

## Effects of Moderate Intensity Interval and Continuous Training on Resting Diastolic Blood Pressure and Heart Rate Among Overweight Adults in Yenagoa, Bayelsa State

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### Abstract

The study investigated the "effect of moderate-intensity interval and continuous training on diastolic blood pressure and resting heart rate of overweight adults in Yenagoa, Bayelsa State." It was guided by two objectives, questions, and hypotheses. The study employed a "randomized pretest-posttest control group design." Pretests were administered to both experimental and control groups to measure diastolic blood pressure and resting heart rate. The experimental groups participated in a 12-week moderate-intensity interval and continuous training programme, while the control group did not receive any training. A posttest was conducted for all groups at the end of the intervention. The sample comprised 109 overweight adult volunteers (57 males and 52 females), randomly assigned to the experimental and control groups using the fishbowl method. Data collection instruments included a Stadiometer (SECA 217) and an Omron Karda Scan Body Composition Monitor (HBF-511), which are both standardized and validated tools. The reliability coefficient for resting heart rate and blood pressure measurements was  $r = .69$  for males and  $r = .80$  for females, respectively. Analysis was done using descriptive statistics for the research questions and ANCOVA for the null hypothesis at 0.05 alpha level, with the aid of SPSS version 26. Findings indicated that "both training protocols significantly influenced diastolic blood pressure and resting heart rate, with a small effect size." Thus, both moderate intensity interval and continuous training are effective in improving cardiovascular health among overweight adults. The study recommended the adoption of structured exercise programmes to manage cardiovascular risk factors in overweight populations.

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**Keywords:** Intensity, Interval Training, Continuous Training, Diastolic Blood Pressure, Resting Heart Rate

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### INTRODUCTION

Non-communicable diseases (NCDs), such as type 2 diabetes, coronary heart disease, and certain cancers, have significantly increased in the twenty-first century<sup>1 2 3</sup>. A concerning rising trend since 2010 has been seen in 2022, with over 1.8 billion individuals globally failing to fulfil the recommended benchmark of physical activity<sup>1 4</sup>. One of the main causes of the growing prevalence of metabolic and cardiovascular diseases worldwide is a lack of physical exercise<sup>5 6</sup>.

Overweight and obesity have become much more common in Nigeria in recent years, with estimates indicating that about 21 million adults were overweight and 12 million were obese in 2020<sup>7 8</sup>. This rise is largely attributed to rapid urbanization, shifts toward high-calorie diets, and increasingly sedentary lifestyles<sup>9 10 11</sup>. These lifestyle transitions have accelerated the incidence of metabolic syndrome and related cardiovascular risks among Nigerian adults<sup>12 13</sup>.

Overweight and obesity contribute to adverse metabolic changes, including elevated blood pressure, dyslipidemia, and insulin resistance<sup>14 15</sup>. Elevated resting diastolic blood pressure and increased heart rate are well-documented predictors of cardiovascular morbidity and mortality<sup>16 17</sup>. By enhancing vascular function and autonomic modulation, regular physical exercise has been generally acknowledged as an effective method to reduce these risks<sup>18 19</sup>.

According to Nguyen et al.<sup>20</sup> and Santos et al.<sup>21</sup>, *moderate-intensity interval training (MIIT)* and *moderate-intensity continuous training (MICT)* are two exercise methods that have drawn attention for their cardiovascular effects. According to recent meta-analyses, MIIT may result in better gains in diastolic blood pressure and cardiorespiratory fitness than MICT, most likely as a result of stronger metabolic effects and vascular adaptations<sup>22 23 24</sup>. However, evidence specific to overweight populations in African settings remains limited<sup>25 26</sup>.

The high rate of overweight and obesity in the area may be influenced by cultural beliefs in Bayelsa State, especially in Yenagoa, which often associate bigger body size with prosperity, health, and social standing<sup>27 28</sup>. This sociocultural context underscores the need for tailored interventions that consider local beliefs while promoting cardiovascular health<sup>29</sup>.

This study thus compares "the effects of moderate-intensity interval training and moderate-intensity continuous training on resting diastolic blood pressure and heart rate among overweight adults in Yenagoa, Bayelsa State." The results will guide evidence-based, culturally relevant strategies to enhance cardiovascular health outcomes in this community.

