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Effects of Cross-Fit Trainings on Body Composition and Some Physical Parameters in Sedentary Men

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Abstract

Purpose: Body composition and some physical parameters of 12-week Cross-Fit training intensity in sedentary male individuals; Changes in body composition, heart rate, blood pressure, flexibility, endurance, and maximal strength were examined. Tool and Method: This study is in a private sports center operating in Çankırı, between the dates of 01 March - 31 May (12 weeks) in 2019, between the ages of 18- 54 years (average age is 40.73 ± 10.43 years, height is 177.93 ± 5.61 cm) 15 healthy adult men who did not do sports during the last 6 months participated and 12-week Cross-Fit training was done. The time set for training is 90 minutes. The participants were trained 4 days a week (Monday, Wednesday, Friday-Sunday) between 20:00 and 21:30. All the tests made to the participants were made between 08:30 and 12:00 in the morning, one day before and one day after the training programs. Statistical analysis of the findings obtained from the test results was determined by using the SPSS 25.0 for Windows package program. The subject group included in the study was analyzed at 0.05 significance level by using the reason for "Paired Samples T Test" to compare the results obtained after the measurements and to determine the significance levels of the differences between the averages (Samples were compared with the pre-post test). Results: In the light of the data obtained, it was observed that there was a statistically significant difference in the variables (body composition, cardiovascular measurements, physical measurements, maximal force measurements) in all values measured and measured (pretest-posttest). It is thought that; functional training, which is one of the determinants of these differences, is effective on the body composition of the sedentary men and some physical parameters, and the necessary training should be given to functional training activities in regularly planned and created training contents.

Key Words: Cross Fit, Sedentary, Physical Parameters

Introduction

Cross-Fit is considered as one of the high-intensity functional training methods that progress and progress very quickly. Cross-Fit, which has developed rapidly in recent years and is an alternative training method or exercise program instead of traditional fitness equipment, has gained acceptance for people today and has started to be in high demand (Hak et al., 2013). With the development of cross-fit in the 1990s, more than 200,000 athletes and approximately 11,000 gyms started to be seen worldwide (Mate-Munoz et al., 2017).

Cross-fit was originally founded by Greg Glassman, both a fitness trainer and gymnast, and published in 1995 by California / Santa Cruz. It was published in 2001 as a webcast (Glassman, 2010).

Cross-fit training (CFT) means strength and fitness program in general. This program was originally developed for military training, and later became popular among civilians. Cross-fit workouts are mostly performed in the form of high-intensity strength exercises. Cross-fit exercises are performed quickly, with repetitive movements and with little or no rest between sets (Glassman, 2007). It is observed that individuals who perform regular cross-fit training have improved both muscle endurance and muscle strength over time (Glassman, 2006). In addition, Cross-fit has been reported that contributes significantly to agility, balance, coordination, cardiovascular endurance, and flexibility, strength, speed, endurance and strength development (Glassman, 2009).

Cross-Fit training has been shown to create both a broad, overall and inclusive fitness (Turna et al., 2009). In this way, the combined style of cross-fit has been named as a workout of the day (Wod), which is called both a physical training philosophy and a competitive sports type, called exercise of the day. These wods start and end in a period of 10-50 minutes (Glassman, 2009). After a good warm-up in these training sessions, one of the power or strength programs is applied, and during these applications, high-intensity exercises, rapid repetitions and an aerobic load are performed between the sets with little or no rest period (Sprey et al., 2016).

Cross-Fit is considered an option for HIIT. The most important reason why HIIT training is in high ranks is that the Cross-Fit training system has a similar structure. While Cross-Fit training programs are considered to have positive effects on body composition, a more effective training program and a higher cruise rate are required to reach clearer data (Halson, 2014). Although there are many participants of Cross-Fit studies, there are limited studies related to Cross-Fit. The purpose of this study is to examine the effect of Cross-Fit training on body composition and some physical parameters in male sedentary individuals.

Material and Methods

Research Group and Working Design

In a private sports center operating in the city of Çankırı, between the dates of 01 March - 31 May (12 weeks) in 2019, he has not worked for the last 6 months, aged 18-54 (average age 40.73 ± 10.43 years, height length 177.93 ± 5.61 cm) voluntary 15 healthy adult males participated. The subject group was informed about the content, purpose and application form of the study and their approvals were obtained for their willingness to participate in the study. During the research, the whole program was implemented at the sports center between 08:30 and 12:00 in the morning.

