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# Assessment of the Effect of a Six-Week CrossFit Training Program on Body Composition and Functional Capacity

## Evaluación del Efecto de un Programa de Entrenamiento de CrossFit de Seis Semanas en la Composición Corporal y la Capacidad Funcional

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**SUMMARY:** This study investigates the impact of a six-week CrossFit training program on body composition and functional capacity in middle-aged men and women. CrossFit is a sport that involves high-intensity physical activities, including gymnastics, weightlifting, running, jumping, and lifting heavy objects. The research included 21 men and 17 women, all of whom were regular CrossFit practitioners. Body composition—assessed via multi-frequency bioelectrical impedance—covered body weight, body mass index (BMI), body fat percentage, and muscle mass percentage, measured both before and after the training period. Functional capacity was evaluated through a comprehensive test battery, including handgrip strength, push-ups, sit-ups, sit-and-reach tests, and aerobic beep-test. Statistical analyses incorporated descriptive statistics, the Shapiro-Wilk test for normality, and paired-samples t-tests to compare pre- and post-intervention results. The results revealed that height, weight, BMI, muscle mass, and fat mass remained relatively stable for both sexes over the six weeks. However, significant improvements were observed in upper body strength and endurance, with notable increases in mean sit-up and push-up performances in both men and women. Additional significant gains were detected in males on the sit-and-reach test and in females for hand grip strength and standing long jump. VO2max did not exhibit significant changes. In conclusion, the six-week CrossFit program positively influenced functional performance, especially upper body strength and endurance, although it did not substantially alter body composition. The findings offer practical insights for coaches and professionals designing CrossFit-based training regimens.

**KEY WORDS: Crossfit training; Body composition; Functional capacity; Percentile norms.**

## INTRODUCTION

CrossFit (CF) is a sport characterized by complex intensity and a diverse range of physical activities, designed to develop multiple motor qualities, including strength, endurance, power, and other fitness components. The basic unit in CF training programs is the "workout of the day" (WODs), which combines exercises from weightlifting, gymnastics, and cardio-respiratory type exercises (Glassman, 2003, 2010b; Sauvé *et al*., 2024).The WODs are performed for the shortest time, through high-intensity movements, with great amplitude, many repetitions, and minimal or no recovery between sets (Glassman, 2007, 2010b). Workouts are typically designed to complete the required task in the shortest amount of time, i.e.,"For Time"(FT), or to complete the maximum number of repetitions or rounds in a given time interval, i.e.,"As Many Rounds As Possible (AMRAP) (Glassman, 2010a).

CrossFit is gaining popularity among a diverse range of age groups and populations, from active athletes to individuals seeking to improve their body composition, enhance functional capacity, and overall health. In CrossFit, like many other sports, optimal body composition (BC) may significantly impact sports achievement and play an important role in athletic performance, where they require alternating aerobic and anaerobic metabolism (Montalvo *et al*., 2017). A good anaerobic performance of CrossFit athletes is expressed by the maximum peak power that an individual can generate during a short-duration maximal effort, for a very short time (5-10 seconds). This is closely related to the accumulation of muscle mass. Age, sex, nutritional habits, physical activity, and other factors can all influence the development of body composition. There were close associations between morphological variables and sports

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performance in CrossFit competitors. Some authors described the morpho-functional status of the CrossFit athletes with three main components: "strength and muscle mass", low "adiposity", and "aerobic capacity" (Gómez-Landero *et al*., 2020).

Functional capacity refers to an individual's ability to perform necessary or desired physical activities under controlled conditions (Patterson & Mausbach, 2010). Functional capacity in CrossFit athletes is expressed in their ability to effectively perform a wide range of multi-joint movements, similar to those encountered in everyday life and in various sports (Sauvé *et al*., 2024). To determine functional capacity, various test batteries have been created and are widely used, including physical tests performed under strictly defined conditions. These include EuroFit, AlphaFit, and FitnessGram, which are widely used in adolescents and are based on reliable norms for individuals up to 18 years of age. Only the AlphaFit test battery offers a variant for individuals between 18 and 69 years of age; however, the proposed tests and assessment scales are designed for non-athletic populations. For those practicing various fitness training methods, including CrossFit, Street Fitness, and other high-intensity interval training (HIIT), we did not find a generally accepted test battery with sex and age norms on which to base comparisons of functional capacity across individual fitness training methods. Detailed percentile scores for the general population have been published for the test battery developed by the American College of Sports Medicine (ACSM) and for the tests in the Canadian population (Hoffmann *et al*., 2019).

