"The Effect of Cardio Exercises on Some Physiological, Physical and 800m Race Following the COVID-19 lockdown"

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Introduction

Cardiovascular exercises aim to enhance endurance by raising heart rate, breathing rate and blood circulation, Moreover excellent way to maintain the body activity, remain body healthy and promote to burn calories and lose weight. (Matthew A. Nystoriak and Aruni Bhatnagar, 2018). Outdoor activities such as running is constantly shown to be one of the most famous forms of exercise, between 7.9 and 13.3% of adults (Hulteen et al., 2017). Under the COVID-19 restrictions, running was one of the very few patterns of exercise that could still be performed due to its individual nature and with ease of keeping social distancing restrictions. In this sense, cardio exercise was proposed as a successful strategy to lower body fat percentage and boosts the skeletal muscle capacity to use oxygen (Booth and Winder, 2005). Body composition one of the key components of health in both individuals and populations. However, it is also effect health outcomes, and its measurement is progressively considered important in clinical practice. (Clodagh Toomey et., al, 2015). The main elements of body composition are Skeletal muscle mass (SMM), (FFM) Fat free mass, (PBF) percentage body mass and Body mass index. (Clodagh Toomey et., al, 2015).

A new coronavirus (SARS-CoV-2) was emerged in December 2019, in Wuhan, Hubei Province, China (Wu, et al., 2020). Its first appeared was on November 17, 2019, according to (the Gurdian reports, 2021), "coronavirus disease 2019" (COVID-19) was characterized as a pandemic across the globe on 11 March 2020, with the rapid increase in the number of cases all over the world.(World Health Organization [WHO], 2020).

First case of COVID-19 in egypt was confirmed on February 14, 2020, were announced according to (the official website of the Egyptian MOH) specialized for the news of COVID-19 outbreak in Egypt. As a consequence of the lockdown strategies, many people who were consistently following their fitness activities at the gyms, or in the track, or other clubs before the lockdown have been affected intensely. (Ammar et al., 2020a,c). It's a must after Covid-19 lockdown that individuals understand and follow the restrictions practicing physical activity and exercises habits. Therefore, the main aim of this study was to determine the effect of Cardio exercises on Some Physiological, Physical and 800m Race following the COVID-19 lockdown.

Statistical hypotheses

1- Significant differences pre and post applying the proposed exercises in body composition variables (Skeletal muscle mass (SMM), Fat free mass (FFM), Body mass index (BMI), percentage body fat (PBF)) Cooper test and 800 running race For the experimental group.
2- Significant differences pre and post applying the normal training routine in body composition variables (Skeletal muscle mass (SMM), Fat free

mass (FFM), Body mass index (BMI), percentage body fat (PBF)) Cooper test and 800 running race For the control group.

3- Significant differences comparing post applying the normal training routine in body composition variables (Skeletal muscle mass (SMM), Fat free mass (FFM), Body mass index (BMI), percentage body fat (PBF)) Cooper test and 800 running race For both experimental and control group.

Materials and Methods

Experimental method was used with 2 different groups, one experimental group and one control group. Before and after applying the proposed training exercises body composition, Cooper test and 800 m running race test were done to asses physical and physiological condition for both experimental group and control group.

Subject

Study included twenty-four volunteer university students at Faculty of physical education for girls (PEF), Helwan university year 3 , divided into two groups 12 student experimental group and 12 students control group, Age 20.66 ±0.92, weight 63.51±7.02 and Height 164.33±6.32, Experimental group applied the referred specific cardio exercises addition to the normal faculty program, for (9) weeks, (2) training units per week with total (17) training unites and the control group applied the normal faculty program. Subjects signed a consent letter for their readiness to participate in the recent study in the beginning of the applied training exercises.

Table (1): Descriptive Mean (±SD) for subject's characteristics in Age, Weight, and Height

Number	Age (years)	Weight (kg)	Height (cm)
24	20.66 ±0.92	63.51±7.02	164.33±6.32

Procedures

Pre test

Subject started with before intervention assessments Sunday 18/10/2020 at the faculty of physical education for girls – helwan university. Starting the assessment day with body composition assessment at the laboratory followed by the physical and performance assessment at the track and field.

Applying Proposed Exercises

Exercises applied for 9 weeks in a raw with a total of 17 session, two sessions per week, session duration started with 20-30 minutes and by the end of the program duration was 40-45 minutes. Exercise intensity, load, progression, and volume of the exercises were considered. Exercises intensity was between 70-75 % to enhance cardio vascular endurance. Different cardio exercises were used to enhance endurance such as high knees, climbers, punches, push ups and jumping jacks ..etc .

