REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No.2 (2024)
http://www.veterinaria.org
Article Received: Revised: Published:

Effect Of Aerobic Versus Strength Training Among Underweight Population With Insomnia- A Pre Post Design

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ABSTRACT

Background: Insomnia is a common sleep disorder characterized by persistent difficulties in falling asleep, staying asleep, or experiencing restful sleep, even under favorable sleep conditions. Various studies worldwide have revealed the prevalence of insomnia in 10%-30% of the population, with some even reaching 50%-60%.. It can have a profound impact on an individual's daily life, leading to various adverse effects on physical, mental, and emotional well-being. Literature studies found that exercise mainly muscle-strengthening exercises can improve insomnia especially among overweight and post-menopausal women. There is minimal research in literature regarding role of exercises in underweight population with insomnia**.**

Objective: The main purpose was to check the effect of aerobic and strengthening exercises on underweight people suffering from insomnia.

Methodology: The insomnia severity index was given to 100 people out of which 52 people were selected in this study, which was divided between two groups. The aerobic group, strengthening group and each had 26 participants.

Results: There was a significant difference between pre and post values of the insomnia severity scale (p=.000), which was highly significant. exercise protocol showed a significant change between pre and post values for the BMI (p=.000). The value that was found for the body weight after comparing the data before and after the exercise intervention was partially significant(p=.003).

Conclusion: Both aerobic and strengthening exercises are helpful to improve insomnia. Aerobic exercises were slightly more beneficial in order to reduce insomnia.

Keywords: insomnia, aerobic, strength, training, body mass index, underweight, population.

INTRODUCTION

Insomnia is defined as the inability to fall asleep, maintain, or improve sleep duration or quality, affecting activities of daily life despite having a favorable sleep environment and conditions(1). There are some clinical signs and symptoms of insomnia such as chronic sleep latency, frequent awakenings at night, or prolonged periods of wakefulness(2).

How much time people generally take to fall asleep before going to bed was regularly checked to assess how much time people spend sleeping. the results were grouped based on medical standards, taking into account that insomnia lasts at least 30 minutes. Another question focused on determining the frequency of sleep disruptions, asking participants how many times they had problems falling asleep in the previous month, also the participants were asked about the experiences they had the past month like being unable to sleep during the night and having difficulties sleeping, to better understand the difficulties people encountered with falling asleep(3).

Even though there have been reports of a variety of features, the most prevalent kind of insomnia was one that mostly interfered with people's ability to sleep(2). Muhammad et al. 2022 stated that among South Indians who reported having insomnia symptoms, "18% had trouble falling asleep, 18% had trouble staying asleep, and 7.9 % of respondents suffered early morning awakenings"(4) but the majority of Turkish insomniac's patients said they had problems falling asleep(2). Jiang et al. 2015 conducted a study that discussed about the risk factors for insomnia. Age, affected disorder, dysfunction belief, and lower socio-economic status were found to be positively interlinked with the prevalence of insomnia, also the consequences of insomnia among university students were discussed in three studies, which stated that insomnia can affect both physical and mental well-being, increases hospitalizations, absence from work, and can have significant economic effects(5).

A comprehensive analysis of population-based studies in Western countries reported a relatively low prevalence of insomnia at approximately 6%. The diagnostic criteria for insomnia were based on the guidelines provided by the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV). However, the prevalence of insomnia symptoms was found to be high. Among various risk factors, age and gender were identified as the most significant contributors, with women and older adults experiencing a higher prevalence of insomnia(6) During the period between 2003 and 2010, there was a 13% increase in the number of Americans seeking medical treatment for insomnia(7).

In the sleep heart health research, a community-based cohort, people (middle-aged and older) who reported sleeping 5 hours or less per night were 2.5 times more likely to develop diabetes mellitus than others who recorded sleeping 7 to 8 hours per night(8).

Cao et al. 2017 in a study, revealed that insomnia is more prevalent among young adults compared to old adults, which means young adults are more prone to suffer from insomnia. this high prevalence among young adults was found because of some risk factors such as career stress and night shift work due to advanced urbanization and industrialization. Natural sleep pattern was disturbed due to these factors leading to insomnia(9).

