# Impact of Moderate Altitude Walking Programme on Blood Pressure and Resting Heart Rate Among Middle Aged Men

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***Abstract*- Purpose of the study: The main objective of the study was to find out the effect of moderate altitude walking program on blood pressure and resting heart rate.**

**Materials and Methods: 45 middle aged men were randomly selected as subjects from various places around Kannur, Kerala State. The age of the subjects were ranged from 40 to 45 years. The subjects were further classified at random into two equal groups of 15 subjects each in which group - I underwent moderate altitude walking, for six days per week for twenty four weeks and group - II acted as control who were not undergo any special activities other than normal activities. The experimental group underwent their training program at a moderate hill near Kannur Town, Kannur, Kerala. The selected criterion variables such as systolic and diastolic blood pressure and resting heart rate were assessed before and after the training period. The blood pressure was assessed by using sphygmomanometer and resting heart rate was measured by using bio-monitor.**

**Statistical Tool Used: The collected data were statistically analysed by using Analysis of Covariance (ANCOVA).**

**Results: From the results of the study it was found that there was a significant decrease in blood pressure and resting heart rate for moderate altitude training group when compared with the control group.**

***Key words*: Moderate altitude, brisk walking, resting pulse rate, resting heart rate, t-test, Livene's test and ANCOVA.**

## INTRODUCTION

Regular bodily changes brought on by age increase the likelihood of developing a variety of diseases, and this is a self-regulatory factor that raises the risk of cardiovascular disease, hypertension, and diabetes.[1,2] The cardiovascular system is frequently affected by ageing during rest and activity. Maximum oxygen uptake values decreased by an average of 8 to 10% over the course of each decade starting at the age of 20 to 30, and then increased to 15 to 20% over the following years, indicating a decline in exercise tolerance.[3] Exercise of the endurance variety will improve senior individuals' aerobic capacity[4], improve their quality of life, and increase their ability to function independently for the duration of their lives. Additionally, the aerobic capacity will alter the body's composition, control lipid metabolism, and lower levels of inflammation and diabetes.[6,7] Nowadays, a variety of aerobic exercises, including walking, cycling, swimming, rowing, etc., are advised to cure a variety of illnesses, including heart and lung disorders, diseases linked to the metabolic syndrome, and muscle, bone, and joint ailments in senior individuals.[8] Physical exercise has helped to lessen cases of chronic illnesses including diabetes and cardiovascular disease as well as early mortality.[9]

It is common knowledge that walking is healthy. Additionally, it doesn't call for any specialised abilities or tools, and anyone of either gender may do it with little danger of damage.[10] The main advantages of walking for both psychological and physical health are consistently demonstrated.[11-14] It is a leisure activity with added health advantages that also lowers cardiovascular risk factors including atherosclerosis and myocardial ischemia. Walking, like aerobic exercise, increases physical fitness, improves quality of life overall, and lowers all-cause mortality.[17,18] Every third to fifth Indian has hypertension, which is an increasing concern in India.[19-21] Compared to pre-hypertension and normotension, the risk of cardiovascular disease is enhanced by 1.55

(relative risk, RR), coronary heart disease by 1.50, and stroke by 1.71.[22]

The number of coronary artery segments and branch sizes are growing, along with the need for more oxygen-rich blood during aerobic activity. In turn, it provides an extra pathway for oxygen-rich blood to reach the heart's working muscles. As a result, in the event of an arterial block, it provides a different route and keeps the blood supply going.[23-25] Mountain hiking appears to be a physically demanding sport that can go for a long time given the altitude difference. Despite the fact that the average walking time for mountain hikers has been stated to be two or three hours, actual walking times vary greatly among them.[26,27] When walk up the hills vertically, it forces to work along with greater effort and it results to improves the cardiovascular efficiency and tone-up various muscles, especially the lower body.[28]

## MATERIALS AND METHODS

The purpose of the present study was to know moderate altitude training program is an effective tool on reducing blood pressure (systolic and diastolic) and resting heart rate among middle aged men.