Post assessment

Post intervention assessment take place at the as the pre intervention Wednesday 9/12/2020 with the same procedures followed at the first assessment.

Body composition assessment - Experimental procedures

Before starting the proposed exercises measurements of the body composition was performed 30 min prior to body evaluation physical fitness and (800m) running race for both experimental and control group. Skeletal muscle mass (SMM), Fat free mass (FFM), Body mass index (BMI), percentage body fat (PBF) were measured for both experimental and control group by the use of Inbody 720 (Biospace, Co., Seoul, Korea). (Model 5402, Takei, Niigata, Japan) and grip test (Model 5401, Takei),were measured.

Cooper Test

Cooper test procedures was explained to all subjects. Running 12 mins with the best performance is the main target from the test, distance with meters was recorded. Before and after applied the cardio training exercises, both experimental and control group were tested cooper test to assess the cardiovascular performance. After warming up routine, subjects asked to run for 12 mins with the best performance.

800m Running Race Event

800m race event procedures were explained to all subjects. Sprinting 800m in the shortest time running race event. Best timing was recorded. Before and after applied the cardio training exercises, both experimental and control group were tested 800m race event assess the subject's performance. After warming up routine, subjects asked to run 800m with the best performance.

Statistical Analysis

All statistical analyses were performed by the SPSS 20 package program for statistical evaluation of the results. Mean and standard deviation (SD) values were analyzed for variables. Paired Samples T-Test and Independent Samples T-Test were used to compare between experimental and control group with a significance value set at $p<0.05$.

Results

Table (2): Mean (±SD), P value and Progress Percentage of SMM, FFM, BMI and PBF for the Experimental group before and after applying cardio exercises.

Variables	Before		After		P-value	Progress %
SMM	24.71 ±	5.12	25.26 ±	5.23	0.008*	2.23 %
FFM	43.73 ±	6.85	43.15 ±	6.85	0.000*	1.32 %
BMI	24.31 ±	3.05	23.63 ±	2.88	0.000*	2.81 %
PBF	32.94 ±	5.70	32.18 ±	5.82	0.000*	2.30 %

Sig. (2-tailed)*

P value ≤ 0.05

Table (2) shows descriptive statistics Mean (±SD) and P value of SMM, FFM, BMI and PBF for the Experimental group before and after applying cardio exercises with Progress Percentage from (1.32%: 2.81%).

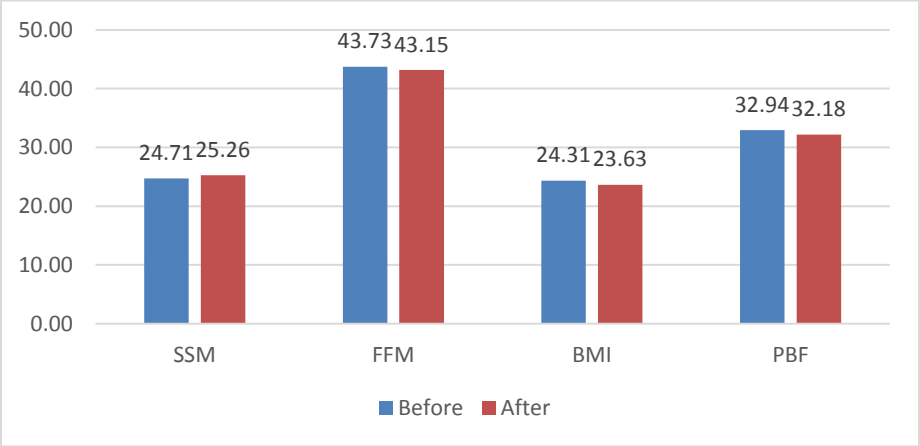

Fig. (1) Mean difference between before and after for the Experimental group in the SMM, FFM, BMI and PBF variables

Table (3): Mean (±SD), P value and Progress Percentage of SMM, FFM, BMI and PBF for the Control group before and after applying cardio exercises.