Pre-sleep cognition in many people with insomnia implies effective, sleep and its effects, and autonomic views among many other issues. In addition, enthusiasm, work productivity, cognitive ability, and emotional regulation appear to be linked to the most common health complications. These findings were from self-report policies intended to assess which was before the review of the relevant and the decline in sleep-related living quality in insomnia. Additionally, studies have suggested that it may be able to distinguish between those who have insomnia and people who sleep well using self-reported symptom assessments(10).

There was a higher prevalence of insomnia in university students which might have been caused by increased stress over plans and jobs or night computer usage which affects the control of biological sleep/wake cycles(5). Additionally, there was no discernible variation in the prevalence of insomnia before or after 2006, indicating no long-term shift. Other cross-sectional studies had shown a gradual rise in the prevalence of insomnia in the general population over time, which was inconsistent with our findings(9).

Population-based studies have supported earlier findings by showing that poorer health issues are associated with disturbed sleep, regardless of socioeconomic background(4). Insomnia and its accompanying disorders have a substantial negative influence on a person's quality of life, but several treatment options may improve both a person's health and well-being but also their overall well-being(11).

Sleep issues drastically reduce quality of life and negatively impact both health and quality of life (12). Mental or physical disorders including depression, dementia, non-alcoholic hepatic steatosis, hypertension, cardiovascular disease, and prenatal depressive symptoms have all been associated with insomnia(13). Recent studies showed a strong high correlation between anxiety disorders and sleep problems, which the authors accepted. However, they noted that there isn't enough empirical data to help therapists effectively treat both anxiety and sleep issues concurrently. This points to the necessity for more research to comprehend and create efficient therapies for those with comorbid anxiety and sleep difficulties(14). According to a study in 1967 by Monroe, bad sleepers showed greater body temperatures, vasoconstrictions, movements, and body surface resistance than outstanding sleepers. Additionally, elevated levels of the stress hormone cortisol, oxygen usage during the day, and heart rate have all been connected in certain studies to insomnia(10).

This makes it possible for distinct insomnia subtypes to share the same sleep symptoms while having diverse non-sleep features. In fact, according to the trait of the affective disorder, seemingly similar sleep complaints are linked to individual differences in very different brain areas, according to recent imaging findings on the brain structural correlates of insomnia severity in people with depression, anxiety, both, or none(14).

It is believed that exercise can help those who have trouble falling asleep as well as those who have been diagnosed with insomnia (15). The prevalence of self-reported insomnia decreases over ten years when physical activity levels rise at various intensities(16).

A complete clinical examination of the patient's sleep issues and pertinent circumstances from the patient, their partners, and/or anyone else who may be delivering therapy is used to accomplish the clinical assessment and diagnosis of insomnia. Evaluation of daytime sleepiness may be difficult since they might indicate a fundamental problem or a concurrent condition. The doctor should assess the patient’s perception of therapy response along with the sort, frequency, development, and persistence of symptoms. Numerous sleep diaries and questionnaires may be used to acquire comprehensive data about insomnia(8).

Further study is required to determine if treating insomnia also reduces symptoms of anxiety and depression given the link between sleep disruptions and emotion dysregulation. A combination therapy approach focusing on both issues is preferable, or the most efficient therapeutic technique that results in noticeable treatment gains must be determined(17). Exercise and physical activity have also been shown to have immediate impacts on sleep quality(18).

In a more recent systematic review of the association between exercise and sleep, Kedrow and colleagues (2015) reported that both short- and long-term exercise benefits sleep duration, sleep efficiency, and sleep latency. In addition, long-term, but not short-term, exercise was shown to improve sleep quality. However, while the findings of the aforementioned studies and recent systematic reviews support the acute effects of both endurance and resistance exercise on sleep quality, similar studies in people with mental illness are lacking, in particular, the differential effects of exercise on different mental illnesses(18), According to a population-based seven-year follow-up study, the incidence of medically diagnosed insomnia was 5.7% in 2005, and the majority of those afflicted were not highly active(15). Even with improvements in diagnosis and treatment, insomnia is still widely underdiagnosed and frequently untreated (19).

