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# Impact Of Cardiovascular Exercises On Sleep Quality In Sedentary Individuals: An Experimental Investigation

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## Abstract

*Lack of sleep is still a crucial problem for many sedentary persons in terms of keeping good health. This study examines the influence of cardiovascular exercise on the quality of sleep-in sedentary individuals and emphasizes the benefits of non-pharmacological sleep aids. Thirty individuals total were enrolled in the study and split into two groups: the experimental group (n = 15) exercised for eight weeks, while the control group (n = 15) continued to lead sedentary lives. The Pittsburgh Sleep Quality Index (PSQI) was utilised by the researcher to assess participants' sleep quality both prior to and following the intervention. The mean PSQI scores for the intervention group decreased from 14.07 to 8.07 ($p<0.001$), indicating a significant improvement in sleep quality. The control group, on the other hand, did not display any prominent changes ($p=0.104$). In addition, the post-intervention analysis declared that the experimental group had significantly better sleep quality than the control group ($p<0.001$). These results [1]established the effectiveness of planned cardiovascular exercise programs as a non-pharmacological treatment to improve sleep quality in this population and indulge strong evidence for the positive effects of regular cardiovascular exercise on sleep quality in sedentary people.*

***Keywords:*** *Sleep quality, Cardiovascular Exercise and Sedentary behavior.*

## Introduction

It is important to get enough sleep for good health because they are ill and spend most of them time sitting or lying. More than 5 million deaths occur each year as a result of sedentary life styles (World Health Organization, 2010). One way to enhance the health and wellness of those who are inactive is through participation in aerobic exercise activities that increase heart rate and blood flow. This type of exercise has several advantages including improvement in mood, cognitive function, heart and body metabolism, and overall quality of life. To know how exercises relate to sleep, it is necessary to understand what sleep is. The state of sleep includes non-rapid eye movement (NREM) and rapid eye

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movement (REM) aspects. NREM sleep contains four stages: Stage I involves a dip in brain activity after the person moves from deep slumber; stage II entails gradual shifts in thalamic and cortical neuronal activity resulting into relaxation, decreased muscle tone and slower breathing; then comes stage III which marks the onset of deep sleep characterized by reduced attention span plus raised synchrony between cortical and thalamic activities. A slow heart rate, muscle tension, and breathing characterize stage 4 which is a very deep state of more brain activity as compared to REM sleep (Louwagie, 2019).

Exercise can improve cardiovascular function through changes in the cardiovascular system. Active exercise promotes the body's heart rate hypertrophy and reduces atherosclerotic markers, blood pressure, and resting heart rate. In addition, it increases high-density lipoprotein (HDL) cholesterol and improves myocardial perfusion, both of which can support cardiovascular function and reduce cardiac stress in patients. Cardiovascular outcomes such as aerobic capacity, metabolic processes, blood lipids, insulin sensitivity, immunity, myocardial perfusion, and fibrinolytic activity can be attributed to physical activity (Armin et al., 2023)

Many centuries ago, thanks to the development of chest radiography in the 1950s and 1960s, and echocardiography in the 1970s and 1980s, training for changes in cardiac morphology and function could be assessed in detail. The term "athlete's heart" refers to these changes, which include left and right ventricular swelling, left ventricular hypertrophy, increased left ventricular size, and increased left atrial volume (Miller et al 2016).

Most studies show that physical activity has a positive effect on sleep outcomes in adults with sleep disorders such as insomnia, sleep disorders, and obstructive sleep apnea disorder (OSAS). However, evidence on its effect on sleep goals is limited and results are not significant. Physical activity appears to be effective in improving sleep, especially in middle- aged and older adults who are sedentary for long periods. This study suggest that more research is needed on the effects of physical activity on sleep goals, especially in young people who are sedentary (Rai A et al,.2023).

A 12-week aerobic exercise can be beneficial on middle-aged and elderly people with poor sleep. Many people do not know how to properly improve their sleep quality and heart recovery function through exercise. Exercise, if done wrong, can be ineffective in improving one’s sleep quality and heart recovery function. To that end, I offer this exercise can increase your heart rate variability (HRV) and reduce your risk of heart disease. Furthermore, it has been demonstrated that a good night’s sleep is of great importance in the following aspects: We see this in the link between exercise and HRV (Tseng et al., 2020).

The financial impact of lack of enough rest is also huge. It is believed that the costs due to missed work days, motor vehicle accidents caused by fatigue, healthcare expenses etc may reach billions per year (Hafner et al., 2017).

Sleep deprivation has been linked to many negative health outcomes such as increased chances of cardiovascular diseases, metabolic syndrome, and cognitive impairment and mental disorders (Itani et al., 2017)

The quality of sleep has different aspects like how long one sleeps, how they sleep and if they are satisfied or not with their sleeping (Ohayon et al., 2017).

