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RESEARCH ARTICLE

INVESTIGATION OF THE EFFECTS OF 8-WEEK TABATA TRAINING ON PHYSICAL PERFORMANCE IN AMPUTEE FOOTBALL PLAYERS

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ABSTRACT

Purpose: The aim of this study was to investigate the effects of 8-week tabata training on physical performance in amputee football players. For this purpose, 24 male football players (age 21.9±5.24, height 174.8±7.62, weight 65.4±8.23) who played in amputee football Super league and had at least 5 years of amputee football history participated in the study voluntarily.
Materials and Methods: The athletes participating in the study were divided into 2 groups of 12 each as control group (CG) and tabata group (TG) by simple random method. While the TG applied an 8-week tabata exercise protocol during the normal football season (6 units per week, total 64 units), the CG continued only football training (6 session per week, 48 total units). Tabata protocol was applied as 4 sets 2 times a week for 8 weeks. Height, weight, standing long jump, vertical jump, 10-20-30 m. sprint and yoyo tests were performed as pre-test before 8 weeks and post-test after 8 weeks. Dependent sample t test was used to determine whether there was a difference between the pre-test and post-test of each group.
Results: According to the pre-post test data between the groups; statistically significant differences were found in the final weight (-1.92±0.38), final VKI (-1.05±0.19), final SLJ (33.91±7.51), final VJ (7.66±1.54), and final Yoyo (1.437±0.26) measurements of TG and KG ($p>0.05$).
Conclusion: Tabata protocol applied for 8 weeks will be very useful to be used more in the development of aerobic and anaerobic endurance skills which are very important in amputee football players.

Keywords: amputee football, endurance, tabata, high-intensity, vertical jump

INTRODUCTION

Football is a team sport that requires coordinating sudden and fast movements with multi-directional movements (1,2). Football is one of the most popular sports in the world and amputee football, beach football and futsal are sports branches inspired by football. Amputee football is one of the sports branches played by disabled individuals. Amputee football is a branch that requires sports performance such as high-level endurance, strength, speed, quickness and strategy, high level control and is played by athletes who do not have a leg using a cane (crutch). An amputee football match is a type of football played for a total of 50 minutes consisting of 25 minutes and 2 halves. Amputee football is played in an area of 60x40 metres with castles at both ends with its own rules (3). Considering the high intensity of the football competition, amputee footballers should be in excellent condition to easily perform all activities with and without the ball while moving with crutches (4). Studies indicate that using crutches is quite tiring (5). Therefore, it can be safely said that,

as with footballers, players should be well prepared for the game not only technically and tactically, but also, most importantly, physically (6). Similarly, in amputee football, the muscular strength and endurance required by the branch and should have an appropriate body composition according to the position played and the physiological and morphological characteristics required by the positions (7). High-intensity interval training (HIIT) models have emerged as a method to improve cardiometabolic function and thus physical performance. Based on this logic, tabata training modelling has been applied to improve physical performance. Tabata involves the completion of short or long repetitive sets of high-intensity exercise with alternating rest periods (8). Tabata is defined as repeated and intense efforts interspersed with periods of low or moderate intensity exercise recovery (active recovery) or complete rest, performed at an intensity that causes >85% of maximum heart rate (HR). The total work duration can be 10 s-6 min and is performed with a 1:1-3:1 work/rest ratio (e.g. 10 s work for 10 s rest or 30 s work for 10 s rest) (8). However, the tabata training model has not been used in amputee footballers and its effect on physical performance is unknown. The aim of this study was to investigate the effects of tabata training on performance in amputee footballers. The performance effects were compared between Tabata Group and Control Group for 8 weeks.

Hypotheses of the study: Does 8 weeks of training with tabata protocol have an effect on vertical jump performance in amputee football players? Does 8 weeks of training with tabata protocol have an effect on long jump performance in amputee football players? Does 8 weeks of training with tabata protocol have an effect on endurance performance in amputee football players?

MATERIALS AND METHODS

Participants

Twenty-four male volunteers aged between 18-40 years, living in Ankara province, regularly following football training for at least the last 1 year, not having any cardiovascular disease, blood disease, alcohol and cigarette consumption participated in the study. Participants were asked to eat at least 2 hours before the tests. According to G-power analyses; Effect size 0.8, α err prob: 0.20, Power (1-β err prob): 0.80, 28 people in total. The participants were divided into 2 groups, each consisting of 12 people, as tabata group (TG) and control group (CG) by simple random sampling method. Height, weight, standing long jump, vertical jump, 10-20-30 m. sprint and yoyo tests were applied to the participants as pre-test before 8 weeks and post-test after 8 weeks. It was approved by Istanbul Nisantası University Ethics Committee (Date: 04.01.2024, No: 2024-01) that the research design was in compliance with the Helsinki Declaration on Ethical Principles in Medical Research on Humans (2023/06).

