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INVESTIGATING THE EFFECTS OF AEROBIC EXERCISE AND RESPIRATORY TRAINING ON CARDIOVASCULAR AND RESPIRATORY HEALTH DURING PREGNANCY.

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ABSTRACT

BACKGROUND: While the benefits of exercise are well-established, its specific effects on cardiovascular and respiratory health during pregnancy are less studied.

OBJECTIVE: This study aimed to investigate the effects of aerobic exercise and respiratory training on cardiovascular and respiratory health in pregnant women.

METHODS: A randomized controlled trial was conducted among 120 pregnant women. Participants were randomly allocated to either an aerobic exercise group, respiratory training group, or control group. Cardiovascular and respiratory health metrics were recorded before and after the intervention.

RESULTS: Both the aerobic exercise and respiratory training groups showed significant improvements in blood pressure, heart rate, lung capacity, and oxygen saturation compared to the control group post-intervention. There were no significant differences in these metrics within the control group pre- and post-intervention.

CONCLUSION: The study suggests that aerobic exercise and respiratory training during pregnancy can positively influence cardiovascular and respiratory health. Further research is needed to validate these findings and explore long-term outcomes.

KEYWORDS: Pregnancy, Aerobic Exercise, Respiratory Training, Cardiovascular Health, Respiratory Health.

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INTRODUCTION

The significance of exercise in maintaining overall health is well-documented, however, its implications during pregnancy, particularly with respect to cardiovascular and respiratory health,(1) warrants further exploration. Pregnancy brings a multitude of physiological changes, with the cardiovascular and respiratory systems experiencing notable alterations to meet the augmented metabolic demands.(2, 3)

Aerobic exercise has been widely recognized for its potential cardiovascular benefits, including improved cardiac output and reduced risk of hypertension. For the respiratory system, exercise has been associated with enhanced lung capacity and oxygen uptake efficiency.(4, 5) These beneficial adaptations can have profound effects

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on the maternal-fetal environment, potentially optimizing pregnancy outcomes and reducing pregnancy-related complications.(6, 7)

Respiratory training, meanwhile, has the potential to improve respiratory muscle strength, increase lung volume, and optimize gas exchange.(8, 9) Despite the recognized benefits of respiratory training in the general population, its specific impacts during pregnancy are understudied.(9-11)

Previous literature illustrates conflicting perspectives. Some studies suggest a correlation between regular aerobic exercise and respiratory training and decreased incidences of gestational hypertension, gestational diabetes, and preterm labor.(12-14) Others, however, caution against potential risks including fetal distress and premature delivery. This study aims to contribute to this dialogue, investigating the effects of aerobic exercise and respiratory training on cardiovascular and respiratory health during pregnancy.(11, 15)

MATERIAL & METHODS

STUDY DESIGN: This is a randomized controlled trial comparing the effects of aerobic exercise and respiratory training on pregnant women's cardiovascular and respiratory health.

PARTICIPANTS: The study involved pregnant women aged 18-40 years, who are at 10-14 weeks gestation at the time of enrollment.(16, 17)

INCLUSION CRITERIA: Singleton pregnancies, women who have been cleared by their healthcare provider to participate in the exercise regimen, and those willing to provide informed consent.(18, 19)

EXCLUSION CRITERIA: Pregnancies with high-risk factors such as placenta previa, incompetent cervix, chronic hypertension, heart disease, restrictive lung disease, and those contraindicated for exercise by their healthcare provider.(20, 21)

DATA COLLECTION PROCEDURE: Upon enrollment, participants were randomized into one of three groups: aerobic exercise, respiratory training, or control. Baseline data including blood pressure, heart rate, lung capacity, and oxygen saturation was recorded. The exercise group participated in a supervised aerobic exercise regimen, while the respiratory training group followed a structured respiratory exercise routine. The control group received standard prenatal care. All groups was monitored biweekly, recording changes in cardiovascular and respiratory health metrics.(22, 23)

DATA ANALYSIS: Statistical analyses included descriptive statistics, repeated measures ANOVA for within-group and between-group comparisons over time, and Pearson's correlation to explore relationships between variables.(23, 24)

ETHICAL CONSIDERATION: The study was conducted following the ethical guidelines of the Declaration of Helsinki. Informed consent was obtained from all participants, and they was assured of confidentiality and their right to withdraw at any point in the study. Ethical approval was secured from the Institutional Review Board prior to study commencement.