Training Criteria;

- Being over the age of 18 and under 55,
- Having a sports history for doing all the physical activities in the study,
- Ones who have no history and presently still without coronary artery disease, cancer, hypertension (systolic> 140 mmHg, diastolic> 90 mmHg) and have no diabetes,
- Those who do not use alcohol and drug-like substances,

Tests and Training Protocol

In the Cross Fit application area established in a private sports center for the participants, strength training, resistance enhancer that lasts 90 minutes a day for 4 weeks (Monday, Wednesday, Friday, Sunday) between 20:00-21:30 in the training unit, aerobic capacity-building circular training (circuit training) and flexibility-enhancing cross-fit training program were implemented. Warm-up and Stretching (10-15 min.), Demo application (5-10min.), Cross-fit exercises (55-60 min.), Cooling and stretching movements (3-5min.) it is formed. One week before the start of the study, the trainings were given about the movements in the training program and application studies were carried out for the participants to apply these movements correctly. The participants were asked to lift the heaviest weight they could lift the movements in 1 repetition provided that they applied the movements correctly. The measurements were taken as values before the participants started training and after 12 weeks of exercises (body composition, cardiovascular fitness, aerobic capacity and physical parameters). Volunteers were warned not to consume alcohol, drugs, excessive fatty foods or to engage in strenuous activities 1 day before the test measurements. In the research, pretest-posttest model was applied. Participants did not have a certain nutritional program and any food restrictions during their training.

Table 1. CrossFit Training Program

Program 1	Program 2	Program 3
Air Squat	Front Squat	Overhead Squat
Push Press	Push Jerk	Deadlift
Sumo Deadlift	High Pull	Medicine Ball Clean
500 Rowing	30 Push Up	10 Thruster
40 Wall Ball	20 Box Jump	10 Kettle Bell Swiang
5 Hang Power Clean	7 Cleans (kg)	10 Pull Up (Barfiks)

Measurements

Health and performance measurement controls of the participants were taken in a fully equipped sports center in Çankırı. The subjects were subjected to height, body weight, body composition measurements and physical exercise tests in the order specified.

1. Body Composition Measurements

Participants whose height was measured were included in body composition measurement. Body weight (kg) and composition evaluations of the subject group (Body mass index-BMI (kg / m^2), Body Fat Ratio-BFR (%) bio-electric impedance (BIA) analysis method (Inbody 270 Body Composition Analyzer, model Plus 270) BIA is an analysis method based on lean tissue mass and electrical permeability difference of fat (Lukaski, 2003).

The test measurements of the subjects are between 8:30-12:00 in the morning, before the liquid and food intake in the evening, before toilet, etc. needs were made in a way that was met. The metal and ornaments on the subjects were removed and the subject to be measured was dressed in a minimum suit, feet bare, the analysis tool was asked to hold the hand electrodes by standing vertically on the aluminum bases. The results were recorded with the help of a laptop connected to the Body Composition Analyzer.

2. Cardiovascular Measurements

2.1. Heart Beat Rate Measurement: The resting HR values of the volunteers were measured by recording the Polar brand RS800cx hour based on the lowest heart rate every 5 seconds. The recordings were recorded by throwing them to the computer with the infrared of the watch. The Polar brand is a Finnish watch and consists of two parts. One piece is clock-shaped, worn on the subject's wrist, the other piece is in the form of a rubber band and is worn around the chest at heart level, there are interval options of 5-10-15 seconds for heart rate recording, and the information recorded for detailed, long-term analysis can be uploaded to the computer (Tamer, 2000).

2.2. Blood Pressures' Measurement: Each subject was provided to repeat the test 3 times and the lowest value measurement was recorded from these 3 applications. Blood pressure measurements of the subject group at rest were determined in mmHg by using aneroid – sphingomano-meter and stethoscope devices (Tamer, 2000).

3. **Physical – Physiological Measurements**

3.1. Sit and Reach Test: The test bench was used for the Sit-Reach test with a length of 35 cm, width of 45 cm, and height of 32 cm to measure the flexibility of the muscles and the test was repeated 3 times and the best result was recorded as the flexibility value (Raven et al., 1976).