Research design

The participants were divided into two simple random groups as Tabata Group (TG) and Control Group (CG). Firstly, height-weight and body mass of the participants were taken. Then vertical jump, long jump, 10-20-30 metres sprint and endurance tests were taken. CG continued routine football training for 8 weeks, while TG applied tabata protocol 2 days a week. The study was completed by repeating the post-tests. The values obtained from the pre-test and post-tests were recorded and statistically analysed. The tests applied in the study are the tests applied to the national athletes in the Brazilian amputee national team, as well as the measurements applied for amputee athletes (7).

Inclusion and exclusion criteria of the study;

- It was assumed that all individuals participating in the study understood the importance of the study and the tests.
- It was assumed that all individuals participating in the study performed maximal performance during the tests.
- It was assumed that all individuals participating in the study voluntarily performed the tabata protocol.

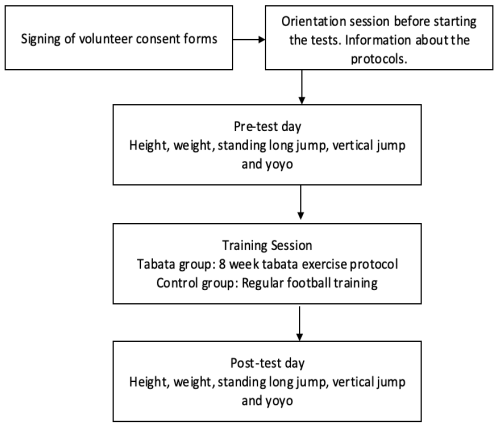

Figure 1. Research diagram

- This study was limited to 24 male athletes between the ages of 18-40 who played licensed football in the Turkish Armed Forces Rehabilitation Centre Disabled Sports Club in Ankara province in the 2023-2024 season.

Height and weight measurement

'The height of the participants was measured in m with a wall-mounted stadiometer (Holtain, UK) with an accuracy of 0.1 cm in an anatomical posture, barefoot, with feet fully on the ground, heels together and in contact with the wall, knees tense and body upright position, with reference to the point where the tip of the head touches the height meter table. Body weights were measured with a digital scale (Seca, Vogel and Halke, Hamburg) with an accuracy of 0.1 kg, while wearing light sportswear consisting of shorts and T-shirt, barefoot and in anatomical posture. Height and body weight were measured twice and averaged (9).

Speed test

10 Metre, 20 Metre and 30 Metre Run (Witty, Italy) The athlete ran with maximal effort on a flat surface with funnels between point A and point B. After complete rest, the test was repeated and the best of the 2 measurements was recorded as a score (9).

Vertical jump

The athlete was asked to jump on a Microgate witty, wirelles trainig timer (China) jump mat with feet apart and upright to the highest point she could reach. The measurement was done 2 times and the best degree was recorded (10).

Standing long jump

The measurement was made between the toe of the participant's foot at the starting line and the heel of the foot where the participant jumped and fell, and the point where the participant fell with a metre was calculated and noted. The test was performed on non-slippery ground, the test was repeated after complete rest and the best degree of the 2 measurements was recorded as a score (10).

Yoyo endurance test

The Yoyo test is a physical fitness test that measures endurance and fitness. Especially popular among athletes, it is used to assess running endurance and speed. The test involves the participant running forwards and backwards along a line and takes place at certain intervals at increasing speeds. The participant starts at one end of a line and runs towards a target at the other end. Then, as soon as he/she reaches the target, he/she turns back and this process is repeated at a certain speed. The speed is indicated by audible signals and the speed increases each time. If the participant fails to reach the target or does not align with the signal sound, the test ends and the last level run is recorded (11).

Data analysis

SPSS 25 package programme (SPSS Inc., Chicago, IL, USA) was used for statistical analysis of the data. Mean, minimum, maximum and standard deviation values were calculated for height, weight, standing long jump, vertical jump, 10-20-30 m. sprint and yoyo tests of all participants. Skewness-Kurtosis test was performed to determine whether the data of the groups were normally distributed, and it was determined that the data of the two groups were normally distributed. Within-group pre-test and post-test comparisons were analysed by paired sample t test and between-group pre-test and post-test comparisons were analysed by independent sample t test. Alpha level $p \leq 0.05$ was taken as the statistical significance level.

