

The Effects of Regular Aerobic Exercise on Cardiovascular Physiology in Healthy Adults

Authors:

Soaud A M Moftah¹, RAJA A. Moftah², Gomaa Sulaiman³, Alsadek. H. bogzil⁴

¹Benghazi University, Faculty of Medicine, Department of Physiology, Campus Almarj, Almarj, Libya

²Benghazi University, Faculty of Public Health, Department Health Informatic, Benghazi Campus, Benghazi, Libya

³Faculty of medical Technology, University of Tripoli (UOT) Tripoli Libya

⁴Department of pharmacology, Faculty of Medical veterinary, University of Omar EL Mukhtar, Libya

Corresponding Author:

Soaud A M Moftah

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ABSTRACT:

Aerobic exercise is widely recognized for its beneficial effects on cardiovascular health. This study investigates the physiological adaptations of the cardiovascular system in response to a 12-week moderate-intensity aerobic exercise program in healthy adults. Thirty participants (aged 20–40 years) were assessed for resting heart rate, blood pressure, and VO₂ max before and after the intervention. Results showed a significant decrease in resting heart rate and systolic blood pressure, and a notable increase in VO₂ max. These findings support existing literature on the cardiovascular benefits of aerobic training and highlight the importance of regular physical activity in maintaining cardiovascular health.

Keywords: *Aerobic exercise, Cardiovascular physiology, VO₂ max, Resting heart rate, Blood pressure, Physical activity, Cardiovascular health, Exercise adaptation, Healthy adults, Exercise physiology*

1. INTRODUCTION:

Cardiovascular disease remains the leading cause of mortality globally, with lifestyle factors such as physical inactivity playing a major role in its prevalence. Numerous studies have demonstrated the benefits of aerobic exercise in enhancing cardiovascular function and reducing disease risk (Booth et al., 2012). Regular aerobic training induces several physiological adaptations, including improved cardiac output, reduced resting heart rate, and enhanced oxygen uptake capacity (Powers & Howley, 2018). This study aims to evaluate the cardiovascular changes in healthy adults following a 12-week aerobic exercise program, focusing on key parameters such as resting heart rate, blood pressure, and maximal oxygen uptake (VO₂ max).

2. MATERIALS AND METHODS:

2.1 Participants:

Thirty healthy adults (15 males and 15 females) aged between 20 and 40 years were recruited from a local university. Participants had no history of cardiovascular or metabolic diseases and were not engaged in any structured exercise program in the previous six months.

Written informed consent was obtained from all participants.

2.2 Study Design:

This was a prospective, single-group intervention study. Baseline measurements were taken during the week before the intervention began. The exercise intervention lasted 12 weeks, and post-intervention measurements were taken within one week of the final exercise session.

2.3 Exercise Intervention:

Participants engaged in a moderate-intensity aerobic exercise program (60–70% of age-predicted maximum heart rate) for 45 minutes per session, 4 days per week. Exercise modalities included treadmill running and stationary cycling, supervised by certified trainers.

2.4 Outcome Measures:

Measurements included:

- **Resting Heart Rate (RHR):** Measured via palpation after 5 minutes of seated rest.
- **Blood Pressure (BP):** Measured using an automated sphygmomanometer.

- **VO₂ Max:** Estimated using a submaximal cycle ergometer test and extrapolation method.

2.5 Statistical Analysis:

Data were analyzed using paired t-tests to compare pre- and post-intervention values. A p-value of <0.05 was considered statistically significant.

3. RESULTS:

3.1 Resting Heart Rate:

Mean resting heart rate significantly decreased from 74.2 ± 6.8 bpm to 66.5 ± 5.9 bpm ($p < 0.001$).

3.2 Blood Pressure:

Systolic blood pressure reduced from 122.4 ± 9.3 mmHg to 115.7 ± 7.8 mmHg ($p = 0.002$), while diastolic pressure showed a non-significant change from 78.5 ± 6.4 mmHg to 76.8 ± 5.9 mmHg ($p = 0.09$).

3.3 VO₂ Max:

Estimated VO₂ max increased from 37.8 ± 4.5 mL/kg/min to 42.3 ± 5.1 mL/kg/min ($p < 0.001$), indicating enhanced aerobic capacity.

4. DISCUSSION:

The findings of this study confirm the positive impact of regular aerobic exercise on cardiovascular health. The significant decrease in resting heart rate suggests improved parasympathetic tone and cardiac efficiency, a hallmark of aerobic training adaptation (Fletcher et al., 2013). The reduction in systolic blood pressure highlights the potential of exercise to mitigate hypertension risk, even in normotensive individuals. Notably, the increase in VO₂ max indicates enhanced oxygen delivery and utilization, contributing to improved physical performance and endurance.

These results are consistent with previous research that has shown improvements in cardiovascular parameters following structured aerobic training (Swift et al., 2012). Although diastolic pressure did not change significantly, the overall trend supports cardiovascular benefit. Limitations include a relatively small sample size and lack of a control group, which should be addressed in future studies.

5. CONCLUSION:

A 12-week program of moderate-intensity aerobic exercise leads to significant improvements in cardiovascular physiology, including reductions in resting heart rate and systolic blood pressure, and increased VO₂ max. These adaptations underscore the critical role of regular aerobic activity in promoting

cardiovascular health and preventing disease in healthy adults.

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REFERENCES:

1. Booth, F. W., Roberts, C. K., & Laye, M. J. (2012). Lack of exercise is a major cause of chronic diseases. *Comprehensive Physiology*, 2(2), 1143–1211. <https://doi.org/10.1002/cphy.c110025>
2. Fletcher, G. F., Ades, P. A., Kligfield, P., et al. (2013). Exercise standards for testing and training: a scientific statement from the American Heart Association. *Circulation*, 128(8), 873–934. <https://doi.org/10.1161/CIR.0b013e31829b5b44>
3. Powers, S. K., & Howley, E. T. (2018). *Exercise Physiology: Theory and Application to Fitness and Performance* (10th ed.). McGraw-Hill Education.
4. Swift, D. L., Johannsen, N. M., Lavie, C. J., Earnest, C. P., & Church, T. S. (2012). The role of exercise and physical activity in weight loss and maintenance. *Progress in Cardiovascular Diseases*, 56(4), 441–447. <https://doi.org/10.1016/j.pcad.2013.09.012>