3.2. VO_{2max} and HR Max. Measurement: Subjects maxVO_2 - VO_2 KAH max. 20 m for the estimating; the shuttle running test was used. The test is a test that starts at a running speed of 8.5 km / h, and the running speed increases by 0.5 km / sec every 1 minute, and a distance of 20 meters is run round-trip. The test cassette used for the 20 m shuttle run according to the protocol was used to determine the running speed. The test was terminated when the subject did not overlap the two signals or when he left the test. According to the results obtained, the VO_2 max values of the subjects were recorded in ml / kg / min (Bangsbo and Krustrup, 2009).

3.3. Bench Press and Leg Press Measurement (5 RPM): Standard plate weights of 1kg / 1.5kg / 2kg / 2.5kg / 3kg / 5kg / 10kg / 15kg / 20kg were used for bench press and Leg Press measurement. The maximal force of each participant was determined by 5 repetition method. This method has been determined during the application phase by trying before the measurement to determine the weight of each participant. After the weight was increased to the barbell in the bench press movement, each participant was provided to lift this weight with the appropriate technique, if the participant was able to lift the weight without difficulty, 5 minutes of rest were provided and additional additions were made to the weights (Haff and Triplett, 2016).

3.4. One minute sit up test: For crunch test measurement; Participants were allowed to sit up with maximum repetition for 1 minute when the start command was given with the knees bent at an angle of 90 degrees in the supine position, hands on the nape and the soles of the feet in contact with the ground. During the shuttle application, an assistant was provided to hold the

participant's feet to prevent the feet from touching the ground. Subjects were asked to try the test before the measurement was applied. The subjects were asked to touch the shoulders when they lie on the ground, their elbows to touch the knees when they are straightened, and the shuttle was written on the number of record records repeated at the end of 1 minute (Brisebois et al., 2017).

3.5. One minute Squat Test: For squat measurement, fixed plate weights of 1kg / 1.5kg / 2kg / 2.5kg / 3kg / 5kg / 10kg / 15kg / 20kg were used. The maximal force of each participant was determined by 5 repetition method. During the application of this method, the weight of each participant was determined by trial and error. After the weight was increased to the barbell in the Smıth Machıne tool, each participant was provided to lift this weight with the appropriate technique, and if it was able to lift the weight without difficulty, additional additions were made to the weights by providing 5 minutes rest (Haff and Triplett, 2016).

3.6. One minute Burpee Test: The burpee movement is a practice movement combined with squatting movement, push-ups and vertical bounce quickly, sequencing one after another, and the number of burpee movements that the participants can repeat this mixed motion series in 1 minute was recorded in the data sheet (Brisebois et al., 2017). Although the Burpee movement is a movement that targets all muscles; During exercise, various muscles, such as triceps, trapezes, deltoids, quadriceps and pectorals, work harder than others, named after the American psychologist Royal H. Burpee, who thought and discovered fitness movements for agility, coordination and fitness (Haff and Triplett, 2016).

Statistical Analysis

The statistical analysis of the data obtained as a result of the measurements was made using the SPSS 25.0 for Windows package program. In order to compare the data obtained after the measurements of the subjects participating in the study with each other and to determine the significance levels of the differences between the averages, the “Paired Samples T Test” was used at the 0.05 significance level.

Results

The study was conducted between 15 March and 31 May in 2019 with a total of 15 subjects, voluntary sedentary men. The ages of the subjects ranged between 18 and 55, with an average of 40.73 ± 10.43 years. The results of the study in which the effects of Cross-Fit training on sedentary men on body composition and some physical variables are aimed are given below.

Table 1: Comparison of; Body Weight, Body Fat Percentage and Body Mass Index Pretest-Posttest Values of Males Participating in the Study.

Variances (n=15)	**Pre - Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**T**	**p**
Body Weight (kg)	89,06±9,43	77,62±7,20	8,923	0,000*
Body Fat Percentage (%)	24,98±8,80	17,62±6,51	7,316	0,000*
BMI (kg/m^2)	28,76±4,03	21,86±2,34	8,157	0,000*

p<0,05*

When Table 1 is examined, the pre and post test values of the participants as a result of the statistical analysis; A statistically significant difference was observed between Body Weight ($t = 8.923$, $p < 0.05$), Body Fat Percentage ($t = 7.316$, $p < 0.05$) and Body Mass Index values ($t = 8.157$, $p < 0,05$).