RESULTS

When Table 1. is examined, the tabata group data of the participants in the study; mean age 22.3±4.14, mean height 174.1±8.43, body weight 66.1±8.32, body mass index 20.85±5.46, standing long jump 173.9±21.2, vertical jump 27.83±5.06, 10-m. sprint 2.42±0.2, 20-m. sprint 3.95±0.28, 30-m. sprint 5.69±0.38, yoyo 40.05±1.21.

When Table 2. is examined, the control group data of the participants in the study; mean age 21.7±5.50, mean height 175.6±7.34, body weight 65.7±7.79, body mass index 21.3±1.60, standing long jump 147.7±18.5, vertical jump 24.5±5.4, 10-m. sprint 2.37±0.16, 20-m. sprint 3.99±0.36, 30-m. sprint 5.63±0.36, yoyo 39.65±0.91.

When the relationship analiyzed between the groups, statistically significant differences were found in the post test weight (-1.92±0.38), post-test BMI (-1.05±0.19), SLJ post-test (33.91±7.51), VJ post-test (7.66±1.54), and Yoyo post-test (1.437±0.26) measurements of TG and CG ($p>0.05$).

Table 1. Descriptive statistics of the Tabata group and findings related to Skewness and Kurtosis values

Parameters	n	Min.	Max.	Mean±SD	Skewness	Kurtosis	Cohens'd
Age (year)	12	17	30	22.3±4.14	0.527	-0.786	0.32
Height (cm)	12	155	185	174.1±8.43	-0.893	0.637	0.83
Body Weight (kg)	12	55.6	84.6	66.1±8.32	0.892	0.717	1.61
BMI (cm)	12	10	29	20.85±5.46	-.278	-.921	1.43
Standing long jump (cm)	12	131	209	173.9±21.2	-0.455	0.228	-2.76
Vertical jump (cm)	12	16	33	27.83±5.06	-1.176	1.531	-1.63
10-m sprint (sc)	12	2.13	2.78	2.42±0.20	0.835	0.118	-0.25
20-m sprint (sc)	12	3.50	4.43	3.95±0.28	0.386	-0.338	-0.24
30-m sprint (sc)	12	5.08	6.60	5.69±0.38	0.973	2.765	0.20
Yoyo (kg/ml/min)	12	38.75	42.14	40.05±1.21	0.724	-0.958	-1.23

Min: Minimum, Max: Maximum, sc: second, BMI: Body Mass Index, SD: Standart Deviation

Table 2. Descriptive statistics of Control group and findings related to Skewness and Kurtosis values

Parameters	n	Min.	Max.	Mean±SD	Skewness	Kurtosis	Cohens'd
Age (year)	12	16	35	21.7±5.50	1.562	2.226	0.12
Height (cm)	12	157	183	175.6±7.34	-1.524	2.916	0.76
Body Weight (kg)	12	54.2	81	65.7±7.79	0.449	-0.2631	1.10
BMI (cm)	12	17.9	23.6	21.3±1.60	-0.503	0.398	1.94
Standing long jump (cm)	12	118	173	147.7±18.5	-0.161	-0.419	-0.22
Vertical jump (cm)	12	16	36	24.5±5.4	0.458	0.621	-0.36
10-m sprint (sc)	12	2.13	2.67	2.37±0.16	0.406	-0.823	-0.45
20-m sprint (sc)	12	3.56	4.67	3.99±0.36	0.457	-0.979	-0.12
30-m sprint (sc)	12	5.10	6.15	5.63±0.36	-0.020	-1.403	0.12
Yoyo (kg/ml/min)	12	37.7	40.7	39.65±0.91	-0.635	-0.071	-0.40

Min: Minimum, Max: Maximum, sc: second, BMI: Body Mass Index, SD: Standart Deviation

Table 3. Pre-post test values between groups

Parameters		Mean±SD	p	Cohens'd
BMI (cm)	Pre	0.19±0.13	0.195	0.13
	Post	-1.05±0.19	<.001*	0.19
Standing long jump (cm)	Pre	26.16±7.57	<.001*	0.99
	Post	33.91±7.51	0.046	1.30
Vertical jump (cm)	Pre	3.33±1.47	<.001*	0.65
	Post	7.66±1.54	0.960	1.30
10-m sprint (sc)	Pre	-0.03±0.06	0.111	-0.01
	Post	-0.082±0.04	0.662	-0.50
20-m sprint (sc)	Pre	-0.038±0.08	0.888	-0.12
	Post	-0.015±0.10	0.651	-0.04
30-m sprint (sc)	Pre	0.054±0.11	0.623	0.13
	Post	0.041±0.08	0.193	0.14
Yoyo (kg/ml/min)	Pre	0.406±0.29	<.001*	0.40
	Post	1.437±0.26	<.001*	1.59