This study aims to assess the effect of a six-week CrossFit training program on body composition and functional capacity in CrossFit athletes through a test battery proposed by us.

## MATERIAL AND METHOD

**Participants.** The present study included a total of 38 CrossFit athletes (21 men and 17 women) in the Scaled category (an easier adaptation of the highest category, Rx), who trained in a licensed CrossFit Affiliate in Sofia, Bulgaria. The mean age of the male athletes was 39.1 ± 6.48 years, and their training experience was 3.80 ± 2.50 years. The female athlete was 41.06±7.28 years old and had a training experience of 3.81±2.69 years. Body composition and functional capacity were measured before and after the six-week CrossFit training program (strength modality) (Table I). The inclusion criteria established were a minimum of 1 year of CrossFit experience and no other type of physical training in addition to CrossFit. A key condition during the experiment was that participants maintain their current nutritional and recovery regimen to highlight the effects of the training methodology on functional capacity and anthropometric indicators.

**Ethical Considerations.** All athletes signed the informed consent form and voluntarily participated in the study. The study protocol was reviewed and approved by the Ethical Committee of the National Sports Academy "Vassil Levski", Sofia, Bulgaria (Protocol No. EC-NSA-2025-001/ 08.04.2025) and was conducted in accordance with the principles stated in the Declaration of Helsinki for human studies and research (World Medical Association, 2008). A Level 1 CrossFit Coach selected participants.

### Study design

**Anthropometry.** Body height (cm) was determined by Martin's anthropometer (GPM, Switzerland). The body composition analysis included body weight (kg), body mass index (BMI, kg/m$^2$), muscle mass (%), and fat mass (%), which were determined by multi-frequency bioelectrical impedance measurements (InBody 170 analyzer, Korea). For accurate analysis, the following requirements have been met: the measurements of each athlete were made at least two hours after a meal and at least 12 hours before training.

**Functional capacity testing battery.** The test battery included assessments for maximal upper limb strength, the strength endurance of the upper limb and abdominal muscles, explosive lower limb power, flexibility of the lower back and hamstring muscles, and aerobic capacity. For the included tests, we used age percentile evaluations. Before performing the test battery, the participants underwent a warm-up led by the CrossFit instructors.

**Handgrip strength (Dynamometry).** The handgrip (kg) was measured by Takei 5401 Digital Dynamometer(Takei Scientific Instruments Co., Ltd., Tokyo, Japan). The sum of the best results for both hands is used to estimate the maximum grip strength according to normative-referenced percentile values for physical fitness among Canadians (Hoffmann *et al*., 2019).

**Flexibility of the lower back and hamstring muscles (Sit-and-reach)**. Participants sat on the floor with legs straight. The tested individuals reached forward as far as possible between their legs. The distance between the fingertips and the foot line, which was conventionally set at 26 cm, was measured. Two attempts were performed, and the better result, accurate to 0.1 cm, was used to assess flexibility according to normative-referenced percentile values for physical fitness among Canadians (Hoffmann *et al*., 2019).

**Explosive lower limb power (Standing long jump).** The participants stood with feet shoulder-width apart and toes behind the starting line. The jump was performed with an arm swing. The achievement was measured with a tape measure accurate to 0.1 cm. The test was conducted twice, and the better attempt was used. For the Standing long jump test, we did not find age percentile evaluations.

