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A Cross Sectional Study on Effect of Physical Activity on Improving Sleep Quality Among Young Adults

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ABSTRACT

Purpose: To investigate the effectiveness of physical activity on improving sleep quality in student population.
Methods: Cross sectional study design. A total of 93 College students were taken, 60 subjects met the inclusion criteria and were allocated into two groups based on the 5-item physical activity questionnaire, very high level, high level and acceptable level are categorized in group– A (N= 20, Physically active) and low active level and inactive level are categorized in group – B (N= 40, Physically inactive/Sedentary). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The questionnaire is valid, reliable and consists of ten main questions comprising of 19 self-rated subjective questions. The answers to the questions generate seven component scores. These components include sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction. The scores of these questions were dichotomized into the seven main components, with a range of 0 to 3 per each component, and a maximum scoreof 21 and a minimum of 0 for the whole questionnaire. A global PSQI score of 5 and total sleep time (TST) of 7 hours were used to differentiate between poor and good sleepers.
Results: Independent t test was used to differentiate the mean significance difference between continuous variables. Both the groups have shown difference in their global score as well as in component scores. Statistical analysis of the data revealed that physically active subjects showed better sleep quality when compared to physically inactive subjects.
Conclusion: The study showed a moderate inverse association between reported physical activity and PSQI, meaning that the more people report being physically active, the better their overall sleep quality. In addition, it was found that a high percentage of people who reported low physical activity also reported poor sleep quality on the PSQI. This may indicate that people with less physical activity are more likely to have overall poor sleep quality. Thus, this study concludes that physical activity has a significant effect in improving sleep quality in healthy individuals.

Keywords: physically active, physically inactive, sedentary lifestyle, sleep quality, PSQI, young adults.

INTRODUCTION

Sleep is a naturally recurring state of mind and body, characterized by altered consciousness relatively inhibited sensory activity, reduced muscle activity and inhibition of nearly all voluntary muscles during REM sleep [1], and reduced interactions with the surroundings [2]

Sleep is associated with a state of muscle relaxation and reduced perception of environmental stimuli. The sleep-wake cycle refers to the pattern of time we spend awake and asleep every 24 hours. This pattern is one of the body's circadian rhythms and is species-specific. For humans, the 24-hour clock is divided between approximately eight hours of sleep and 16 hours of wakefulness.[3]

Two body processes control sleeping and waking periods. These are called sleep/wake homeostasis and the circadian biological clock. The homeostatic mechanism regulates sleep intensity, while the circadian clock regulates the timing of sleep. With sleep/wake homeostasis, the longer you are awake, the greater your body senses the need to sleep.[4]

During the day, light exposure causes the master clock to send signals that generate alertness [5] and help keep us awake and active .as the night falls, the master clock initiates the production of melatonin, a hormone that promotes sleep, and then keeps transmitting signals that help us stay asleep through the night. In this way, our circadian rhythm aligns our sleep and wakefulness with day and night to create a stable cycle of restorative rest that enables increased daytime activity. [6]

The right amount of sleep can vary from person to person, but the centers for disease control and prevention recommend that adults get at least 7 hours. [7]

Occasional interruptions to sleep can be a nuisance, while an ongoing lack of quality sleep can affect a person's performance at work or school, their ability to function day to day, their quality of life, and their health [7]. Sleep deprivation occurs when an individual fails to get enough sleep. The amount of sleep that a person needs varies from one person to another. [8]

A person who is getting too little quality sleep may experience a range of symptoms, including Fatigue, Irritability, Mood changes, Difficulty focusing and remembering, etc. [9]

In the incidence and prevalence of sleep deprivation, 83.4% of the population had some type of sleep disorder. Symptoms of insomnia were reported by 78.2% of the population and 29.2% had moderate to severe insomnia. 78.4% of the population had poor sleep quality. According to a study by TIMES OF INDIA,93 percent of Indians are sleep deprived getting less than 8 hours per night.58 percent believe their work suffers due to lack of adequate sleep. 11 percent take leave from work because of lack of sleep.87 percent of Indians say lack of sleep affects health.72 percent of Indians are waking up 1 to 3 times per night.[10]

Based on the available studies, "we have evidence that exercise does, in fact, help you fall asleep more quickly and improves sleep quality," says Charlene Gamaldo. M. D, medical director of Johns Hopkins center sleep. But there are still some debates.