RESULTS

Participants' demographic data are presented in Table 1.

Table 1: Demographic data

Variable	Aerobic Exercise (n=40)	Respiratory Training (n=40)	Control (n=40)
Age (mean ± SD)	28.7 ± 4.2	29.5 ± 3.8	28.9 ± 4.0
Gestational Age at enrollment (weeks)	12.2 ± 1.2	12.5 ± 1.1	12.3 ± 1.0
BMI (mean ± SD)	24.3 ± 3.1	23.9 ± 2.8	24.1 ± 3.2
Gravidity (mean ± SD)	2.3 ± 0.9	2.2 ± 0.8	2.3 ± 1.0
Parity (mean ± SD)	1.1 ± 0.9	1.0 ± 0.8	1.1 ± 0.9

No significant differences were observed among the groups for demographic variables at baseline.

Table 2 presents the pre- and post-intervention values for the cardiovascular and respiratory health metrics.

Table 2: Cardiovascular and Respiratory Health Metrics

Outcomes	Pre-intervention (mean ± SD)	Post-intervention (mean ± SD)	P-value
Aerobic Exercise Group			
Blood Pressure (mmHg)	120.5/80.3 ± 7.2/4.6	118.6/78.8 ± 5.9/4.1	<0.05
Heart Rate (bpm)	78.4 ± 8.6	75.5 ± 7.8	<0.05
Lung Capacity (liters)	4.7 ± 0.5	4.9 ± 0.4	<0.05
Oxygen Saturation (%)	97.2 ± 0.8	97.9 ± 0.6	<0.05
Respiratory Training Group			
Blood Pressure (mmHg)	121.1/80.6 ± 6.8/4.4	119.9/79.3 ± 6.1/3.9	<0.05
Heart Rate (bpm)	78.9 ± 8.2	76.7 ± 7.9	<0.05
Lung Capacity (liters)	4.8 ± 0.4	5.2 ± 0.4	<0.05
Oxygen Saturation (%)	97.1 ± 0.9	98.2 ± 0.8	<0.05
Control Group			
Blood Pressure (mmHg)	120.8/80.5 ± 7.0/4.5	120.7/80.4 ± 6.8/4.3	>0.05
Heart Rate (bpm)	78.5 ± 8.3	78.3 ± 8.1	>0.05
Lung Capacity (liters)	4.7 ± 0.5	4.7 ± 0.5	>0.05
Oxygen Saturation (%)	97.3 ± 0.8	97.3 ± 0.8	>0.05

Post-intervention, both the aerobic exercise and respiratory training groups showed significant improvements in blood pressure, heart rate, lung capacity, and oxygen saturation compared to the control group. There were no significant differences in these health metrics within the control group pre- and post-intervention.

Overall, the results suggest that aerobic exercise and respiratory training may have beneficial effects on cardiovascular and respiratory health in pregnant women. Further research is required to validate these findings and investigate long-term outcomes.

DISCUSSION

The results of this study emphasize the potential beneficial effects of both aerobic exercise and respiratory training on cardiovascular and respiratory health in pregnant women, consistent with previous research.(25)

In line with the findings of a study aerobic exercise resulted in significantly improved blood pressure and heart rate, implying enhanced cardiovascular health. Further, the positive alterations in lung capacity and oxygen saturation align with the study, highlighting the benefits of regular aerobic activity in optimizing pulmonary function during pregnancy.(25, 26)

Similarly, the respiratory training group experienced significant improvements in all measured outcomes, suggesting the importance of structured respiratory exercises. These findings complement those of another study, suggesting an improvement in respiratory muscle strength, lung volume, and gas exchange efficiency.(27, 28)

Despite these significant findings, our results contrast with certain studies cautioning against potential risks of exercise during pregnancy. Notably, no adverse outcomes were observed in our study, underpinning the safety of the administered exercise regimens when performed under suitable supervision and guidance.(29)

CONCLUSION

This study indicates that both aerobic exercise and respiratory training during pregnancy may significantly enhance cardiovascular and respiratory health, potentially optimizing pregnancy outcomes. These findings underscore the need to incorporate appropriate exercise and respiratory training programs in prenatal care. However, further longitudinal studies are needed to explore the long-term effects and potential implications for maternal and fetal health.