*Min: Minimum, Max: Maximum, sc: second, BMI: Body Mass Index, SD: Standart Deviation, *: p<0.05*

DISCUSSION

This study was conducted to investigate the effects of 8-week tabata training on physical performance in amputee football players. For this purpose, 24 male football players who played in amputee football super league and had at least 5 years of amputee football history participated in the study voluntarily. An 8-week tabata exercise protocol was applied to the athletes during the normal football season. As a result of the study, it can be hypothesised that tabata practice improves physical performance in amputee footballers.

When the studies on the body composition of the participants were examined; Kayıhan and colleagues

determined the body mass index as 21.9±0.25 kg/m2 in a study conducted on 14 amputee national team football players (12) This study shows that a 4-week basic training programme including exercises for the improvement of physical parameters provided significant improvements in the body composition of amputee football national team athletes. Also, in another study, 12 amputee football players were compared with 14 sedentary below-knee amputees (13,14). According to the body mass index findings, there was a statistically significant difference between amputee football players and sedentary amputees in favour of football players. In a study conducted on 11 amputee footballers in the literature, it was reported that the body mass index was 21.88±2.08 kg/m2. (14). In another study, when the groups of 28 amputee footballers between the ages of 16-45 were compared among themselves, it was emphasised that the body mass index of the footballers who received training decreased more (16). In Yıldız's study, the effects of 6-week preparation period training applied to amputee football players on physical and physiological parameters were examined. The mean age of the players in the study was X=33.27±7.43 years, mean height was X=173.06±7.11cm, mean body weight was X=74.75±11.43 kg for pre-test and X=72.20 ± 9.50 kg for post-test (17). The study showed that there was no significant relationship between age and height and physical-physiological parameters, while there was a significant difference between body weight and parameters. These results indicate that the effect of training programme on body weight is significant (18). However, the unrelated findings of the study with age and height suggest that further research is required to understand the effect of training on these parameters in more depth. In this context, it may be important to conduct more comprehensive and long-term studies to understand how training programmes affect individual physical characteristics (18,20). In addition, it was stated that waist-hip ratios were higher in the training group than in the control group in proportion to body mass indexes. However, this difference was reported to disappear after the training. In our study, statistically significant differences were found in weight (-1.92±0.38) and BMI (-1.05±0.19) measurements (p>0.05).

According to the vertical jump distance classification study, the jump distance in men was defined as 66 cm and above excellent, 50-65 cm good, 40-49 cm average, 33-39 cm poor, 29 cm poor, and centimetres and below this measure were defined as 'very poor'. In our study, when the jump heights of amputee footballers before training were analysed, it was seen that the control and exercise groups were 'very poor' (21,22). When the distance jumped after training was analysed, it was seen that amputee football players in the control group jumped more than amputee football players in the training group, but no difference was observed between the two groups in terms of jump distance. It was noted that the difference in strength between the healthy and amputee sides was higher in amputee footballers than in sedentary amputees (23). The explanation for this result is that amputee footballers use their healthy side extremities more than sedentary amputees and their healthy side extremities are stronger. Mills et al. documented improvements in vertical jump performance in a training group of 20 female athletes aged between 18 and 23 years who participated in 10 weeks of lumbopelvic stabilisation training (24,25). In a 7-week, 3-day-a-week training programme for 19 female high school athletes, plyometric training was compared with dynamic stability and balance training, and both groups had better jump performance and significantly increased in the vertical jump test. Although the increase in dynamic stability and balance training was not an expected result, the researchers attributed this to the application of plyometric training.

This study can be applied for the application of different training techniques in amputee football. Physical performances of athletes can be improved with basic strength exercises to be applied on the field.

CONCLUSION

The analysis of the data revealed that there was a significant difference in body weight values between the teams. Also, significant differences were found between the groups in standing long jump and vertical jump values. As a result, it can be said that strength training plans made with the Tabata protocol applied during the season can contribute to the sportive performance of the teams and play an important role in the challenge against competitors.

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