There are many ways to improve sleep problems, such as drug therapy, physical therapy (transcranial magnetism, brain wave therapy, etc.), exercise interventions, etc. The effects of drugs are more effective, but sleeping pills are difficult to use because they have serious side effects and are easy to cause drug addiction. Physical therapy is not the best way to

improve sleep quality because it is effective and has few side effects, but it requires professional guidance and some financial support. Aerobic exercise is more suitable for all types of people, easy and fast than the above treatments. In addition to improving sleep quality, aerobic exercise can strengthen a person's immune system and improve mood (Li, L., 2022).

After a comprehensive analysis of early studies, it became clear that while the effects of exercise on sleep have been widely studied, sedentary people have received little attention. Previous research has focused on mostly sleep disorders like sleep apnea or insomnia etc. And some other conditions such as Parkinson's disease, cancer and heart disease. This study focuses on vulnerable people because they are at high risk for these diseases.

**Objectives**

1 To determine the causal effect of regular cardiovascular exercise participation on the sleep quality of sedentary adults.
2 To investigate whether engaging in a structured exercise program leads to measurable improvements in various aspects of their sleep.

**Material and Method**

This study adopted an experimental approach using a group design and pre and post intervention phases to evaluate the effect. Participants were assigned to an experimental group that received an exercise intervention and a control group that received no intervention.

**Participant**

A simple random sampling technique was used to create a sample that effectively represents the poor population with sleep problems. This structure ensures that everyone in the group has an equal chance of being selected for the study.

Thirty subjects (n=30) were selected from University of Gujrat. The half (n=15) randomly assigned to the experimental group and the remaining half (n=15) to the control group. The participants who live sedentary life were selected with age 18-25.

**Material**

In this research, the researcher used the Pittsburgh Sleep Quality Index (PSQI)

consisting of fifteen questions before or after the interventions to measure the sleep quality.

**Procedure**

This research proposed to explore the impact of cardiovascular exercise on quality of sleep through a simple and effective method. Researcher recruited 30 adults and split them into 02 groups randomly: an exercise group (n=15) and a control group (n=15). Those in the exercise group engaged in a 08-week regimen of moderate-intensity cardiovascular activities, such as brisk walking or jogging, for thirty minutes in a day and five days in a week. Meanwhile, the control group continued with their regular daily activities without any changes. All participants filled the sleep quality questionnaire the Pittsburgh Sleep Quality Index, at the pre and post the 08-week interventions.

**Result And Interpretation**

**Table 4.1 Paired Sample T-test Results of Experimental Group Pre- and Post-Physical Exercise**

| Variable | N | Mean | Std. error Mean | T | p |
|---|---|---|---|---|---|
| Experimental Group Pre-intervention | 15 | 14.07 | .316 | 21.737 | 0.000 |
| Experimental Group Post-intervention | 15 | 8.07 | .206 | | |

Table 4.1 represents the paired sample t-test to compare the sleep quality before and after the experimental intervention. The mean of sleep quality before the intervention of physical exercise was 14.07 (SE =.316). The mean of sleep quality after the intervention of Physical Exercise of was 8.07 (SE = .206). The t-value was 21.73. The p-value was .000. Since the p-value is less than 0.05, Results also indicate that Physical Exercise had a meaningful impact on improving the sleep quality of sedentary people.

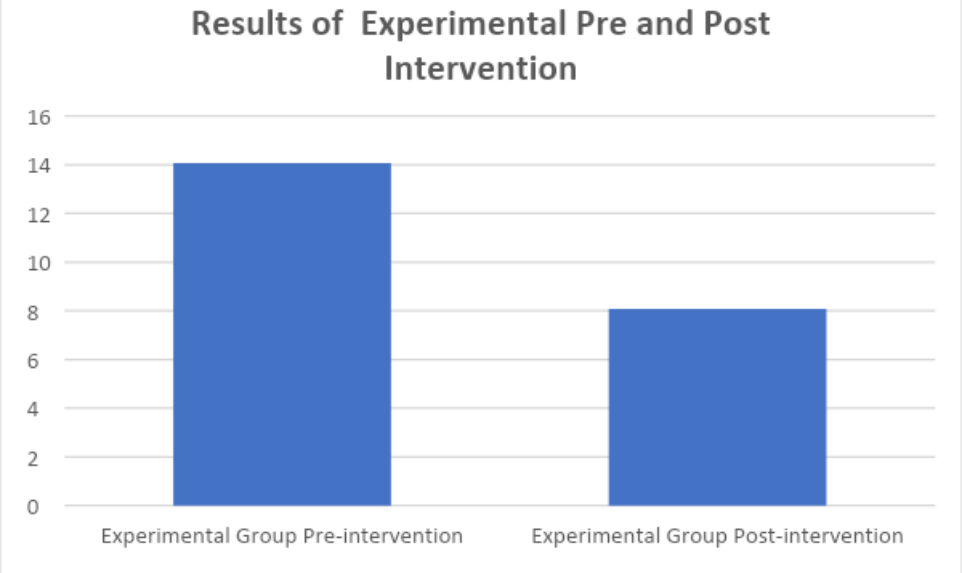



**Table 4.2 Paired sample T-test Results of Control Group Pre- and Post-Intervention**

| Variable | N | Mean | Std. error Mean | T | p |
|---|---|---|---|---|---|
| Control Group Pre-intervention | 15 | 12.4667 | .74322 | -1.740 | .104 |
| Control Group post-intervention | 15 | 12.7333 | .79881 | | |