**Upper body strength endurance (Push-ups).** The participants assumed a prone position, with legs together and hands placed directly under the shoulders. The arms were fully extended. Men used their toes as a pivot point, while women used their knees as a pivot point. The participants maximally extended their arms at the elbows, directing them outward, and then assumed the "down" position, with the chin touching the mat. The abdomen and thighs were not allowed to touch the mat. The test ended when the participant could not maintain proper technique for two consecutive repetitions. The maximum number of push-ups performed to failure was evaluated according to age and sex using percentile age tables of the American College of Sports Medicine (American College of Sports Medicine, 2017).

**Strength endurance of the abdominal muscles (Sit-ups).** The test started from a lying position, with knees bent at a right angle and arms crossed, each palm placed on the opposite shoulder. The participant would rise until the elbows touched the knees. During the test, an assistant firmly held the ankles to the floor. The goal was to perform the maximum number of sit-ups in 1 minute.

**Maximum aerobic capacity.** The test was conducted using the Leger method (Léger *et al*., 1988) on a 20-meter course marked with cones. The test began at a speed of 8 km/h, which had to be maintained according to audio signals (Beep) given at the moment of reaching the cones. The speed increased by 0.5 km/h every minute, up to a maximum of 21 levels. The test was terminated when the participant fell more than two meters behind the end cones for two consecutive signals. The numbers of completed levels and shuttles at the

Table I. Six-week CrossFit training program.

| | Workout of the day (WOD) | |
|---|---|---|
| Day | First three-week micro cycle with strength training | The second three-week micro cycle with strength training |
| Monday | **Strength training** 15 min. A couplet (front squat and military press) is performed in 3 sets of 4 minutes. The first week the repetitions are 7, the second - 6, the third - 5. The exercises are performed for 1.5 - 1.0 min, and the remaining time of the four-minute interval is used for rest. | **Strength training** 12 min. Squat with a barbell in front of the chest is performed in 4 sets of 3 min. 3, 2, 1 repetitions are performed (first, second, third week) with maximum weight for about 15 s, and the remaining time of the three-minute interval is rest. |
| Tuesday | **Strength training** (15-16 min) -4 sets of 4 minutes each. A triplet is performed, with repetitions reduction and seconds increasing each week:<br>Pull-ups on a bar without swinging - 10, 8, 6 repetitions.<br>Gorilla rows - 10, 8, 6 repetitions, with an increase in the weight of kettle bells.<br>Isometric vertical pull-on low rings to chest - 20, 25, 30 s.<br>The remaining time of the four minutes after completing the repetitions is used for rest. | **Strength training** 10 min. Four sets of 2.5 min:<br>Dips on rings - 6, 8, 10 repetitions for the 1, 2, and 3 weeks, respectively.<br>Barbell rowing - 12, 10, 8 repetitions with increasing barbell weight, for the 1, 2, and 3 weeks, respectively.<br>The couplet is performed with the corresponding number of repetitions, and the remaining time from the four minutes is used for rest. |
| Wednesday | **Strength training** for 6 min - 2 sets of 3 mi each. The giant series is performed and rested for the remaining time of the three-minute interval.<br>Forward lean with a barbell on the back - 8 repetitions.<br>Isometric abdominal hold on parallel bars (L-sit) - 20 s.<br>Romanian Dead lifts (RDLs) - 8 repetitions.<br>Boat pose from supine position with slightly raised arms and legs - 40 s. | **CrossFit** (15 min) - AMRAP, FT. |
| Thursday | **Interval or cyclic work** is performed. Aerobic training is performed for 30-40 minutes (in CrossFit, it is called an engine type). | **CrossFit** (15 min) - AMRAP, FT. |
| Friday | **CrossFit** (15 min) - AMRAP, FT. Variety workout. | **CrossFit Benchmark** - Fran, Nancy, Diane. |
| Saturday | **CrossFit** (15 min) - AMRAP, FT. Variety workout. | **CrossFit** (15 min) - AMRAP, FT. Variety workout. |
| Sunday | **CrossFit** (15 min) - AMRAP, FT. Variety workout. | **CrossFit** (15 min) - AMRAP, FT. Variety workout. |

final level were used to calculate the tested individual's maximal oxygen consumption (VO2max [ml.kg-1.min-1]). The test was conducted and evaluated with specialized software (Kolimechkov *et al*., 2018). Percentile assessments by sex and age were conducted in accordance with the ACSM guidelines (American College of Sports Medicine, 2008).