Variables	Before		After		P-value	Progress %
SMM	25.05 ±	5.68	25.18 ±	5.67	.047*	0.53
FFM	43.78 ±	7.14	43.47 ±	6.50	.185	0.70
BMI	23.05 ±	3.87	22.17 ±	3.88	.310	3.83
PBF	32.63 ±	5.64	32.48 ±	5.53	.014*	0.46

Sig. (2-tailed)*

P value ≤ 0.05

Table (3) shows descriptive statistics Mean (±SD) and P value of SMM, FFM, BMI and PBF for the Control group before and after applying cardio exercises with Progress Percentage from (0.46%: 3.83%).

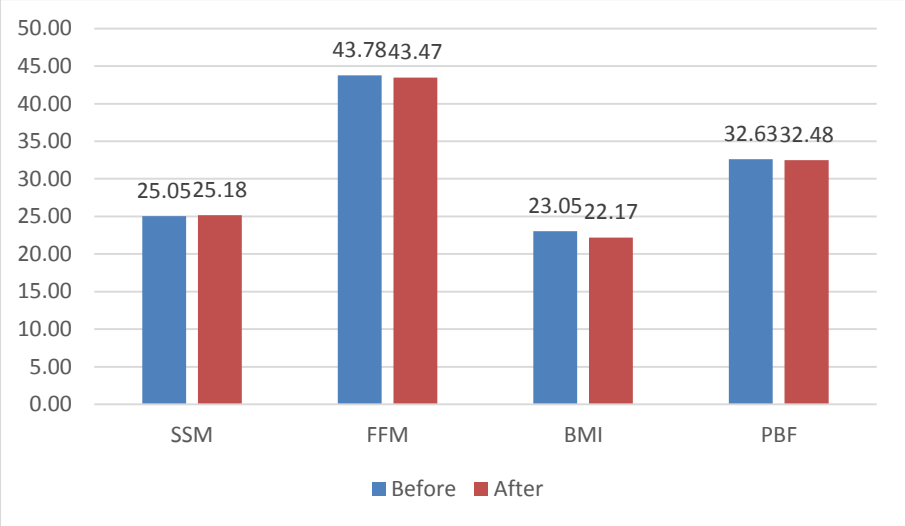

Fig. (2) Mean difference between before and after for the control group in the SMM, FFM, BMI and PBF variables

Table (4): Mean (±SD), P value and Progress Percentage of SMM, FFM, BMI and PBF for both Experimental and Control group in the after measurements.

Variables	Experimental		Control		P-value
SMM	25.26 ±	5.23	25.18 ±	5.67	0.563
FFM	43.15 ±	6.85	43.47 ±	6.50	0.937
BMI	23.63 ±	2.88	22.17 ±	3.88	0.399
PBF	32.18 ±	5.82	32.48 ±	5.53	0.873

Sig. (2-tailed)*

P value ≤ 0.05

Table (4) shows descriptive statistics Mean (±SD) and P value of SMM, FFM, BMI and PBF for both Experimental and Control group in the after measurements.

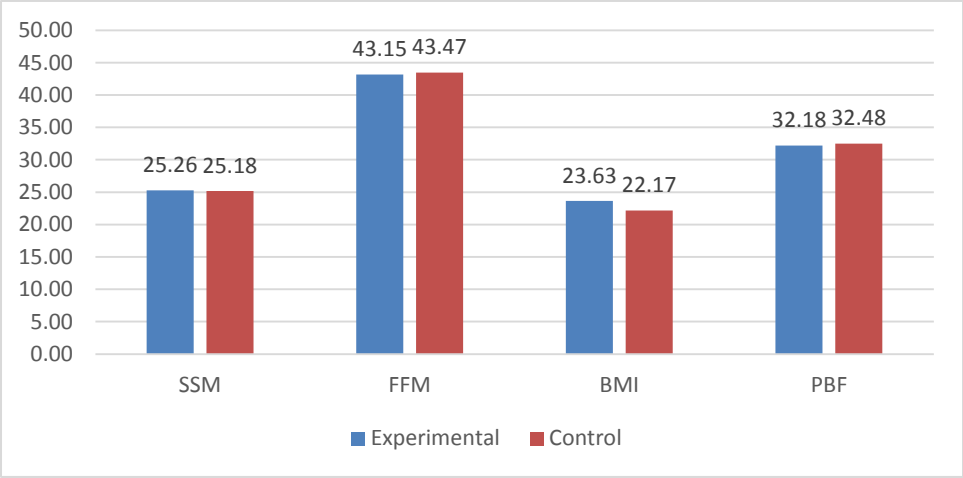

Fig. (3) Mean difference between both Experimental and Control group for the SMM, FFM, BMI and PBF in the after measurements.