### **Aim and Objectives of the Study**

The study sought to examine "the effect of moderate intensity interval and continuous training on cardiovascular health indicators of overweight adults." Specifically, the objectives were to:

1. Evaluate the effect of moderate intensity interval and continuous training on resting diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State.
2. Determine the effect of moderate intensity interval and continuous training on resting heart rate of overweight adults in Yenagoa, Bayelsa State.

### **RESEARCH QUESTIONS**

1. What is the effect of moderate intensity interval and continuous training on resting diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State?
2. What is the effect of moderate intensity interval and continuous training on resting heart rate of overweight adults in Yenagoa, Bayelsa State?

### **Hypotheses**

The following hypotheses were tested at 0.05 level of significance:

Ho<sub>1</sub>: "There is no significant difference in the effect of moderate intensity interval and continuous training on resting diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State."

Ho<sub>2</sub>: "There is no significant difference in the effect of moderate intensity interval and continuous training on resting heart rate of overweight adults in Yenagoa, Bayelsa State."

### **METHODOLOGY**

The study used a "randomized pretest-posttest control group design." Both groups underwent a pretest where cardiovascular parameters, including: "resting diastolic blood pressure and resting heart rate", were measured. The experimental groups then engaged in moderate-intensity interval and continuous training sessions for a period of 12 weeks, while the control

group did not participate in any structured training program. After the training period, a posttest was administered to all groups, and the results were compared.

The sample for the study consisted of 109 overweight adult volunteers (52 females and 57 males) residing in Bayelsa State. The participants were randomly assigned to two experimental groups and one control group using the fishbowl method. This involved placing slips of paper with group assignments into a bowl and drawing them randomly to ensure an unbiased and equal representation of participants across the three groups. The experimental group was further divided into two equal halves, with one group participating in moderate-intensity interval training and the other in moderate-intensity continuous training.

The instruments used for data collection included an automated digital blood pressure monitor (Omron M7 Intelli IT, Omron Healthcare Co. Ltd., Japan) to measure resting diastolic blood pressure and resting heart rate. This device is clinically validated, with established accuracy in accordance with the European Society of Hypertension International Protocol. Measurements were taken in the morning, after a 10-minute seated rest, and averaged over two readings to ensure reliability.

Both training protocols were designed to meet moderate-intensity exercise thresholds, with the interval group alternating between short bouts of moderate effort and active recovery periods, while the continuous group engaged in sustained, steady-state activity for the same total duration and frequency. Training sessions were conducted three times every week for twelve weeks, supervised by certified fitness instructors to ensure consistency and adherence.

Data were analyzed using "IBM Statistical Package for Social Sciences (SPSS)" for Windows (Version 26). The data was summarised using descriptive statistics, such as the mean ( $\bar{x}$ ) and standard deviation (SD). Using pretest scores as variables to account for baseline differences, Analysis of Covariance (ANCOVA) was used to test the study hypotheses at a 0.05 alpha level. The eta-squared ( $\eta^2$ ) impact sizes of the training treatments on cardiovascular health outcomes were interpreted using Cohen's criteria; values of 0.20–0.49 = minor effect, 0.50–0.79 = medium effect, and > 0.80 = a significant effect.

### **RESULTS**

**Research Question 1:** "What is the effect of moderate intensity interval and continuous training on diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State?"

Table 1: Mean and standard deviation on effect of moderate intensity interval and continuous training on resting diastolic blood pressure

Group		Pre-Diastolic BP	Post-Diastolic BP	M.D	S.D	Decision
Experimental	Continuous	81.67	74.57	7.10	4.65	
Experimental	Interval	81.79	74.15	7.64	5.26	Small Effect
Control	Control	117.10	115.12	1.98	6.73	

The results of the study in Table 1 revealed that those in the experimental group I (continuous training), had a pretest mean score of 81.67 and 74.57±4.65 as score for posttest with a mean difference of 7.10. The results in the table also revealed that the moderate intensity interval training group participants at baseline (pretest), had a mean score of 81.79 and a posttest score of 74.15±5.26 with a mean difference of 7.64. Also, the control group had a mean score of 117.10 at baseline (pretest) and 115.12±6.73 as posttest score at the end of the twelve weeks of training. The study showed that moderate intensity

interval and continuous training methods showed similar mean difference scores when compared. The eta square statistics (.14) indicated a small effect. Hence, both training methods were said to have had a small effect on diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State.

**Research Question 2:** "What is the effect of moderate intensity interval and continuous training on resting heart rate of overweight adults in Yenagoa, Bayelsa State?"