**CrossFit training program (strength modality)**:

1. General warm-up exercises (running, rowing, jumping rope) 3-4 min.
2. Briefing 1-2 min - explanation of the workout.
3. Specific warm-up 5-10 min.
4. Strength training 15-20 min.
5. CrossFit 10-15 min. - AMRAP (As Many Rounds/Reps as Possible), FT (For Time).
6. Stretching (cooldown) 3-4 min.

Table I presents the six-week training program (strength modality) of the CF participants

**Statistical analysis**. Descriptive statistics and a test for normality (Shapiro-Wilk) were performed using SPSS 23.00 (IBM, USA). The paired-samples t-test was applied to assess the differences in body composition and functional parameters between the initial and the final testing.

## RESULTS

The morphological characteristics of middle-aged CrossFit athletes were presented in Table II. The mean height and weight are 178.7±6.00 cm and 84.3±10.10 kg in male CF athletes and 156.1±3.64 cm and 63.5±7.89 kg in female ones. The average values for BMI between the first (men: 26.4±2.88 kg/m$^2$; women: 23.5±2.18 kg/m$^2$) and second testing (men: 26.4±2.76 kg/m$^2$; women: 23.5±2.06 kg/m$^2$) are similar.

Optimal levels of muscle and fat mass are maintained during the testing period, in both men and women. The percentage of muscle mass varies between 47.0±2.44 % and 47.01±3.31 % in men and between 43.25±2.01 % and 43.37±1.81 % in women. A slight, not significant, decrement was observed in percent body fat (PBF), from 17.6±4.35 % to 17.5±3.31 % in men and from 22.0± 3.81% to 21.87±3.36 % in women athletes. On the other hand, sex-related differences are well expressed in the assessed anthropometric and body composition components ($p < 0.05$; $p < 0.001$), with a predominance in males for most of them. The only exception is PBF, which has higher values in female CF practitioners.

The results from the functional testing battery provided by us are presented in Table III. After the training period, a significant increase in the mean values of sit-ups ($p< 0.001$), push-ups ($p< 0.05$), and the sit-and-reach test ($p<0.05$) was observed in men CF athletes. The mean values of sit-ups ($p < 0.001$), push-ups ($p < 0.05$), hand grip strength (HGST) ($p<0.05$), and standing long jump ($p<0.05$) in women CF athletes also change significantly over the six-week training period. Regarding maximal oxygen consumption (VO2max), no significant differences were found between the sexes.

Comparative results of the percentile values of the functional test battery between the first and second testing of the CF athletes were presented in Figures 1 and 2. Significant increases in percentile values were observed for the HGST and Sit-ups in males and for the HGST and Push-ups in female athletes. Regarding the maximal oxygen consumption and Sit-and-reach test percentile assessments, no significant differences were found between the sexes.

Table II. The mean values of morphological characteristics of the tested CrossFit practitioners before and after a six-week training program