Table (5): Mean (±SD), P value and Progress Percentage of Cooper Test and (800m) running race Event for the Experimental group before and after applying cardio exercises.

Variables	Before	After	P-value	Progress %
Cooper Test (Meter)	1450.00 ±239.32	1816.67 ± 279.07	0.000*	25.29 %
(800m) running race (Sec.)	4.52 ± 0.75	3.95 ±0.43	0.002*	12.61 %

Sig. (2-tailed)*

P value ≤ 0.05

Table (5) shows descriptive statistics Mean (±SD) and P value of Cooper Test and (800m) running race Event for the Experimental group with Progress Percentage from (12.61%: 25.29%).

Table (6): Mean (±SD), P value and Progress Percentage of Cooper Test and (800m) running race Event for the Control group before and after applying cardio exercises.

Variables	Before	After	P-value	Progress %
Cooper Test (Meter)	1400.00 ±346.41	1675.00 ± 391.09	0.000*	19.64 %
(800m) running race (Sec.)	4.38 ±0.87	3.84 ±0.60	0.001*	12.33 %

Sig. (2-tailed)*

P value ≤ 0.05

Table (6) shows descriptive statistics Mean (±SD) and P value of Cooper Test and (800m) running race Event for the Control group with Progress Percentage from (12.33%: 19.64%).

Table (7): Mean (±SD), P value and Progress Percentage of Cooper Test and (800m) running race Event for both Experimental and Control group in the after measurements.

Variables	Experimental Group	Control Group	P-value
Cooper Test (Meter)	1816.67 ± 279.07	1675.00 ± 391.09	0.035*
(800m) running race (Sec.)	3.95 ±0.43	3.84 ±0.60	0.602

Sig. (2-tailed)*

P value ≤ 0.05

Table (7) shows descriptive statistics mean (±SD) and P value and Progress Percentage of Cooper Test and (800m) running race Event for both Experimental and Control group in the after measurements.

Discussions

Table (2) shows statistics for the experimental group, (SSM) Mean (±SD) before 24.71 ± 5.12, after 25.26 ± 5.23 with P value (0.008*), and progress Percentage 2.23%, (FFM) Mean (±SD) before 43.73 ± 6.85, after 43.15 ± 6.85 with P value (0.000*), and Progress Percentage 1.32%, (BMI) Mean (±SD) before 24.31 ± 3.05, after 23.63 ± 2.88 with P value (0.000*), and progress percentage 2.81%, (PBF) Mean (±SD) before 32.94 ± 5.70 , after 32.18 ± 5.82 with P value (0.000*), and Progress Percentage 2.30%.

Table (3) shows statistics for the control group, (SSM) Mean (±SD) before 25.05 ± 5.68, after 25.18 ± 5.67 with P value (0. .047*), and Progress Percentage 0.53%, (FFM) Mean (±SD) before 43.78 ± 7.14, after 43.47 ± 6.50 with P value (0.185), and Progress Percentage 0.70%, (BMI) Mean (±SD) before 23.05 ± 3.87, after 22.17 ± 3.88 with P value (0. 310), and Progress Percentage 3.83 %, (PBF) Mean (±SD) before 32.63 ± 5.64, after 32.48 ± 5.53 with P value (0.014*), and Progress Percentage 0.46%.

Table (4) shows statistics for both Experimental and Control group in the after measurements, (SSM) Mean (±SD) Experimental group 25.26 ± 5.23,Control group 25.18 ± 5.67 with P value (0.563), (FFM) Mean (±SD) Experimental group 43.15 ± 6.85, Control group 43.47 ± 6.50 with P value (0.937), (BMI) Mean (±SD) Experimental group 23.63 ± 2.88, Control group 22.17 ± 3.88 with P value (0.399), (PBF) Mean (±SD)

Experimental group 32.18 ± 5.82, Control group 32.48 ± 5.53 with P value (0.873).

(Parpa and Michaelides, 2021) showed that body fat percentage in professional soccer players was significantly increased after a 7-week lockdown period compared to a 5-week transition period. The training program of the players in this study included muscle strength and power training three times per week and cardiorespiratory training four times per week. Herrera-Valenzuela et al. (2020) also showed increased body weight in combat sports athletes during the lockdown.