Exercise training slows the rate of cognitive deterioration, enhances performance on measures of psychological and cognitive health, and increases sleep quality(20). To completely understand how physical exercise impacts sleep length

and quality, as well as how it alters the underlying physiology of the older population, further study is required. Once the multivariable model was adjusted in this study, there was no longer a statistically significant link between alcohol consumption and the signs of insomnia. This result deviates from past research that linked alcohol use to severe sleep disruption but quicker sleep onset(4). Additionally, a curvilinear link between insomnia and BMI was seen(21).

BMI influences SRH and overall mortality regardless of illness, psychological well-being, or other biological risk variables. Although the routes and mechanisms connecting sleep, overweight, and obesity are well documented the pathways related to sleep and underweight are less understood, there is speculation that a low intake of calories may be associated with low concentrations of sleep-inducing gut peptides such as cholecystokinin and an increase in wake agents such as orexin (21).

Being underweight was connected with an increased risk of death when compared to the general population, and age impacted the thinnest participants more than the general population(22), In comparison to their healthy peers, the prevalence of sleeplessness was greater among underweight (19.3%), overweight (16.4%), and obese (20.1%) teenagers (12.6%) (21). There was a link between sleeplessness symptoms in older persons and being underweight, various chronic conditions, and unhealthy lifestyle behaviors (4), prevalence studies have discovered a correlation between exercise and fewer sleep problems, as well as a link between a sedentary lifestyle and a higher prevalence of insomnia(23). Maintaining good health requires adequate rest and frequent movement. Sleep issues and poor sleep quality, on the other hand, are indicated to influence physical activity levels(16).

Roveda et al. (2011) compared the benefits of higher-intensity endurance exercises (30 minutes at 80% max load) with high-intensity strength training (80% max load) on the duration of sleep in young healthy males. Both exercise modes significantly improved the quality of sleep indicators to a similar degree, with no substantial between mode difference(18), aerobic and strength activities are both efficient in decreasing insomnia in postmenopausal women, although resistance exercises are much more beneficial(1).

When compared to persons who did nothing, muscle activity was associated with a lower prevalence of bad to very poor sleep quality, with connections becoming stronger as sleep quality deteriorated(24). However, research on the impact of strengthening training on the sleep of older persons with severe depression, fibromyalgia, GAD, and heart disease has found substantial improvements in the quality of sleep, SE, and sleep latency(25).

Additional study is needed to create more strategies that especially target increasing the quality of life in people suffering from insomnia(11).

Firstly, studying how exercise affects sleep quality in this particular group can help create targeted ways to improve healthy weight gain and better sleep. Secondly, since insomnia is a common sleep problem that affects overall health, looking into how exercise can help manage it will give useful information for doctors and people dealing with it. Lastly, the results of this study may improve the lives of underweight people with insomnia, benefiting their physical and mental well-being, and contributing to better health for everyone in society. The objective of this study was to evaluate the effect of aerobic and strengthening exercises among underweight individual suffering from insomnia.

METHODS

Study sampling and data collection

In this study, the sample size collected was 52 through convenient sampling. The participants have an inclusion criteria of age limit of 18-29 years irrespective of gender, with a BMI <18.5, according to the ISI score >7, suffering from chronic insomnia. The exclusion criteria were individuals with a BMI > 18.5, suffering from any cardiovascular disease, insulin-dependent diabetes mellitus, and thyroid and liver disease. chronic pain conditions and regular use of sedatives, hypnotics, or painkillers.

An ISI-based questionnaire was administered to a sample population, it consists of seven questions that evaluate the nature and impact of sleep difficulties experienced by the person. These questions cover factors such as sleep onset, sleep maintenance, early morning awakening, interference with daily functioning, and satisfaction with sleep quality. Each question is rated on a scale from 0 to 4, with higher scores indicating more severe insomnia.

The total score ranges from 0 to 28, with higher scores representing greater insomnia. The ISI provides valuable insights to clinicians and researchers in understanding the extent of insomnia-related distress, guiding treatment decisions, and measuring treatment outcomes effectively.

PROCEDURE

A group of 100 people received the Insomnia Severity Index (ISI) scale along with a consent form. Among them, 52 students were chosen based on specific inclusion criteria. To be included in the study, participants needed to meet two conditions: firstly, their ISI score had to be above 7, indicating a significant level of insomnia severity, and secondly, their BMI (Body Mass Index) had to be below 18.5, indicating a low body weight.