Table 2: Comparison of RHBS, DBP, SBP Pre-test and Post-test Values of the Male Participants

Variances (n=15)	**Pre - Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**T**	**p**
RHBS (beat/min.)	80,40±8,92	75,86±4,89	3,445	0,004*
DBP (mm/hg)	80,80±4,12	78,00±3,04	3,581	0,003*
SBP (mm/hg)	122,46±5,27	120,20±4,41	3,900	0,002*

*RHBS: Resting Heart Beat Speed *DBP: Diastolic Blood Pressure *SBP: Systolic Blood Pressure

When Table 2 is examined, as a result of the statistical analysis, according to the results of the pre and post test measurements of the volunteers; There was a statistically significant difference between Resting Heart Rate ($t = 3.445$, $p < 0.05$), Diastolic Blood Pressure ($t = 3.581$, $p < 0.05$) and Systolic Blood Pressure values ($t = 3.900$, $p < 0.05$).

Table 3: Comparison of Resilience, Flexibility and Strength Pre test – Post test Values of Male Participants

Variances (n=15)	**Pre-Test** $\bar{X}\pm$ Sd	**Post - Test** $\bar{X}\pm$ Sd	**t**	**p**
Flexibility (cm)	19,32±4,57	23,08±4,09	-5,325	0,000*
KAH Max (ml/kg/min)	192,86±5,43	185,26±4,49	5,253	0,000*
VO_2 Max. (ml/kg/min)	57,08±5,69	60,09±5,33	-2,270	0,040*
5 RPM Leg Press (kg)	120,66±31,27	253,00±91,21	-8,204	0,000*
5 RPM Bench Press (kg)	39,66±14,93	80,00±17,92	-16,711	0,000*
1 Min. Crunch	28,00±8,53	40,20±11,46	-8,134	0,000*
1 Min. Squat	23,80±8,96	35,06±12,09	-8,791	0,000*
1 Min. Burpee	22,66±8,32	32,80±10,19	-10,605	0,000*

p<0,05*

When Table 3 is examined, as a result of the statistical analysis, according to the pre and post test measurement results of the volunteers; There was a meaningful difference between; Flexibility (t = -5,325, p <0.05), KAH max (t = -5,253, p <0.05), VO2 max (t = -2,270, p <0.05), 5RPM Leg Press (t = -8,204, p <0.05), 5RPM Bench Press (t = -16,711, p <0.05), 1 minute Crunch (t = -8,134, p <0.05), 1 minute Squat (t = -8,791, p <0.05) and 1 minute Burpee (t = -10.605, p <0.05).

Discussion

Although there are many studies about Cross-Fit; there are limited studies existing related to Cross-Fit.

Body Composition Measurements

In our study, when we compared the participants' body weights before and after the training, it was found that there was a significant decrease in the body weight (p = 0.000; p <0.05) (Table 1).

According to Baynaz et al. It was determined that the strength exercises performed with their own body weight for 6 weeks with cross-fit training had a positive effect on the body weight values of the sedentary (Baynaz et al., 2017). According to Paoli et al., in a study with three different groups performing endurance training, high intensity circular training and low intensity circular training, found that the group that performed high intensity circular training had a higher decrease in body weight than the other training groups (Paoli et al., 2010). Carol et al., investigated the effect of jogging and walking exercise on performance with 60 women and men aged 24-48. They practiced the participants for 8 weeks. They found that there was a significant reduction in the body weight of the participating women and men. In our study, when the pre and post values of the participants were compared (p = 0.005; p <0.05) (Table 1), a significant decrease was found (Carol et al., 2002). Gomez et al., stated that there was a significant increase in total lean mass with 10-week resistance training ((Gomez et al., 2015). Mertens et al. [19] applied a 2-month running program with 8 sedentary female and 8 male subjects with an average age of 54.9 years (Mertesn et al., 2015).

At the end of the study, they found that the body fat rates decreased significantly. Katzmarzyk et al.; As a result of aerobic exercise exercises, which were applied to 650 men between the ages of 17-65 for 20 weeks, changes in blood lipids and body fat mass were discussed. At the end of the training, a 3.3% decrease in the body fat masses of the participants was observed. In our study, when the BMI pre and post values of the participants were compared (p = 0.005; p <0.05) (Table 1), a significant decrease was found (Katmarzky et al., 2001). Choi et al., showed that the BMI values of students decreased from 22.58 kg / m2 to 22.65 kg / m2 as a result of their study (Choi et al., 2017). In the study of Murawska-Cialowicz et al., it was stated that three-month cross-fit training performed on 15 adults significantly reduced body mass index values (Murawska-Cialowicz et al., 2015). Schjerve et al. [23], in the study of adults who applied the HIIT (Cross-Fit, PX90) training method, BMI decreased from 36.6 ± 1.2 kgm2 to 36.0 ± 1.2 kgm2 and this decrease was found to be significant 2% (Schjerve et al., 2008). The results in this study are similar to the results of our study. In our study; the decrease in body weight, body fat percentage and BMI values of male participants doing Cross-Fit training is thought to be caused by the effectiveness of the training process. Considering the literature, the findings we obtain are also supported by the literature.