| MALE (n=21) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Traits | 1st testing | | | 2nd testing | | | P-value |
| | Mean±SD | Min | Max | Mean±SD | Min | Max | |
| Body height (cm) | 178.30±5.79 | 165.80 | 190.00 | 178.70±6.00 | 165.80 | 190.00 | 0.901 |
| Body weight (kg) | 84.30±10.10 | 65.00 | 102.90 | 84.30±9.72 | 65.50 | 103.60 | 0.904 |
| BMI (kg/m$^2$) | 26.40±2.88 | 20.70 | 31.40 | 26.30±2.76 | 21.00 | 30.60 | 0.825 |
| Muscle mass (%) | 47.00±2.44 | 38.90 | 49.70 | 47.10±3.31 | 37.30 | 51.30 | 0.851 |
| Fat mass (%) | 17.60±4.35 | 11.60 | 31.80 | 17.50±5.76 | 9.90 | 34.60 | 0.936 |
| FEMALE (n=17) | | | | | | | |
| Traits | 1st testing | | | 2nd testing | | | P-value |
| | Mean±SD | Min | Max | Mean±SD | Min | Max | |
| Body height (cm) | 156.12±36.35 | 163.00 | 173.80 | 156.12±36.35 | 163.00 | 173.80 | 0.901 |
| Body weight (kg) | 63.71±7.88 | 52.10 | 78.00 | 63.49±7.70 | 51.50 | 78.00 | 0.490 |
| BMI (kg/m$^2$) | 23.46±2.18 | 18.80 | 26.20 | 23.35±2.06 | 19.10 | 25.90 | 0.331 |
| Muscle mass (%) | 43.25±2.01 | 40.00 | 46.90 | 43.37±1.81 | 41.00 | 46.90 | 0.521 |
| Fat mass (%) | 21.99±3.81 | 15.10 | 27.30 | 21.87±3.36 | 26.80 | 15.20 | 0.698 |

Table III. The mean values of functional characteristics of the tested CrossFit practitioners before and after a 6-week training program.

| MALE (n=21) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Functional tests | 1st testing | | | 2nd testing | | | P-value |
| | Mean±SD | Min | Max | Mean±SD | Min | Max | |
| HGST (both hands, kg) | 94.50±10.87 | 71.90 | 110.40 | 96.40±12.04 | 63.50 | 121.5 | 0.186 |
| Sit-and-reach test (cm) | 32.80±6.02 | 19.00 | 45.00 | 34.90±5.97 | 20.00 | 44.00 | 0.032 |
| Standing long jump (cm) | 235.30±21.03 | 186.00 | 274.00 | 236.30±23.11 | 177.00 | 280.00 | 0.543 |
| Push-ups (repetitions) | 39.40±15.19 | 20.00 | 90.00 | 42.90±16.26 | 24.00 | 99.00 | 0.049 |
| Sit-ups (repetitions) | 39.80±6.08 | 31.00 | 50.00 | 45.80±7.44 | 30.00 | 57.00 | 0.001 |
| $VO_{2max}$(ml.kg$^{-1}$.min$^{-1}$) | 52.50±4.46 | 44.90 | 61.60 | 52.20±4.12 | 45.50 | 60.10 | 0.740 |
| FEMALE (n=17) | | | | | | | P-value |
| Functional tests | 1st testing | | | 2nd testing | | | |
| | Mean±SD | Min | Max | Mean±SD | Min | Max | |
| HGST (both hands, kg) | 64.20±6.68 | 53.00 | 76.20 | 67.71±4.77 | 60.60 | 75.6 | 0.002 |
| Sit-and-reach test(cm) | 39.00±8.18 | 20.00 | 49.00 | 40.00±7.02 | 29.00 | 50.00 | 0.361 |
| Standing long jump (cm) | 190.65±16.77 | 153.00 | 210.00 | 196.53±19.36 | 153.00 | 225.00 | 0.048 |
| Push-ups (repetitions) | 48.18±19.17 | 23.00 | 101.00 | 61.65±24.53 | 36.00 | 106.00 | 0.012 |
| Sit-ups (repetitions) | 39.82±5.45 | 32.00 | 50.00 | 46.00±6.58 | 37.00 | 63.00 | 0.001 |
| $VO_2$max (ml.kg$^{-1}$.min$^{-1}$) | 46.03±3.84 | 39.60 | 51.70 | 45.39±3.74 | 39.60 | 51.4 | 0.356 |