## STUDY PARTICIPANTS

Thirty middle-aged males living in different areas surrounding Kannur, Kerala, India were chosen at random to participate in the study. The individuals' ages varied from 35 to 45 years old. There were two groups of fifteen each made up of the chosen subjects. Group II is regarded as the control group since they did not participate in any training programs outside of their regular daily activities. Group I was deemed the experimental group because they endured walking at a moderate altitude for twenty-four weeks, six days per week. The experimental group completed their training regimen at Kannur's modest altitude. The participants in the current study were further separated into three teams of five persons, with one member from each team serving as the team's guide during the hill walking program and helping to gauge the program's intensity.

Because of the uneven terrain, including uphill, plateau, and downhill, during the moderate altitude training program, it was decided to establish the time length as intensity. The individual's enthusiastically engaged in the training program and shown a desire to increase their cardiovascular fitness. At each hill walking program, the participant turnout was measured, and it was 96%. The following is the timetable for the hill walking program:

Table – I: Walking Programme Schedule

| Week | Warming up | Intensity of Work | Warming down |
|---|---|---|---|
| 1 – 4 | 10 minutes | 15 minutes | 10 minutes |
| 5 – 8 | 10 minutes | 20 minutes | 10 minutes |
| 9 – 12 | 12 minutes | 25 minutes | 10 minutes |
| 13- 16 | 12 minutes | 30 minutes | 10 minutes |
| 17 – 20 | 15 minutes | 40 minutes | 12 minutes |
| 21 – 24 | 20 minutes | 50 minutes | 15 minutes |

## PROCEDURE

The criteria variables the researcher used were: Blood pressure and heart rate when at rest. The mercury blood pressure Aqua Metallic BPMR121 sphygmomanometer29 was used to measure the systolic and diastolic blood pressure, and the bio-monitor was used to measure the resting pulse rate. 30 After the subjects had been seated for 10 minutes, blood pressure was measured using a cuff of the proper size. The measurements were performed twice, with at least two minutes passing between each measurement attempt. If blood pressure readings were different and higher than 4 mmHg, the third measurement was done. The subjects were instructed to report at dawn on the days before and following the experimental period in order to collect data. The subjects of the current study were asked about their interest in moderate altitude training (uphill, plateau, and downhill walking). They acknowledged that they were new to walking on moderate altitude and stated that they had not engaged in any other similar sports over the previous few years. All individuals were given a self-administered questionnaire to see whether they had any physical or physiological impairments, and it was discovered that none of them were. Prior to enrolment, the individuals provided written consent to take part in this study..

## DATA ANALYSIS

The paired sample "t" test, which assesses whether error variances are equal To determine if there was a significant difference between the experimental group and control group on particular criteria variables, Levene's test and Analysis of covariance (ANCOVA) were employed. In every instance, a fixed level of confidence of.05 was used to test for significance, which was deemed adequate..

## RESULTS

The data collected on blood pressure and resting heart among experimental and control groups were analyses and the results were presented in Table – II.

Table – II Paired Sample T = Test of Walking at Moderate Altitude Group and Control Group on Selected Dependent Variables

| Variable Name | Group Name | Walking at Moderate Altitude Group | Control Group |
|---|---|---|---|
| Systolic Blood Pressure (in mm Hg) | Pre-test Mean | 131.86 | 132.46 |
| | Post-test Mean | 127.25 | 131.86 |
| 't' – ratio | | 46.86* | 1.113 |
| Diastolic Blood Pressure (in mm Hg) | Pre-test Mean | 93.85 | 92.46 |
| | Post-test Mean | 89.42 | 91.87 |
| 't' - ratio | | 49.86* | 1.023 |
| Resting heart rate (Numbers/min) | Pre-test Mean | 81.32 | 82.16 |
| | Post-test Mean | 77.19 | 82.10 |
| 't' - ratio | | 63.23* | 0.23 |

The results of Table II's paired sample "t" test on blood pressure and resting heart rate indicate that both criterion variables were significantly lowered in the hill walking group. Before moving on to the Univariate analysis, a preliminary analysis was performed to see if the ANCOVA's preconditional assumptions had been satisfied. As a consequence, the homogeneity of regression slopes, the linear regression connection between the covariates and the dependent variables, and the assumption of equality of variance (Levene's test homogeneity) were all investigated. The results are shown in Table-III..