These criteria were used to ensure that the selected participants experienced notable insomnia symptoms and had a BMI indicative of being underweight. The chosen sample of 45 students will be utilized in further research to investigate the relationship between insomnia severity, BMI, and other relevant variables. The 52 people in this study were divided equally into two groups. Aerobic (n=26), Strengthening (n=26).

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The time duration will be four weeks. The exercise training program the for aerobic group will include brisk walking, jumping rope, cycling and jogging at 30%-60% of HRmax for 20 minutes in the 1st and 2nd week, 30 minutes in the 3rd week, and 4th week. Exercise training programs for strengthening groups will include closed-chain exercises. Exercises will include 10-15 repetitions of modified push-ups, squats, forward backwards, and sideways lunges, calf raises, bridging, and sits-up. Warm-up exercises will be given before and after the training program in both groups.

DIET MONITORING

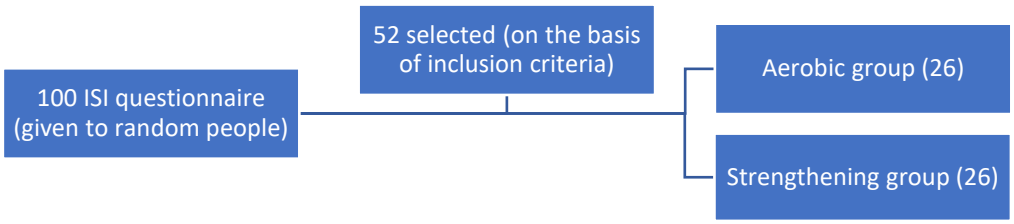
According to the 5-a-day dietary campaign eating at least five servings of fruits and vegetables each day, consuming fried food no more than three times a week, and avoiding high-fat fast food, fewer than three times in the preceding week; and (4) taking 64 ounces of a non-alcoholic, decaffeinated beverage each day. (26)
consuming less or more food can change the total amount of energy we consume but the amount of weight gain is different for various foods, Weight gain may be accelerated by consuming processed meals that are richer in carbs, refined grains, fats, and sugars. When intake was increased, several foods—vegetables, nuts, fruits, and whole grains—were linked to a reduced risk of weight gain(27)
A fixed food timing was given for each meal to maintain a healthy mealtime

DAYTIME SLEEP MONITORING

Daytime sleeping hours were checked throughout the exercise sessions.
If there was daytime sleep it was noted to have a better understanding of nighttime insomnia.

SLEEP DIARY

Each subject was asked to maintain a sleep diary to keep the data for the amount of sleep they had.
Numbers of sleeping hours during the night were noted down after each night of sleep.
Subjects were asked to put on bedtime mode on their smartphones and they were also asked to put on waking alarm.
It was recommended to maintain at least 7- 8 hours of sleep.
The number of waking episodes was also noted down to keep the track for sleep.



STUDY PROTOCOL

Both of the two interventions were given 4 times a week with a day break in between two sessions. Both groups received each intervention for 20-30 mins. Treatment was provided for 4 weeks. Outcome measures were taken before the treatment for pre-test scores and 4 weeks immediately after the treatment for post-test scores. Subjects were aware of the objective of the study without revealing the intervention details.

STATISTICAL ANALYSIS

The data was analysed with IBM SPSS statistics version 23. The Kolmogorov-Smirnov test was employed to find out whether or not the data followed a normal distribution. The result of the test was p=00; in other words it was p< 0.05. Therefore, for the analyses of the data obtained non-parametric statistics were used. For the data analyses, arithmetical means and standard deviations were employed for the level of effectiveness between Aerobic and Strength Training. A non-parametric Mann Whitney-U test was employed to describe the binary variables.