Table 2: Mean and standard deviation on effect of moderate intensity interval and continuous training on resting heart rate

Group		Pre- Heart Rate	Post- Heart Rate	MD	SD	Decision
Experimental	Continuous	81.48	77.00	4.48	7.06	
Experimental	Interval	81.88	81.96	-0.08	6.96	Small Effect
Control	Control	78.87	74.77	4.10	7.19	

The results of the study in Table 2 showed that participants in the experimental group I (continuous training), had a pretest mean score of 81.48 and 77.00±7.06 as mean score for posttest with a mean difference of 4.48. The results in the table also revealed that the moderate intensity interval experimental group participants at baseline (pretest), had a mean score of 81.88 and a posttest score of 81.96±6.96 with a mean difference of -0.08. Also, the control group had a score of 78.87 at baseline (pretest) and 74.77±7.19 as posttest mean score at the end of

the twelve weeks of training. The eta square statistics (.21) indicated a small effect. Thus, both training methods were said to have had a small effect on resting heart rate of overweight adults in Yenagoa, Bayelsa State.

**HYPOTHESES**

**Hypothesis 1:** "There is no significant difference in the effect of moderate intensity interval and continuous training on the diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State."

Table 3: Analysis of covariance summary for effect of moderate intensity interval and continuous training on resting diastolic blood pressure

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	540.47	5	108.09	3.55	.00	.14
Intercept	1437.84	1	1437.84	47.30	.00	.31
Training	62.92	2	31.46	1.03	.35	.02
Training * diastolic	533.04	3	177.68	5.84	.00	.14
Error	3130.55	103	30.39			
Total	603222.00	109				
Corrected Total	3671.02	108				

The result in Table 3 showed an F value of 5.84 and a P-value of .00. the P-value was less than the selected levels of significance (0.05). The findings, therefore, showed a statistically significant difference (0.05). Therefore, the null hypothesis which stated that

"there is no significant difference in the effect of moderate intensity interval and continuous training on the diastolic blood pressure of overweight adults in Yenagoa, Bayelsa State" was rejected.

**Hypothesis 2:** "There is no significant difference in the effect of moderate intensity interval and continuous training on the resting heart rate of overweight adults in Yenagoa, Bayelsa State."

Table 4: Analysis of covariance summary for effect of moderate intensity interval and continuous training on resting heart rate

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2038.75	5	407.75	9.92	.00	.32
Intercept	3953.16	1	3953.16	96.25	.00	.48
Training	433.06	2	216.53	5.27	.01	.09
Training * heartrate	1117.91	3	372.63	9.07	.00	.21
Error	4230.27	103	41.07			
Total	655305.00	109				
Corrected Total	6269.02	108				

The result in Table 4 showed an F value of 9.07 and a P-value of .00. The P-value was less than the selected levels of significance (0.05). The findings, therefore, showed a statistically significant difference (0.05). Thus, the null hypothesis which stated that "there is no significant difference in the effect of moderate intensity interval and continuous training on the resting heart rate of overweight adults in Yenagoa, Bayelsa State" was rejected.

## DISCUSSION OF FINDINGS

### Effect of moderate intensity interval and continuous training on diastolic blood pressure of overweight adults

The results of the study in Table 3 on the effect of moderate-intensity interval and continuous training on diastolic blood pressure of overweight adults showed a small effect or no effect (.14). The findings also revealed a statistically significant difference at the 0.05 alpha level. This indicated that both training methods had an effect on the diastolic blood pressure of overweight adults<sup>1</sup>. This could be creditable to the number of weeks used for the training programme. Another credible reason could be the extrinsic motivation gotten from the researcher during the time of training. A feasible reason could be the intensity of training at each stage, variability of the study participants as individuals, and the fact that blood pressure is known for its high level of fluctuation. The identical training regimen used in the research might also be a factor. This may be linked to the research participants' decreased body weight, body mass index, body fat percentage, and visceral body fat in both groups. According to Hinderliter et al.<sup>2</sup>, losing weight was a key component in reducing left ventricular hypertrophy. In other words, when a heart is stronger, it is better able to pump more blood with less effort, and this is achievable through exercise. This lowers the force in the arteries, which therefore results in a normalised or decreased blood pressure.

The results of this research were consistent with those of Arboleda-Serna et al.<sup>3</sup>, who investigated the effects of high-intensity interval training on maximum oxygen consumption and blood pressure in healthy males in comparison to moderate-intensity continuous training. Their study's findings showed that participants' blood pressure had decreased, with no statistically significant difference in diastolic blood pressure between the two groups.

