Egyptian Journal of Physical Therapy (EJPT)
Egy. J. Phys. Ther. 2024; 18:17-21
Original article
https://ejpt.journals.ekb.eg

Impact of Different Aerobic Exercises on Decreased Functional Capacity in Post Covid Overweight Subjects

Mariam R. Asad[1*], Nesreen G. El-Nahas[1], Heba A. Abdeen[1], Asmaa M. Sharabash[1]

[1] Department of Physical Therapy for Cardiovascular, Respiratory Disorders and Geriatrics, Faculty of Physical Therapy, Cairo University, Egypt.

***Correspondence to:**
Mariam R. Asad, Department of Physical Therapy for Cardiovascular, Respiratory Disorders and Geriatrics, Faculty of Physical Therapy, Cairo University.
Tel: 01280207863
Email: mariam.rezk112003@gmail.com

Published online:
June 2024

Abstract:
Purpose: To study the impact of different aerobic exercises on decreased functional capacity in post covid overweight subjects.
Methods: This study included Sixty participants with history of covid infection, aged (23±5) years old they were recruited from El Ahram Canadian University, these participants assigned into three groups (A, B and C group) equal in number. Group (A) was the control group. Group (B) performed moderate intensity training 60%:75 % of MHR on treadmill for six weeks (3 times per week). Group (C) performed moderate intensity aerobic exercise 60%:75 % of MHR on bicycle for six weeks (3 sessions per week). All participants were evaluated by using cooper 12 MWD TO MEASURE walking distance then calculating vo_2max by using this formula: distance covered in kilo vo_2max(ml/kg/min) = (22.351 x meters) -11.288.
Results: patients who received the treadmill program (group B) had a significant increase in walking distance and VO_2 max ($P<0.05$) with percentages of change of 12.4% and 23.7%, respectively. Participants in group C who received bicycle training had an elevation of walking distance and VO_2max ($P<0.05$) with percentages of change of 20.2% and 46.5%, respectively.
Conclusion: The results demonstrated that treadmill training and bicycle training both elicit large improvements in the VO_2max, with more improvement in vo_2 max with bicycle training.
Key words: post covid, functional capacity, aerobic exercises.

1.Introduction:

The early occurrences of COVID-19 infection in humans in Wuhan were linked to significant live animal and seafood markets, suggesting that people caught the virus from animals. Other humans who had not been around animals contracted the illness shortly after, which proved that the virus could be spread from person to person. Outside of Chinese borders, the disease's spread was seen practically everywhere in the world (1).

Being a known risk factor for respiratory infections, obesity is increasingly understood to contribute to the current coronavirus disease 2019 (COVID-19) pandemic, which is brought on by the coronavirus-2 causing severe acute respiratory syndrome (SARS-CoV-2). This has significant effects on world health since being overweight, as measured by a high body mass index (BMI) (2).

The ability to conduct primarily aerobic, or oxygen-using, work, is a fundamental necessity for many daily activities. For such actions to be successful, the heart, lungs, and circulation must work together to effectively deliver oxygen to the metabolically active muscle mass. Hence, in a variety of clinical settings, the evaluation of functional or aerobic exercise time or peak oxygen consumption offers crucial diagnostic and prognostic information (3).

2. Subject and methods:

2.1. Participants

Sixty participants with history of covid infection, have been recruited from El Ahram Canadian

University, Subjects assigned randomly into three equal groups (A, B and C), the purpose and methods of the study were fully understood by every participant in this study, which adhered with the ethical standards. With approval, NO:P.T.REC/012/004216 from the Ethics Committee of faculty of physical therapy Cairo University Egypt. Each participant provided their Written informed consent.

2.2. Inclusion criteria:

Participants were included as follows:

- Their age between 18 and 28 years old.
- Their BMI ranges from 30 and 35 kg/m^2.
- 6-8 months post covid recovery (PCR Negative).

2.3. Exclusion criteria were:

Chronic diseases as diabetes and hypertension. previous chronic chest disease. history of cardiovascular disease. smokers.

2.4. Design of the study:

Pre-test post-test experimental design, this study included three equal groups (A&B&C). Group A was a control group and Group B&C were study groups.

Measures and Materials:

Evaluating materials and procedure: All subjects were evaluated by the following materials and procedure at the beginning of the study and after 6 weeks.

Informed consent form, Pulse oximeter (RH03) to estimate the oxygen saturation of the blood and the pulse rate for all Participants at the beginning and end of the study, tape measurement was used to measure waist and hip circumference for each participant before and after the study. From the have way between the last rib and iliac crest waist circumference was measured. The hip's widest point was used to measure hip circumference. through dividing waist circumference by hip circumference, the waist to hip ratio was calculated, BMI was calculated by dividing weight on Hight square [Weight (kg) ÷ height^2 (meters).

The Cooper's 12-minute walk test is a well-liked field exercise that evaluates aerobic capacity. The VO_2 max was initially calculated using this fitness test. A person can walk for 12 minutes, and their VO_2max value, which calculates how well they can use oxygen while working out, was calculated using this formula. Vo_2max is equal to (22.351 x kilo meters) -11.288 ml/kg/min (4).