Table 4.2 represents the paired sample t-test to compare the sleep quality before and after the experimental intervention. The mean of sleep quality before the intervention of physical exercise was 12.46 (SE =.316). The mean of sleep quality after the intervention of Physical Exercise of was 12.73 (SE = .206). The t-value was -1.740. The p-value was .104. Since the p-value is greater than 0.05, Results indicate that Physical Exercise had no meaningful impact on improving the sleep quality of sedentary people.

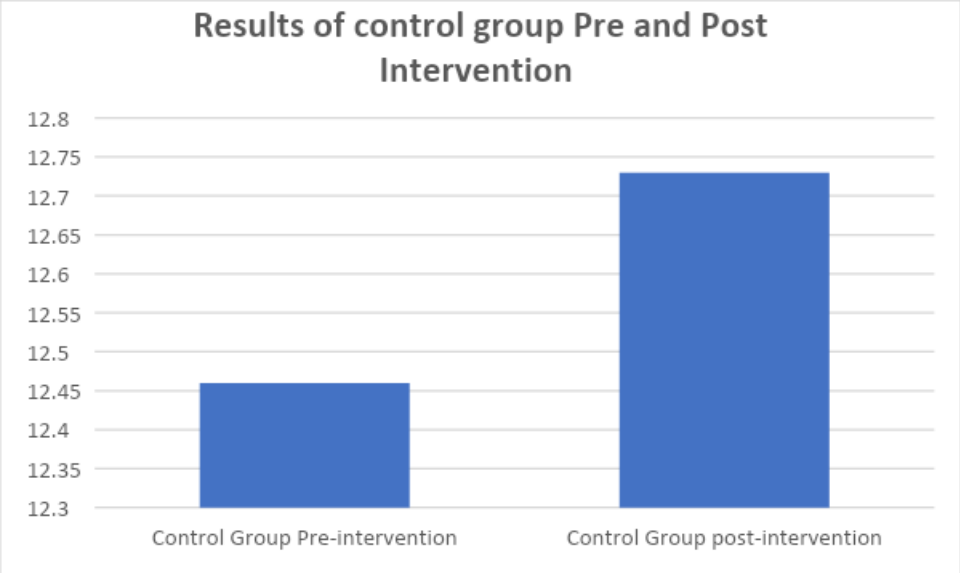
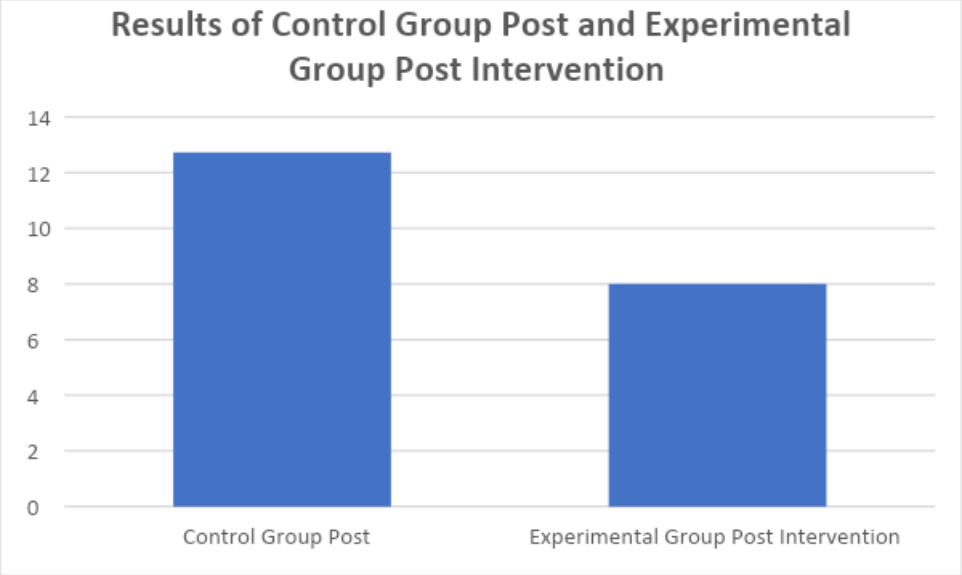