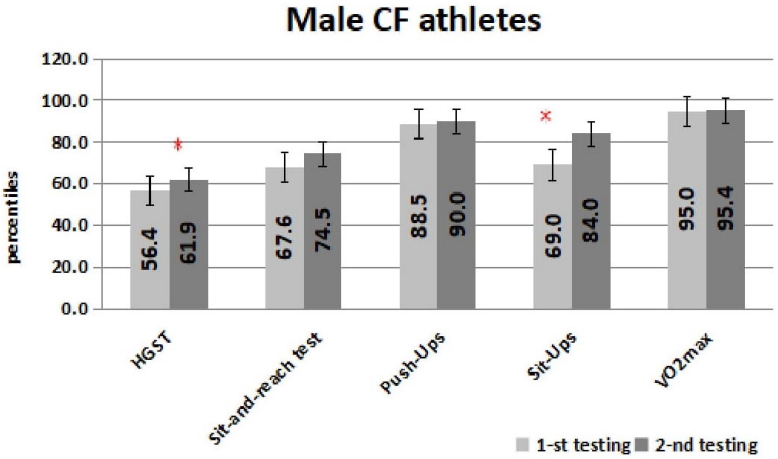


Fig. 1. Percentile values of the functional test battery between the first and second testing of the CF male athletes.

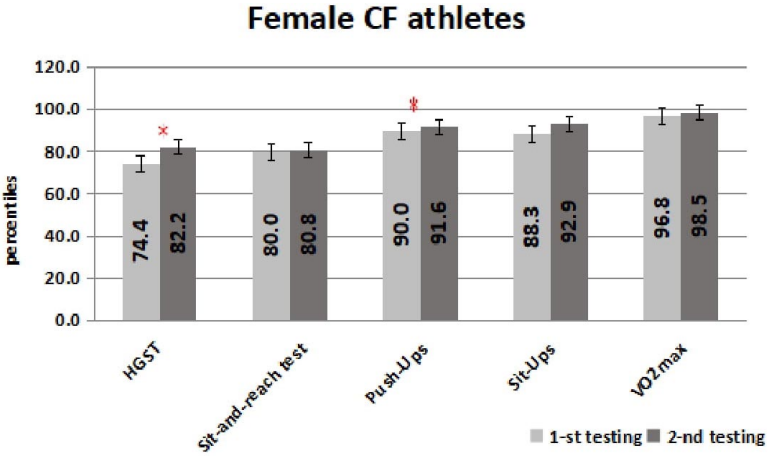


Fig. 2. Percentile values of the functional test battery between the first and second testing of the CF female athletes.

## DISCUSSION

Body composition analysis can be used to monitor an athlete's overall health and provide valuable information for health specialists involved in training programs. The first objective of the present study was to investigate the impact of a six-week CF training program on body composition characteristics in CF practitioners. The period between initial and final testing of height, weight, body mass index, muscle, and fat mass showed relatively constant values, with insignificant differences observed in both sexes. Our findings were confirmed by the results of the other authors (Hillsdon *et al*., 2002; Layman *et al*., 2005). According to the mean BMI values, we categorized men and women CF athletes with overweight and normal weight, respectively (World Health Organization, 1998). It is interesting to note that the higher BMI in men is due to the higher values of muscle mass, and it would be wrong to associate them with overweight and obesity.

Morphological characteristics of CrossFit athletes who participated in our study showed values of percent body fat within the normal range and higher percent muscle mass in both sexes (American College of Sports Medicine, 2018). These values remain relatively constant between the initial and final testing. Contrary to our results Oliveira *et al*.

(2021), found significantly lower average values for body fat in male CF athletes and significantly higher values in female ones. Kicanovic *et al*. (2022), assessed the effect of a 12-week CF program and compared the results between both athletic groups: CF athletes and traditional gym athletes. The authors found improvements in morphological parameters among those who trained with CF.A comparative analysis of morphological parameters and movement quality in both beginners and experienced CF athletes reveals that CF athletes with higher training experience have lower body fat, particularly in the lower body, and improve their functional movement quality (Sporek & Konieczny,2024).

Athletic performance in CrossFit is a product of a dynamic interplay of physiological, psychological, and technical factors, including strength, both aerobic and anaerobic capacity, endurance, mastery of sport-specific techniques, and mental resilience. Unlike many traditional sports where specialization is key, CrossFit athletes are required to cultivate broad-based capabilities rather than focusing exclusively on a single aspect of training (Sauvé *et al*., 2024). This approach is also reflected in the description of the six-week training program (Table II) completed by the CF athletes included in our study. Therefore, the test battery we applied is designed to provide a comprehensive assessment of the functional capacity of CrossFit athletes.