RESULT

		PREWEIGHT	PRE BMI	PREISI	POSTWEIGHT	POSTBMI	POSTISI
Most Extreme Differences	Absolute	0.308	0.346	0.192	0.423	0.731	0.538
	Positive	0.308	0.346	0.192	0.423	0.731	0
	Negative	-0.115	0	-0.115	-0.038	0	-0.538
Kolmogorov-Smirnov Z		1.109	1.248	0.693	1.525	2.635	1.941
Asymp. Sig. (2-tailed)		0.171	0.089	0.722	0.019	0	0.001

Table 4.0 represents Two-Sample Kolmogorov-Smirnov Test
P-value <0.005 signifies that the data was non normally distributed

	N	Mean	Std. Deviation
PREWEIGHT	52	47.519	6.5544
PRE BMI	52	17.333	1.0107
PREISI	52	2.77	0.614
POSTWEIGHT	52	50.346	6.7791
POSTBMI	52	18.646	1.2436
POSTISI	52	1.27	0.448
GROUP	52	1.5	0.505

Table 1.0 Mean and Sandard deviation

	GROUP	N	Mean Rank	Sum of Ranks
PREWEIGHT	AEROBIC	26	22.88	595
	STRENGTHENING	26	30.12	783
	Total	52		
PRE BMI	AEROBIC	26	22.5	585
	STRENGTHENING	26	30.5	793
	Total	52		
PREISI	AEROBIC	26	25.25	656.5
	STRENGTHENING	26	27.75	721.5
	Total	52		
POSTWEIGHT	AEROBIC	26	20.35	529
	STRENGTHENING	26	32.65	849
	Total	52		
POSTBMI	AEROBIC	26	16.5	429
	STRENGTHENING	26	36.5	949
	Total	52		
POSTISI	AEROBIC	26	33.5	871
	STRENGTHENING	26	19.5	507
	Total	52		

Table 2.0 showed mean rank and sum of ranks of groups.

The Mann Whitney test begins by creating a ranked list of observations labeled into two groups. It will then begin with the smallest observation and assign it rank one, followed by rank two, and so on until it reaches the greatest observation, which in this example will have rank 52. If two or more observations have the same value, they are assigned the same rank, which is an average of the available ranks. The test compares the sum of the ranks in both groups. The statistics required for the test are calculated from the rankings and displayed in the table. We can see that for POST WEIGHT, the strength group demonstrated a difference with a total amount of ranks of 849.00. This yielded a mean rank of 32.65. For the aerobic group, the total number of ranks is 529.00, with a mean rank of 20.35, indicating that the strength group has a higher mean rank. Similarly, for POST BMI, the strength group demonstrated a significant difference from the sum of ranks. The strength group's POSTBMI rank total was 949, which was greater than the aerobic group's rank of 429, with

the strength group's mean rank being 16.5 and 36.5, respectively. Meanwhile, the aerobic group (with 871 sum of ranks) showed more positive results compared to the strength group (507 sum of ranks) on POSTISI score. This results in a mean rank 19.5.

GROUPS	U-VALUE	Z-VALUE	P-VALUE
PRE-WEIGHT	244	595	.084
PRE-BMI	234	585	.056
PRE-ISI	305.500	656	.499
POSTWEIGHT	178.000	592	.003
POST-BMI	78	429	.000
POST-ISI	156	507	.000

Table 3.0 showed the U,Z and P-values respectively between pre and post-training protocol

There was a difference between the U-VALUE of PRE and POST training protocols. Smaller U-value for POSTWEIGHT, POSTBMI, and POSTISI supported the hypothesis that there was significant impact of aerobic and strength training among underweight population suffering from insomnia.The Wilcoxon W statistic, denoted as Z-VALUE above, is the greatest of the two rank sums. The Asymp. Sig. (2-tailed) P-value for POSTBMI and POSTISI is.000 (stated as p <.001), which is lower than 0.005. POSTWEIGHT has a significant value of 0.003. As a result, we have sufficient evidence to reject the null hypothesis that aerobic and strength training have no meaningful effect on insomnia in the underweight population.

DISCUSSION

The purpose of this study was to find out whether exercise protocol can help reduce insomnia or not. This study showed that insomnia can be reduced by the exercise protocol, and there was a significant change in other outcomes as well. The population used in this study included college-going students, who were under supervision during the exercise sessions.The values of both groups were similar, indicating that both exercise protocols were equally helpful in improving sleep quality. Both aerobic and strengthening exercises had a positive impact on reducing insomnia severity, highlighting their potential benefits in promoting better sleep patterns. There was a significant difference between pre and post values of the insomnia severity scale (p=.000), which was highly significant. exercise protocol showed a significant change between pre and post values for the BMI (p=.000). The value that was found for the body weight after comparing the data before and after the exercise intervention was partially significant(p=.003).

