groups: high-intensity interval training, moderate-intensity continuous training and control groups. The training was done for 8 weeks and three days a week. He determined that the MaxVO₂ values measured with the yo-yo test increased from 44.72±0.87 to 51.58±1.84 ml/kg.min in the high-intensity interval training group, and the result was statistically significant.

Limitations and recommendations

The number of the participants could be increased to see the results with higher number of athletes. Comparing the Tabata training protocol with the groups applying different training methods may be more useful in demonstrating the effectiveness of this method. In future studies, the application of the relevant training in different age and gender groups may be beneficial in revealing individual differences. Adapting the Tabata protocol as a training method to the routine training of athletes and coaches, can improve their performance positively. Studies can be conducted on the acute and chronic effects of the Tabata protocol, when applied in different environmental conditions. The effects of longer or shorter Tabata trainings or training protocols in which rest intervals are changed on performance can be examined.

Ethical statement

No institution or organization supported the presented study; this is derived from the Master's thesis.

In our study, the rules of journal writing and scientific research and publication ethics were complied with. Responsibility for any violations that may arise regarding the article belongs to the author.

Conflict of Interest

The authors did not express any conflict of interest regarding the study and publication.

Author contributions

Both authors are responsible for the writing, statistical analysis, collecting, listing the data and post-reading of the article.

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