Handgrip strength serves as a robust indicator of overall muscle power and is closely related to muscle mass. Notably, the decline in skeletal muscle mass is recognized as a key factor in the age-related reduction of anaerobic power, even among highly trained master athletes (Komici *et al*., 2023). In our study, the average handgrip strength (HGST) of the subjects was found to be high, significantly exceeding the 50th age percentile (Figs. 1 and 2). Furthermore, as a result of the six-week CrossFit training program, the average HGST values increased significantly, both in absolute terms for women (Table III) and as percentile scores for both sexes (Figs. 1 and 2). These results, in our view, comprehensively reflect the impact of CrossFit training on muscle strength and muscle mass in both sexes. Han *et al*. (2021), also reported that CrossFit is an effective program for enhancing handgrip strength.

Flexibility stands as a crucial component of physical fitness, essential for optimizing athletic performance (Blake, 2023). Consistent, well-structured training programs are proven to foster improvements across all facets of athletic ability, with flexibility benefiting significantly from such dedicated routines (Alonso-Fernández *et al*., 2022). Stretching exercises, both static and dynamic, are effective in increasing muscle flexibility and joint range of motion and are included at the end of each training session in the six-week CF training program completed by the athletes we studied. In our view, this is the main reason why the men in our study significantly improved their flexibility (Table III). Similar results were obtained by Söyler & Kayantas¸ (2020), who found that a 12-week CrossFit training program applied to 15 untrained men led to increased spinal flexibility. The women in our CrossFit study demonstrated high sit-and-reach test scores for their sex and age, with the average percentile rating around the 80th percentile. This suggests that the six-week training program primarily served to maintain their already high levels of flexibility.

Jumping is a fundamental human movement that requires complex motor coordination of both upper and lower body segments (Ashby & Heegaard, 2002). The Standing Long Jump (SLJ) is a test widely used to measure the explosive strength and power of the lower limb (Cvejic *et al*., 2013). The six-week CF training program completed by the athletes we studied included the front squat with barbell and other exercises for most of the muscle groups. Therefore, among the women, we observed a significant improvement in the standing long jump, particularly since the initial level was lower (Table III). In contrast, for the men, the training program primarily played a maintenance role in terms of lower body strength. Similar results were obtained by Limarenko *et al*. (2024), who found that young women training in CrossFit achieved an average standing long jump result of 198.1 ± 6.51 cm, which is close to the value recorded in our study for women after the six-week training - 196.53 ± 19.36 cm (Table III).

Regarding push-ups, only the women showed a significantly higher number and improved percentile scores after completing the six-week training program (Table III, Figs. 1 and 2). Notably, the most significant increase in the average number of push-ups was observed among women, with values of 48.18 ± 19.17 and 61.65 ± 24.53 in the first and second assessments, respectively. This improvement is likely due to the dominance of upper-body exercises in the training program (Table I), particularly the "dips on rings" exercise—a bodyweight movement that primarily targets the chest, triceps, and shoulders, while also engaging the core for stability. A significant increase in the number of push-ups performed in one minute by girls aged 16-18 after three months of CrossFit training was also reported by Limarenko *et al*. (2024).

Abdominal strength is closely linked to athletic performance, and numerous studies have shown that comprehensive training programs including targeted core

exercises can significantly enhance overall sports capabilities (Hibbs *et al*., 2008). In terms of the sit-up test, which assesses muscular endurance of the abdominal region, our data revealed significant improvements only in absolute average values for men (Table III). This progress is likely attributable to the inclusion of specific exercises such as the isometric abdominal hold on parallel bars and the boat pose from a supine position, both of which were incorporated into the training program (Table I).