Comparing the aerobic and strengthening groups both showed statistically significant differences in insomnia severity but aerobic training was more beneficial in reducing insomnia. This suggests that engaging in either exercise protocol led to significant improvements in sleep quality compared to the control group, where individuals did not participate in structured exercise.

According to Jason A. Bennie et al, 2020, those who were not performing exercises had a poor sleep quality level, and as far as we are aware, this study offers the first population-level proof that exercise that strengthens muscles improves sleep quality. Our results are consistent with a recent systematic review of brief/small-scale clinical exercise interventions, which found that, in comparison to no exercise, muscle-strengthening exercise improved sleep quality. However, the cross-sectional aspects of the current study restrict assumptions on cause-and-effect associations.(24)

Xiao tan et al, 2016, According to the study's findings, overweight and obese men who suffer from chronic insomnia can get better sleep with a 6-month aerobic exercise programme. Specifically, as compared to the control group, the exercise group experienced a considerably shorter objective standard of living (SOL), a reduction in the frequency of experiencing problems falling asleep, and an improvement in their depression.(7)

According to pei-yu yang et al. 2012, Through reductions in the overall Pittsburgh Sleep Quality Index score and its subdomains of subjective sleep quality, sleep latency, and sleep medicine use, pooled analyses of the data show that exercise training has a moderately beneficial influence on sleep quality.(12)

According to Giselle Soares Passos et al. 2011, This study found that exercise training significantly improved the quality of life, mood, and objective and subjective sleep in those with chronic primary insomnia. The findings align with other studies that demonstrate the advantages of physical activity for people with sleep disturbances. (23)

Carolina V.R. D'Aurea et colleagues 2018, This study found that exercise training significantly improved the quality of life, mood, and objective and subjective sleep in those with chronic primary insomnia. The findings align with other studies that demonstrate the advantages of physical activity for people with sleep disturbances.(25)

Nalin A. Singh et al. 1997, stated that The exercise benefit is clinically significant, as seen by the 35 percent mean PSQI score drop over 10 weeks and the considerable categorical change from bad to excellent sleepers.(28)

According to T. Muhammad et. Al 2022, Significantly, the results corroborated this by demonstrating that older participants with a normal BMI and those who reported having enough food had fewer symptoms of insomnia than older participants who were underweight and those who reported having insufficient food availability. Prior research

demonstrating that underweight persons had much poorer quality of life scores than normal-weight individuals supports this.(4)
According to Borge Sivertsen et. Al 2014, Gender differences were seen in the prevalence of different sleep issues. Insomnia was more common in girls, while men often reported sleeping for shorter periods of time. Regarding the gender-specific relationships involving sleep and obesity, the research has been contradictory, with some studies indicating higher connections among men.(21)
As mentioned by Geir Fagerjord Lorem et. Al 2017 The results of this study indicate that SRH varied with age, with the thinnest patients being most impacted. A greater mortality risk was linked to underweight, and a change in weight raised this risk. According to a number of academics, being underweight may have worse health effects than being overweight in terms of premature death and quality of life.(22)

CONCLUSION

In conclusion, this study aimed to determine the effectiveness of exercise protocols in improving insomnia and other outcomes. The findings revealed that both aerobic and strengthening training were beneficial in reducing insomnia, indicating their potential as non-pharmacological interventions for improving sleep quality. Additionally, the exercise protocols led to significant improvements in body weight and body mass index (BMI). Aerobic training was found to be more effective in reducing insomnia compared to strength training, although both showed positive effects. The study underscores the importance of exercise in promoting a healthy lifestyle and its potential impact on sleep and overall well-being. These results emphasize the significance of incorporating exercise interventions in managing insomnia and supporting overall health.

Limitations Of Study

1. It is essential to consider the limitations of a relatively small sample size in interpreting the findings.
2. The study only included age group between 18 to 29 years old.
3. The study only included college students.

Future Scope

1. Different age groups can be targeted in future studies.
2. Sample size can be increased.

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