Table – III Levene's Test for Equality of Error Variances of Selected Variables among Groups

| Levene's Test on Systolic Blood Pressure | | | |
|---|---|---|---|
| 'F' | df1 | df2 | Sig. |
| 0.226 | 1 | 28 | 0.416 |
| Levene's Test on Diastolic Blood Pressure | | | |
| 'F' | df1 | df2 | Sig. |
| 0.186 | 1 | 28 | 0.231 |
| Levene's Test on Diastolic Resting Heart Rate | | | |
| 'F' | df1 | df2 | Sig. |
| 0.221 | 1 | 28 | 0.147 |

The idea that groups have comparable variations is referred to as homogeneity of variances. Thus, the resultant F-values of the chosen dependent variables were less than the confidence interval value of 0.05 in Leven's test of equality of the error variance table, indicating that the variance of one group was not statistically different from the other. Because of this, the homogeneity of variance distinguishes between the two groups despite the ability level for each of the dependent variables, indicating that homogeneity of variance has been fulfilled for two dependent variables at a significant 0.05 level of confidence. Thus, it was determined that the requirement of homogeneity of

variance for computing univariate ANCOVA had been satisfied.

Table – IV Analysis of Covariance on Blood Pressure and Resting Heart Rate among Walking Group and Control Group

| Variable Name | Group Name | Hill Walking Group | Control Group | 'F' Ratio |
|---|---|---|---|---|
| Systolic blood pressure (in mm Hg) | Pre-test Mean ± S.D | 131.86 ± 1.26 | 132.46 ± 1.36 | 0.45 |
| | Post-test Mean ± S.D. | 127.25 ± 0.89 | 131.86 ± 0.89 | 34.89* |
| | Adj. Post-test Mean | 128.392 | 131.976 | 128.93* |
| Diastolic blood pressure (in mm Hg) | Pre-test Mean ± S.D | 93.85 ± 1.09 | 92.46 ± 1.08 | 0.931 |
| | Post-test Mean ± S.D. | 89.42 ± 1.43 | 91.87± 1.13 | 42.86* |
| | Adj. Post-test Mean | 90.167 | 91.993 | 116.56* |
| Resting Heart Rate (Beats/min) | Pre-test Mean ± S.D | 81.32 ± 1.87 | 82.16 ± 1.972 | 0.89 |
| | Post-test Mean ± S.D. | 77.19 ± 0.99 | 82.10 ± 1.23 | 39.26* |
| | Adj. Post-test Mean | 79.116 | 82.19 | 96.12* |

* Significant at 0.05 level of confidence. (The table values required for significance at 0.05 level of confidence for 1 and 18 & 1 and 17 are 4.41 and 4.45 respectively).

The 'f'-ratio between the pre-test mean of the moderate altitude walking group and the control group on systolic blood pressure was 0.45, which is negligible at the 0.05 level of confidence, according to Table IV. The post- and adjusted post-test means for the experimental group and control group had f ratio values of 34.89 and 128.93, respectively. This result is significant at the 0.05 level of confidence. The pre-test mean difference in diastolic blood pressure between the moderate altitude walking group and the control group had a "f" ratio of 0.931, which is negligible at the 0.05 level of confidence. The post- and adjusted post-test averages for the experimental group and control group had f ratio values of 42.86 and 116.56, respectively. This result is significant at the 0.05 level of confidence. The pre-test mean difference in resting heart rate between the moderate altitude walking group and the control group had an "f" ratio of 0.89, which is negligible at a 0.05 level of confidence. The adjusted post-test means for the experimental group and control group had f ratio values of 39.26 and 96.12, respectively, which are significant at the 0.05 level of confidence.

According to the aforementioned statistical analysis, the hill walking program resulted in a significant drop in blood pressure and resting heart rate.

## DISCUSSION

The main goal of the current study was to determine how a hill walking program affected blood pressure and resting heart rate. According to Nemoto et al. (2007)[31], high-intensity walking exercise lowers and raises systolic and diastolic blood pressure as well as increases aerobic capacity. More studies are advocating walking solutions after analysing the results of training sessions that generally last 4–5 days per week for 30–60 minutes. 32–40 A six-month walking program for seniors may also improve their physical abilities, including their forced vital capacity, flexibility, resting heart rate, and handgrip strength.[41]

## CONCLUSION

The experimental group achieved a significant decrease in both systolic and diastolic blood pressure, and resting heart rate when compared with the control group. Moreover, there was a significant difference was occurred between the experimental group and control group on selected criterion variables.

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