Treatment equipment and procedure :

Treatment was adjusted according to the following equation:

Max heart rate = 220-age

Group (A) control group, this group included 20 subjects will be evaluated at the beginning and at the end of the study.

Treadmill: (VEGA MAX 8000 IC) was used to train participants in group B which included twenty subjects participating in moderate training for six weeks (3 times per week).

The session included, warming up phase for 5minutes at 60%of maximum heart rate then the main exercise phase for 20 minutes at 70-80% of maximum heart rate Then cooling down phase for minutes at 70%of maximum heart rate.

Bicycle: (LODE CORIVAL/ REHAB) was used to train participants in group C Which included Twenty subjects participating in aerobic exercise for six weeks (3 sessions per week) (5). During session:1-The warming up phase for 5-minute at 60%of maximum heart rate. Then the main exercise phase was performed for 25minutes then cooling down phase for 5 minutes at 60% of maximum heart rate.

Data analysis:

SPSS version 22 was utilized to conduct all statistical analyses. The differences between the three groups before and after the intervention were analyzed using MANOVA, and Post Hoc Tests were applied to detect the significant variations in-between groups. to define the changes within each group pre and post intervention regarding walking distance and vo_2 max Paired T-test was used.

3.Results:

A total of 60 participants were distributed randomly into 3 equal groups. According to the data in **Table 1**, there were no significant variations in the participants' features, including post-covid period, age, height, and gender (p-value was 0.585, 0.084, 0.327, and 0.210, respectively).

Regarding walking distance and VO_2 max, findings indicated no statistical differences between all groups before the training; the P-values were 0.069 and 0.056, respectively. In addition, results exhibited significant variations post-training ($P<0.05$) for walking distance and VO_2 max (**Table 2**).

Regarding walking distance and VO_2 max after the training, post hoc tests indicated significant variations between groups A and B, significant differences between groups A and C, and no significant variations between groups B and C (**Table 2**).

The differences within groups pre- and post-Training were analyzed using Paired Sample T-test. The outcomes indicated that no significant changes in walking distance and VO_2 max of participants in group A (**Table 2**). However, patients who received the treadmill program (group B) had a significant increase in walking distance and VO_2 max ($P<0.05$) with percentages of change of 12.4% and 23.7%, respectively (**Table 2**). Participants in group C who received bicycle training had an elevation of walking distance and VO_2 max ($P<0.05$) with percentages of change of 20.2% and 46.5%, respectively (**Table 2**).

Table (1): Comparison of characteristics between groups A, B, and C.

		Group A	Group B	Group C	F-value	p-value
		$\bar{X}$ ± SD	$\bar{X}$ ± SD	$\bar{X}$ ± SD		
Post covid period (months)		7.45±3.5	8.6±3.2	8.2±3.4	0.542	0.585
Age (years)		24.7±4.2	24.9±3	22.6±3.4	2.594	0.084
Height (cm)		167.3±11.3	162.8±9.7	165.5±7.2	1.14	0.327
Sex		N (%)	N (%)	N (%)		
	Male	6(30%)	3(15%)	8(40%)		0.210
	Female	14(70%)	17(85%)	12(60%)		

$\bar{X}$: Mean, SD: Standard deviation, p-value: Probability value, *: significance.

Table (2): Walking distance and VO_2 max comparison within and between groups A, B, and C.

Variables		**Group A SD ± $\bar{X}$**		**Group B SD ± $\bar{X}$**		**Group C SD ± $\bar{X}$**		**Comparison between Groups**	
								P-value	**F-value**
Distance (km)	**Pre-Treatment**	0.88±0.13		0.97±0.16		0.89±0.12		0.069	2.805
	Post-Treatment	0.9±0.13		1.09±0.12		1.07±0.06		P<0.05	18.33
	Change %			12.4%		20.2%			
	Comparison within Group	P=0.281	T=-1.109	P<0.05*	T=-6.412	P<0.05*	T=-7.041		
VO_2 MAX	**Pre-Treatment**	8.4±2.9		10.5±3.5		8.6±2.4		0.056	3.042
	Post-Treatment	8.8±2.85		12.99±2.7		12.6±1.3		P<0.05	18.556
	Change %			23.7%		46.5%			
	Comparison within Group	P=0.271	T=-1.135	P<0.05*	T=-6.704	P<0.05*	T=-7.01		

Post Hoc tests, Multiple Comparisons (post-treatment)

	Post-Treatment Distance (km)		**Post-Treatment VO_2 MAX**	
	MD	**P-value**	**MD**	**P-value**
Group A vs. B	-0.185	P<0.05*	-4.16	P<0.05*
Group A vs. C	-0.168	P<0.05*	-3.7	P<0.05*
Group B vs. C	0.017	0.880	0.416	0.859

$\bar{X}$: Mean, SD: Standard deviation, MD: mean difference, p-value: Probability value, *: significance, change%: percentage of change.