Regarding maximal oxygen consumption (VO2max), no significant differences were found between the sexes, either in absolute values or in percentile assessments. Similar conclusions were reported in the study by Han *et al*. (2021), involving students training in CrossFit. In our view, the lack of progress in maximal oxygen consumption among the men and women we studied, despite the inclusion of 40-minute aerobic workouts in the program (Table III), can be attributed to their already relatively high baseline levels of aerobic capacity—percentiles 95.0 and 96.78 for men and women, respectively (Figs. 1 and 2).

Han *et al*. (2021), similarly found that CrossFit effectively enhances upper body strength, particularly in push-ups and handgrip strength, among students. However, their study did not observe significant improvements in core strength, BMI, or cardiopulmonary capacity. Limarenko *et al*. (2024), investigated the impact of CrossFit training on speed-strength qualities in female students aged 16-18. In their study, 24 girls were divided into a control group (CG) and an experimental group (EG). After three months, the experimental group demonstrated notable improvements in all motor tests compared to the control group, with statistically significant differences in push-ups completed in one minute—19.4±3.27 (EG) versus 14.8±?3.12 (CG)—and standing long jump results—198.1±6.51cm (EG) compared to 181.6±6.42?cm (CG).

## CONCLUSIONS

The studied training program has a positive impact on body composition and functional capacity, particularly regarding upper body strength and endurance. The applied test battery enables a comprehensive assessment of the development of essential motor qualities, while the percentile norms used take into account the participants' sex and age. To provide more precise age standards and enable adequate comparisons between different fitness methodologies, additional research with larger sample sizes is needed. Thus, conditions are created for a more objective evaluation and optimization of training programs in modern fitness and sport.

**ZAYKOVA, D.; DIMITROVA, A.; BONOVA, I. & PETROV, L.** Evaluación del efecto de un programa de entrenamiento de CrossFit de seis semanas en la composición corporal y la capacidad funcional. *Int. J. Morphol., 43(6)*:2024-2031, 2025.

**RESUMEN:** Este estudio investiga el impacto de un programa de entrenamiento de CrossFit de seis semanas en la composición corporal y la capacidad funcional en hombres y mujeres de mediana edad. CrossFit es un deporte que implica actividades físicas de alta intensidad, como gimnasia, levantamiento de pesas, carrera, salto y levantamiento de objetos pesados. La investigación incluyó a 21 hombres y 17 mujeres, todos practicantes habituales de CrossFit. La composición corporal, evaluada mediante impedancia bioeléctrica multifrecuencia, abarcó el peso corporal, el índice de masa corporal (IMC), el porcentaje de grasa corporal y el porcentaje de masa muscular, medidos antes y después del entrenamiento. La capacidad funcional se evaluó mediante una batería completa de pruebas, que incluía fuerza de prensión manual, flexiones, abdominales, pruebas de sentarse y alcanzar y Beep test de resistencia aeróbica. Los análisis estadísticos incorporaron estadística descriptiva, la prueba de normalidad de Shapiro-Wilk y pruebas t para muestras pareadas para comparar los resultados antes y después de la intervención. Los resultados revelaron que la altura, el peso, el IMC, la masa muscular y la masa grasa se mantuvieron relativamente estables para ambos sexos durante las seis semanas. Sin embargo, se observaron mejoras significativas en la fuerza y la resistencia del tren superior, con aumentos notables en el rendimiento medio en abdominales y flexiones tanto en hombres como en mujeres. Se detectaron mejoras significativas adicionales en los hombres en la prueba de sentarse y alcanzar, y en las mujeres en la fuerza de prensión manual y el salto de longitud parado. El $VO_2$máx no mostró cambios significativos. En conclusión, el programa de CrossFit de seis semanas influyó positivamente en el rendimiento funcional, especialmente en la fuerza y la resistencia del tren superior, aunque no alteró sustancialmente la composición corporal. Los hallazgos ofrecen información práctica para entrenadores y profesionales que diseñan regímenes de entrenamiento basados en CrossFit.

**PALABRAS CLAVE: Entrenamiento CrossFit; Composición corporal; Capacidad funcional; Normas percentiles.**

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