(Facer-Childs et al., 2021) with elite and sub-elite athletes from different sports has also shown that training frequency and duration decreased significantly during lockdown. Reduced physical activity can lead to changes in body composition.

Table (5) shows statistics for the Experimental group, Cooper Test (Meter) Mean (±SD) before 1450.00 ±239.32, after 1816.67 ± 279.07 with P value (0.000*), and Progress Percentage 25.29 %, (800m) running race (Sec.) Mean (±SD) before 4.52 ± 0.75, after 3.95 ±0.43 with P value (0.002*), and Progress Percentage 12.61 %.

Table (6) shows statistics for the control group, Cooper Test (Meter) Mean (±SD) before 1400.00 ±346.41, after 1675.00 ± 391.09 with P value (0.000*), and Progress Percentage 19.64 %, (800m) running race (Sec.) Mean (±SD) before 4.38 ±0.87, after 3.84 ±0.60 with P value (0.001*), and Progress Percentage 12.33 %.

(Bazett-Jones et al., 2020; Dejong et al., 2021) examined the impact of COVID-19 restrictions on runners but identified conflicting results. While, Dejong et al. (2021) reported an increase in weekly running mileage (+1.4 km/week) and frequency (+0.3 session/week), whereas Bazett-Jones et al. (2020) found a decrease in the same variables, −5.4 km/week and −0.7 session/week respectively. The discrepancy between these two studies might be explained by the sampled populations. The severity and length of restrictions could be location-specific and could have affected the runners' training habits differently. Additionally, Bazett-Jones et al. (2020) focused exclusively on the impact in

youth competitive runners, a population with unique challenges, running biomechanics and physiology (Krabak et al., 2021; McSweeney et al., 2021), thus further limiting the generalizability of these previous results. As such, the true impact of COVID-19 restrictions on adult runners' training habits is still unclear.

Table (7) shows statistics for both Experimental and Control group in the after measurements, Cooper Test (Meter) Mean (±SD) Experimental group 1816.67 ± 279.07, Control group 1675.00 ± 391.09 with P value (0.035*), (800m) running race (Sec.) Mean (±SD) Experimental group 3.95 ±0.43, Control group 3.84 ±0.60 with P value (0.602).

Research into the impact of COVID-19 restrictions on physical activity habits will allow athletes, health professionals, and even public health officials, to better understand how population-wide infection control measures impact physical activity habits. Albuquerque Freire et al. (2020) concluded that aerobic exercise at 65–75% of the maximum heart rate could preserve aerobic capacitance during the lockdown. Another study showed that home training with four or five aerobic sessions and two or three strength training sessions improved aerobic fitness in professional soccer players (Rampinini et al., 2021).

In the current study, it has been recorded for both experimental and control group **SMM, FFM, BMI and PBF** after the Cardio Exercises Following the COVID-19 lockdown. (Table 2, 3, 4), these results agreed with (Celenk, Akil, & Kara, 2013)

There is a significant differences and progress percentage observed among all of the Physiological research variables (**SMM, FFM, BMI and PBF**), cooper test and 800m running Race for the experimental group, progressing percentage recorded better results for the experimental group.

And this changes in the experimental group for the Physiological research variables (**SMM, FFM, BMI and PBF**), cooper test and 800m running Race are related to the physiological acute, chronic responses and adaptations to the cardio exercise's intensity and duration.

Although The researchers observed some significant differences and progress percentage among the Physiological research variables (**SMM, FFM, BMI and PBF**), cooper test and 800m running Race for the control group, progressing percentage recorded less results for the control group.

Conclusion

Findings of the study suggest that when the data in this study are obtained and collected in accordance with the previous literature information, it is observed that a significant difference between both experimental and control group in the Cooper Test with p- value (.035*) . Although there was no significant difference between both experimental and control groups in (800m) running race p- value (.602), (SMM) p- value (.563), (FFM) p- value (.937), (BMI) p- value (.399), (PBF) p- value (.873), progress percentage showed higher rates for the experimental group with a noticeable increase in (800m) running race progress percentage (12.61 %), (SMM) progress percentage (2.23 %), (FFM) progress percentage (1.32 %), , (PBF) progress percentage (2.30 %), except for the (BMI) progress percentage reached (2.81 %) while reached (3.83) in the control group. All the research variables changes were as a result of the cardio training exercises adaption.

Recommendations

1- Further research should be carried out on other samples.

2- More research should be carried out among athletes and different age groups.
3- Further research should be carried out on different training periods.

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