4.Discussion:

According to this study there was a significant variation in vo_2 max post moderate intensity aerobic training using treadmill and bicycle with (p value <. 05) which is matched with the result of Milanović et al. (6) which revealed that both endurance training and HIT cause significant increases in the VO_2max of healthy, young to middle-aged persons and described how HIT and aerobic exercise improve VO_2.

The result of Almazán et al. (7) revealed that the more efficient, safe, and well-tolerated intervention to improve cardiovascular fitness is tailored concurrent training at low and moderate intensity for both resistance and endurance training for 8 weeks twice per week for post-covid subjects who had a chronic symptomatic phase lasting longer than 12 weeks. This finding is consistent with the findings of this study, which showed an increase in VO_2 max after moderate intensity aerobic training on a treadmill or bicycle.

According to the study of Mercier et al.(8) who discovered that an increase in an aerobic training programme causes a significant increase in VO_2 max which supports our findings that post-covid overweight participants' functional capacity increased after exercising on the treadmill or the bicycle with p value <05 which also supported by the result of systemic review down by van Baak et al.(9) In people who are overweight or obese, all training methods examined here (aerobic, resistance, combined aerobic and resistance and high-intensity interval training). A higher level of physical fitness was achieved with HIIT, which was marginally more effective than aerobic training at increasing VO_2max. There was no discernible difference between aerobic training and mixed aerobic and strength training.

According to Berardinelli et al.(10) who reported that a sustained improvement in functional capacity and quality of life were obtained by Long-term moderate ET which support the result of this study that demonstrate an increase in walking distance and functional capacity after moderate intensity training at 60:75% of MHR for six weeks which also matched with the result of Maiorana et al.[11] which found increase in functional capacity in middle-aged subjects after moderate intensity circuit training.

5.Conclusion:

The results demonstrated that treadmill training and bicycle training both elicit large improvements in the VO_2max, with more improvement in vo_2 max with bicycle training.

Funding: Not funded.

Conflict of Interests:

Authors declare no potential conflicts of interest.

Acknowledgments:

We would like to thank all individuals who contributed to the completion of this work, especially participants.

References:

1. Rupani, P.F., Nilashi, M., Abumalloh, R.A. et al. 2020 Coronavirus pandemic (COVID-19) and its natural environmental impacts. Int. J. Environ. Sci. Technol. 17, 4655–4666.
2. Kwok, S, Adam, S, Ho, JH, et al. (2020). Obesity: A critical risk factor in the COVID-19 pandemic. Clin Obes. 10:e12403.
3. Jerome L. Fleg , Ileana L. Piña , Gary J. Balady, Bernard R. Chaitman , Barbara Fletcher , Carl Lavie , Marian C. Limacher , Richard A. Stein , Mark Williams and Terry Bazzarre Originally published26 Sep 2000 Assessment of Functional Capacity in Clinical and Research.
4. DasBanibrata 2013, Estimation of maximum oxygen uptake by evaluating cooper 12-min run test in female students of West Bengal, India. Journal of Human Sport and Exercise [en linea]. 8(4), 1008-1014[fecha de Consulta 20 de Marzo de 2023]. ISSN: Disponible en:
5. Molarius, A., Seidell, J., Sans, S. et al. (1999). Waist and hip circumferences, and waist-hip ratio in 19 populations of the WHO MONICA Project. Int J Obes 23, 116–125 (1999).
6. Milanović Z, Sporiš G, Weston M. 2015 Effectiveness of High-Intensity Interval Training (HIT) and Continuous Endurance Training for VO_2max Improvements: A Systematic Review and Meta-Analysis of Controlled Trials. Sports Med. 2015 Oct;45(10):1469-81.
7. Jimeno-Almazán, Amaya, Jesús G. Pallarés, Ángel Buendía-Romero, Alejandro Martínez-Cava, Francisco Franco-López, Bernardino J. Sánchez-Alcaraz Martínez, Enrique Bernal-Morel, and Javier Courel-Ibáñez. 2021. "post-COVID-19 Syndrome and the Potential Benefits of Exercise" International Journal of Environmental Research and Public Health 18, no. 10: 5329.
8. Mercier J, Vago P, Ramonatxo M, Bauer C, Prefaut ,2008. Effect of aerobic training quantity on the VO_2 max of circumpubertal swimmers. Int J Sports Med. 1987 Feb;8(1):26-30.
9. van Baak, MA, Pramono, A, Battista, F, et al.2021 Effect of different types of regular exercise on physical fitness in adults with overweight or obesity: Systematic review and meta-analyses. Obesity Reviews. 2021; 22(S4):e13239.
10. Romualdo Berardinelli, Demetrios Georgiou, Giovanni Cianci, Augusto Purcaro. Randomized, Controlled Trial of Long-Term Moderate Exercise Training in Chronic Heart Failure.1999, Circulation,1173-1182, 99, 9.

11. Maiorana A, O'Driscoll G, Dembo L, et al. Exercise training, vascular function, and functional capacity in middle-aged subjects. Medicine and Science in Sports and Exercise. 2001 Dec;33(12):2022-2028.