Cardiovascular Measurements

In our study, it was found that there was a significant decrease when the pre and final values of the participants with RHBS, DBP, SBP were compared respectively (p = 0.004; p = 3; p = 2; p <0.05) (Table 2). Ersöz et al., For 17 adults between the ages of 30 and 45, they underwent aerobic studies at 50-75% intensity for 45/60 minutes 3 times a week for 8 weeks and 6% at systolic blood pressure at the end of exercise; It was determined that a 10% reduction in the number of resting heart beats occurred (Ersöz et al., 1996). Green et al.; They performed circular training to chronic heart patients with an average age of 62 ± 3 years, and at the end of the exercise, participants found a significant reduction in diastolic and systolic blood pressures (Green et al., 2001). Grace et al., reported that 8-week high-intensity interval training is an effective method for improving respiratory function in men who do not play sports and do regular sports, with an average of 16-19 years of age, and changes blood pressure and resting heart rate in both sports and non-sports (Grace et al., 2016).

At the end of the 12-week Cross-Fit training, it was observed that the subjects performed the recovery with a lower heart rate and the Diastolic and Systolic blood pressures decreased (Perez et al., 2013). When these three results are considered together; we can say that the heart works more economically, therefore it is more efficient. The results obtained are also parallel with the literature.

Physical – Physiological Measurements

In our study, it was found that there was a significant increase in the flexibility pre and post values of the participants (p = 0.000; p <0.00) (Table 3). According to VelazqueAs and Wilmore; a significant change in flexibility has been reported as a result of the 12-week intensive physical activity program (Velazquez and Wilmore, 1991). Zorba et al., performed intense step exercise for young people between the ages of 18-24, 8 days a week for 8 weeks and at the end of the study they found a significant difference in the flexibility values of the experimental group (Zorba et al., 2000). Blake et al., had a 14-week intense exercise program for sedentary obese and normal body weight adults and compared both groups' responses to exercise and physical fitness levels. Flexibility in both groups at the end of the study; they recorded a positive change in their (sit-reach) values (Blake et al., 2000). In our study, it was found that there was a significant difference when the durability pre and post values of the participants were compared (p = 0.000; p <0.00) (Table 3). In their research conducted by Alan et al., they applied sub-maximal intensity aerobic training for 12 weeks to adult subjects. At the end of the training program, it was observed that there was a 9% improvement in the participants' MaxVO2 values (Alan et al, 2000). Hopkins et al.; They applied Cross-fit with a severity of 60-80% to 17 men aged between 30 and 45, 8 weeks, 3 days a week, and a significant increase of 6% in MaxVO2 values was observed at the end of the study. The results obtained in our study in terms of cardiovascular endurance are similar to those in the literature (Hopkins et al., 2009).

Maximal Force Measurements

In our study, when the participants' maximal force pre and post values were compared (p = 0.000; p <0.00) (Table 3), there was a significant change. Clarkson and Hubal. (2002), in a study, the increase in weight level after the leg resistance exercise increased gradually from the end of the 2nd week (Clarkson and Hubal, 2002).

Choi et al.; In Korea, 22 students (11 subjects and 11 control groups) were trained at the university for 14 weeks and 2 days a week Cross-Fit training was done, and they concluded that Cross-Fit training was significantly effective in maximal strength values (Choi et al., 2017).

Conclusion

As a result, we have observed that the individuals who do not actively do sports do not know their bodies thanks to Cross-fit training, their level of self-confidence in training and exercise and their desire for training. As a result of the 12-week data and evaluations obtained; it is concluded that Cross-fit training programs have a positive effect on all parameters evaluated in sedentary male individuals. It is also thought that there is an increase in the level of social motivation of the participants, who are constantly observed, depending on the change in their body structures. Of the work done; it is considered that cross fit training can contribute to different age and gender age groups and the world of sports.

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