REFERENCES

1. Davenport MH, Nagpal TS, Mottola MF, Skow RJ, Riske L, Poitras VJ, et al. Prenatal exercise (including but not limited to pelvic floor muscle training) and urinary incontinence during and following pregnancy: a systematic review and meta-analysis. British journal of sports medicine. 2018;52(21):1397-404.
2. Ma N, Chau JPC, Deng Y, Choi KC. Protocol: Effects of a structured Tai Chi program on improving physical activity levels, exercise self-efficacy and health outcomes among pregnant women: study protocol for a randomised controlled trial. BMJ Open. 2023;13(2).
3. Ma N, Chau JPC, Deng Y, Choi KC. Effects of a structured Tai Chi program on improving physical activity levels, exercise self-efficacy and health outcomes among pregnant women: study protocol for a randomised controlled trial. BMJ open. 2023;13(2):e065640.
4. Birman D. Investigation of the Effects of Covid-19 on Different Organs of the Body. Eurasian Journal of Chemical, Medicinal and Petroleum Research. 2023;2(1):24-36.
5. Scheffers LE, Berg LEv, Ismailova G, Dulfer K, Takkenberg JJ, Helbing WA. Physical exercise training in patients with a Fontan circulation: a systematic review. European journal of preventive cardiology. 2021;28(11):1269-78.
6. ATLI E, UYANIK S, YILDIRIM A, UZUN NYGD, ACAR M, AKINCI B. Investigation of Acute Effects of Slow Controlled Breathing on Fatigue and Vital Markers During Recovery Phase. 2023.
7. Žebeljan I, Lučovnik M, Dinevski D, Lackner HK, Moertl MG, Vesenjak Dinevski I, et al. Effect of Prenatal Yoga on Heart Rate Variability and Cardio-Respiratory Synchronization: A Prospective Cohort Study. Journal of Clinical Medicine. 2022;11(19):5777.
8. Scheffers LE, Helbing WA, Utens EM, Dieleman GC, Dulfer K, Noske J, et al. Study Protocol of the Exercise Study: Unraveling Limitations for Physical Activity in Children With Chronic Diseases in Order to Target Them With Tailored Interventions—A Randomized Cross Over Trial. Frontiers in Pediatrics. 2022;9:791701.
9. Zhang Y, Liao B, Hu S, Pan S-Y, Wang G-P, Wang Y-L, et al. High intensity interval training induces dysregulation of mitochondrial respiratory complex and mitophagy in the hippocampus of middle-aged mice. Behavioural Brain Research. 2021;412:113384.
10. Skow RJ, Labrecque L, Rosenberger JA, Brassard P, Steinback CD, Davenport MH. Prenatal exercise and cardiovascular health (PEACH) study: Impact of acute and chronic exercise on cerebrovascular hemodynamics and dynamic cerebral autoregulation. Journal of Applied Physiology. 2022;132(1):247-60.
11. do Amaral VT, Viana AA, Heubel AD, Linares SN, Martinelli B, Camprigher Witzler PH, et al. Cardiovascular, respiratory and functional effects of tele-supervised home-based exercise training in individuals recovering from COVID-19 hospitalization: A randomized clinical trial. medRxiv. 2022:2022.01. 24.22269745.
12. K Madume A, Nonye-Enyidah E, N Woko C, E Inyang M. Impact of Aerobics Exercise Training on the Pulse Oximetry of Pregnant Women in a Nigerian Teaching Hospital. Journal of Scientific Research and Reports. 2022;28(10):77-84.
13. Huzmeli I, Ozer A, Akkus O, Yalcin F. The results of inspiratory muscle training on cardiac, respiratory, musculoskeletal, and psychological status in patients with stable angina: a randomized controlled trial. Disability and Rehabilitation. 2022:1-12.
14. Gostelow T, Stöhr EJ. The effect of preterm birth on maximal aerobic exercise capacity and lung function in healthy adults: a systematic review and meta-analysis. Sports Medicine. 2022;52(11):2627-35.
15. Elsisi HF, Aneis YM, El Refaye GE, Ghareeb HO. Blood oxygenation response to aerobic exercise combined with breathing exercises in pregnant women: a randomized controlled trial. Bulletin of Faculty of Physical Therapy. 2022;27(1):1-9.
16. Kirkman DL, Ramick MG, Muth BJ, Stock JM, Townsend RR, Edwards DG. A randomized trial of aerobic exercise in chronic kidney disease: evidence for blunted cardiopulmonary adaptations. Annals of physical and rehabilitation medicine. 2021;64(6):101469.
17. del Carmen Carrascosa M, Navas A, Artigues C, Ortas S, Portells E, Soler A, et al. Effect of aerobic water exercise during pregnancy on epidural use and pain: A multi-centre, randomised, controlled trial. Midwifery. 2021;103:103105.
18. Atef H, Abdeen H. Effect of exercise on sleep and cardiopulmonary parameters in patients with pulmonary artery hypertension. Sleep and Breathing. 2021:1-8.
19. Ammar A, Boukhris O, Halfpaap N, Labott BK, Langhans C, Herold F, et al. Four weeks of detraining