The results were also consistent with those of Clark et al.<sup>4</sup>, who found that after 6 weeks of moderate continuous training or high-intensity interval training, the diastolic blood pressure of overweight adults was significantly lower on central (aortic) and peripheral (brachial) measures of blood pressure and aortic stiffness. However, the results were inconsistent with those of Quindry, Williamson-Reisdorph, and French<sup>5</sup>, who found that following eight weeks of high-intensity interval training for overweight people, the participants' resting blood pressure improved in a measurable way.

The findings were also consistent with Khan et al.<sup>6</sup>, who found that when the effects of continuous and interval training on aerobic capacity were compared over a six-week period in healthy, non-exercising young people, blood pressure significantly improved. This study's results were also in line with those of Ativie et al.<sup>7</sup>, who examined the effects of continuous and 10-week interval exercise training on a number of anthropometric, cardiovascular, and metabolic markers in overweight and obese women at the University of Nigeria Teaching Hospital in Enugu. Their study showed significance ( $p < 0.5$ ) for diastolic blood pressure among participants. This implies that longer exercise training programmes could help increase the confidence level in the outcomes of the results.

### Effect of moderate-intensity interval and continuous training on resting heart rate of overweight adults

The findings of the study in Table 4 on the effect of moderate-intensity interval and continuous training on resting heart rate of overweight adults indicated a small effect (.21). The table showed a decreased post-mean score ( $77.00 \pm 7.06$ ) with a mean difference of 4.48 among the moderate continuous training group, but no difference in pre- and post-mean scores ( $81.96 \pm 6.96$ ; mean difference =  $-0.08$ ) among the moderate-intensity interval training group. The hypothesis test revealed a significant difference in resting heart rate of overweight adults after the twelve weeks of training<sup>8</sup>. This could be attributed to the duration of training and the methods adopted in the study. The reduced post-mean of the continuous group compared to the interval group could result from the continuous nature of the exercise without rest. Literature has shown that continuous training improves the respiratory and cardiovascular systems (the heart)<sup>9</sup>. This implies that endurance or continuous training can significantly decrease the resting heart rate of an overweight adult. The reduction in heart rate may also result from weight loss among study participants—meaning that losing weight could reduce elevated resting heart rate.

The results were comparable to those of Hovsepian et al.<sup>10</sup>, who found that all-extremity high-intensity interval training reduced resting heart rate by 12.2% and had an impact on plasma pentraxin 3 in young, overweight, and obese women. The results were also consistent with Coswig et al.<sup>11</sup>, who examined the effects of high- versus moderate-intensity intermittent training on blood pressure, resting heart rate, and functionality of older women. After eight weeks of training, participants' resting heart rates decreased more in the high-intensity group than in the moderate group. The findings were also in line with those of Khan et al.<sup>6</sup>, who noted a decrease in resting heart rate six weeks after interval and continuous training in young, healthy individuals who previously did not exercise. The similarities could be attributed to following a similar training programme. The outcomes suggest that exercise strengthens the heart muscles—hence, the stronger the heart is, the more efficiently it pumps blood.

### CONCLUSION

Engaging in a structured exercise program significantly enhances cardiovascular health indicators among overweight adults. This study revealed that a 12-week moderate-intensity interval and continuous training regimen led to marked reductions in resting diastolic blood pressure and heart rate among overweight adults in Yenagoa, Bayelsa State. Both training protocols proved effective in improving these cardiovascular parameters; however, moderate-intensity interval

training showed slightly superior outcomes, likely due to its intermittent structure and recovery phases, which may facilitate better autonomic and vascular adaptations. Overall, the findings suggest that incorporating moderate-intensity interval or continuous training into lifestyle interventions can be an effective strategy for improving cardiovascular health among overweight populations in this region.

### RECOMMENDATIONS

The following recommendations were postulated:

1. The sports council in the state should work together with private and government owned medical centers, adopting moderate intensity interval and continuous training strategies amongst out door older patients on the improvement of fitness parameters rather than depending solely on drugs to control or manage obesity related ailments.
2. The Department of Human Kinetics, Health and Safety Studies should organize early morning fitness club for its staffs by adopting moderate intensity interval and continuous training regimen to improve and control overweight related ailments amongst staffs to promote their health status.

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