**Table 4.3 Independent T-test Results of Control Group and Experimental Group Post-Intervention**

| Variable | N | Mean | Std. error mean | t | P-value |
|---|---|---|---|---|---|
| Control Group Post | 15 | 12.7333 | .79881 | 20.204 | 0.000 |
| Experimental Group Post Intervention | 15 | 8.00 | 0.206 | | |

Table 4.3 represents the paired sample t-test to compare the sleep quality after the experimental intervention. The mean of sleep quality after 06 weeks of the control group was 14.07 (SE =.316). The mean of sleep quality after the intervention of Physical Exercise of was 8.00 (SE = .206). The t-value was 20.204. The p-value was 0.000. Since the p-value is less than 0.05, Results indicate that Physical Exercise had a meaningful impact on improving the sleep quality of sedentary people of the Experimental Group.




**Discussion**

The correlation that exists between physical exercise and the quality of slumber is generally acknowledged; nevertheless, the fundamental mechanisms remain a subject of ongoing exploration. In accordance with the findings of the referenced study, male individuals classified as overweight or obese who engaged in a regimen of physical activity lasting six months manifested an enhancement in their sleep quality, which was concomitant with a reduction in the percentage of body fat. This observation posits that physical exercise might positively influence sleep quality, at least in part, through modifications in body composition (Kovacevic et al., 2018).

An essential dimension of the investigation pertained to performance metrics. This study undertook a systematic examination and assessment regarding the influence of physical exercise on insomnia manifestations. The findings are notably compelling, indicating that the engagement in exercise can enhance the quality, efficiency, and continuity of sleep among those suffering from insomnia. It is crucial to highlight that these outcomes have been observed to be comparable to conventional pharmacological sleep aids; nevertheless, they lack the deleterious side effects frequently linked with such medications. This observation posits exercise as a viable alternative or adjunctive therapeutic modality for insomnia management (Banno et al., 2022).

The data presented in Tables 4.1, 4.2 and 4.3 provide strong evidence supporting the beneficial effects of aerobic exercise or cardiovascular on sleep quality in sedentary individuals. In Table 4.1, the experimental group showed a significant improvement in sleep quality after a structured physical exercise plan. The mean sleep quality decreased from 14.07 to 8.07, indicating a significant improvement as evidenced by the significant p-value of 0.000. This result shows the positive and beneficial effect of physical exercise on the sleep quality of the participants in the experimental group. Although the mean sleep quality slightly increased from 12.47 to 12.73, this change was not significant (p=0.104). The lack of improvement in the control group also demonstrates the effectiveness of the physical exercise intervention. The post-intervention comparison between the experimental group and the control group in Table 4.3 provides further evidence supporting the effectiveness of physical exercise. The mean sleep quality of the experimental group was lower (significantly better) at 8.00 compared to the control group's 12.73 points, with a p-value of 0.000. This significant difference suggests that physical activity has a positive effect on sleep quality.

**Findings**

Thus, the findings obtained in this study prove that physical activity has the positive impact on the sleep quality for the sedentary individuals. A major shift was perceived on the aspect of excessive sleep, where the mean score reduced from 14.07 for the group under the physical exercise programme as compared to the other group to 8.07 ($p < 0.001$). However, there was a little change in the aspects of sleep in the control group as they were ($p = 0.104$). Single mean comparison of the pre and post intervention in exercise group represented that mean post-test sleep quality score ($M = 8.00$) was significantly better than the control group ($M = 12.7333$). These results give the best thesis that physical exercise can be helpful for inactive people who have inadequate sleep.

## Conclusion

Therefore, there is adequate evidence suggesting that exercise has a beneficial impact on sleep. The results of this research show that the experimental group, who involved in physical exercise group had their sleep pattern improved as compare to control group who lives sedentary according to the study. The current literature provides substantial evidence supporting the beneficial effects of cardiovascular exercise in improving sleep quality. However, this integration is complex and can be influenced by many factors. The primary objective of this study was to fill some of the gaps in the current literature by examining the effects of an 8-week period on heart rate performance during sleep quality (as assessed by the PSQI) in a selected sample. These findings are significant to the physicians, policymakers, and those people who are want improved sleep without pharmalogical treatment.

## Future Recommendations

Firstly, considering the present study, further research should look at the ways to extend their work in the following directions. It is however imperative that longitudinal investigation be conducted in order to evaluate the effectiveness of good sleep in the long run. It is also necessary to learn the intensity, duration, and type of exercise that is best for improving sleep in order to create effective strategies. Furthermore, expanding this study to include different populations, such as those of different ages and those with certain medical conditions, will lead to a generalized rivalry of findings. Exploring the physical and psychological mechanisms underlying the relationship between exercise and sleep may provide a better understanding of the effects.

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