induced by COVID-19 reverse cardiac improvements from eight weeks of fitness-dance training in older adults with mild cognitive impairment. International Journal of Environmental Research and Public Health. 2021;18(11):5930.
20. Scheid JL, Lupien SP, Ford GS, West SL. Commentary: physiological and psychological impact of face mask usage during the COVID-19 pandemic. International journal of environmental research and public health. 2020;17(18):6655.
21. May LE, McDonald S, Forbes L, Jones R, Newton E, Strickland D, et al. Influence of maternal aerobic exercise during pregnancy on fetal cardiac function and outflow. American Journal of Obstetrics & Gynecology MFM. 2020;2(2):100095.
22. Bauer I, Hartkopf J, Kullmann S, Schleger F, Hallschmid M, Pauluschke-Fröhlich J, et al. Spotlight on the fetus: how physical activity during pregnancy influences fetal health: a narrative review. BMJ Open Sport & Exercise Medicine. 2020;6(1):e000658.
23. ALAWNA M, Amro M, Mohamed A. Aerobic exercises recommendations and specifications for patients with COVID-19: a systematic review. European Review for Medical & Pharmacological Sciences. 2020;24(24).
24. Wilke J, Kaiser S, Niederer D, Kalo K, Engeroff T, Morath C, et al. Effects of high-intensity functional circuit training on motor function and sport motivation in healthy, inactive adults. Scandinavian journal of medicine & science in sports. 2019;29(1):144-53.
25. Davenport MH, Marchand A-A, Mottola MF, Poitras VJ, Gray CE, Garcia AJ, et al. Exercise for the prevention and treatment of low back, pelvic girdle and lumbopelvic pain during pregnancy: a systematic review and meta-analysis. British journal of sports medicine. 2019;53(2):90-8.
26. Shabani A, Shabani R, Dalili S, Rad AH. The effect of concurrent endurance and resistance training on cardio-respiratory capacity and cardiovascular risk markers among sedentary overweight or obese post-menopausal women. Journal of Nursing and Midwifery Sciences. 2018;5(4):123.
27. Mottola MF, Davenport MH, Ruchat S-M, Davies GA, Poitras V, Gray C, et al. No. 367-2019 Canadian guideline for physical activity throughout pregnancy. Journal of Obstetrics and Gynaecology Canada. 2018;40(11):1528-37.
28. Koc S. The Acute Effect of Aerobic Exercise on Serum Cortisol Levels of Athletes and Sedentary Individuals. Journal of Education and Training Studies. 2018;6(n12a):29-36.
29. Farpour-Lambert NJ, Ells LJ, Martinez de Tejada B, Scott C. Obesity and weight gain in pregnancy and postpartum: an evidence review of lifestyle interventions to inform maternal and child health policies. Frontiers in endocrinology. 2018;9:546.