Exercise decreases sleep latency. It increases slow-wave sleep. It increases total sleep time. Improve sleep quality and reduce daytime sleepiness.[11]

India is a growing economy with a large population. The health outcome of lack of sleep-in quality and quantity has not been paid much attention to so far. Getting sufficient quantity and good quality sleep is quintessential for good health and longevity [12]. The prevalence of sleep disorders in India is high. A study has pegged the percentage of insomnia to be as high as 33% among adults in India. the impact of sleep deprivation on health is deep and extensive. Daytime sleepiness in adults can lead to reduced productivity. Sleep-deprived people are less effective in making quality decisions and more likely to experience distress; develop obesity and are more likely to get coronary heart disease. [13] On average, most college students get 6-6.9

hours of sleep per night, and the college years are notoriously sleep-deprived due to an overload of activities. Recent research on college students and sleep indicates that insufficient sleep impacts our health, our moods, our GPA, and our safety. [14]

The reality is that many students are overworked. However, a lack of sleep can severely hurt grades, among other things. This ends up hurting in the long run, as being sleep-deprived impacts, the skills needed to do well on tests, like memory recall and concentration. [15]

Exercise may be an effective non-pharmacological intervention to improve sleep. Impaired sleep quality and quantity are associated with future morbidity and mortality.[16]

Need of the Study

There is a big problem facing college students today. Students are sleeping less and not getting a healthy amount. The Centers for Disease Control and Prevention (CDC) estimates that, as a nation, 35% of adults are not getting enough sleep. This comes out to about 84 million adults sleeping less than the recommended 7 or more hours a night. [15] Lack of sleep can be caused by, and contribute to, mental health problems. According to the National Alliance on Mental Illness, 44% of students experience symptoms of depression. Also, 80% feel overwhelmed by academic responsibilities, and 50% have struggled with anxiety. [14, 15] Recent studies suggest that exercise may have an effect on the quality and quantity of sleep, sleep latency, total sleep time, and daytime sleepiness.

So, my study is the first of its kind to explore the effectiveness of exercise on sleep quality and comparison of sleep quality between physically active and physically inactive individuals among the student population of the age group 20 -24 years.

Objectives of the Study

- To study the effectiveness of Exercise on improving Sleep Quality in physically active individuals in student population.
- To study the Sleep Quality in physically inactive individuals in student population.
- To compare the effectiveness of Exercise on improving Sleep Quality in physically active and physically inactive individuals in student population.

MATERIALS & METHODS

***Study design*:** Cross sectional study design.

***Ethical clearance and informed consent*:** The participants were requested to provide their consent for participation in the study. All the participants signed the informed consent and the rights of the included participants have been secured.

***Study population*:** Students indulged in physical activity and with sedentary lifestyle.

***Study setting*:** Subjects were recruited from final year, department of physiotherapy in GSL College of Physiotherapy and Swatantra Institute of Physiotherapy and Rehabilitation, Rajamahendravaram, Andhra Pradesh, India.

***Study duration*:** 6 months

***Sampling method*:** Non randomized convenient sampling.

***Sample size*:** A total of 93 subjects were screened in that 60 subjects were recruited to participate in the study. Recruited participants were explained the purpose and relevance of the study. The participants were included the study after obtaining informed consent. All the eligible participants were screened by 5 item physical activity questionnaire and allocated into 2 groups.

GROUPS	NO. OF SUBJECTS
GROUP A	N = 20
GROUP B	N = 40

Inclusion Criteria:

- Apparently healthy,
- above 20 years old.

- 5 item physical activity questionnaire.
- Sedentary lifestyle.
- Moderate to vigorous Exercised Individuals (since past month).
- Male and female gender.
- Age 20-25 years.

Exclusion Criteria:

- Hospitalized patients.
- Sleep medications.
- People with medical assistance (e.g., pregnant women, people with facilities,etc.).
- Psychiatric disorders (e.g., hypomania)
- Breathing-related sleep disorders.
- Cardiovascular diseases and pulmonary diseases.
- Any other diseases that can limit lung capacity (e.g., cold, flu).
- History of pulmonary surgery.
- Neurological diseases.
- Having a recent musculoskeletal injury
- History of illness that limits physical exertion.
- Any surgery that restricts the physical activity.

Outcome Measures

5 item physical activity questionnaire [17]

The 5-item physical activity questionnaire was developed based on Cho's study and Baecke, Burema, & Frijters's study. From 8 original items, three were discarded from testing based on high semantic similarity. These items consisted of type, frequency, intensity, duration, overall length of physical activity during their leisure time. All responses to the types of physical activity were coded on five-point scales. To determine the physical activity level, it requires several steps. Firstly, it is necessary to obtain a score from adding their responses on the different types of physical activities, frequency, intensity, duration, and overall length of physical activity. Secondly, this was calculated by multiplying sum scores to the scaled score for the type of physical activity that the person performed. The maximum and minimum scores were "100" and "4, respectively. Thirdly, the author divided the physical activity index into five categories; "very high level", "high level", "acceptable level", "low active level", and "inactive level". The specific cut-offs used for classification of physical activity index were "very high level (>96)", "high level (95–64)", "acceptable (63–36)", "low level (35–16)", and "inactive level (15–4)". Higher scores indicated higher activity levels during their leisure time.

The Pittsburgh Sleep Quality Index (PSQI)[18]

The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire which assesses sleep quality and disturbances over a 1-month time interval. Nineteen individual items generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The scores of these questions were dichotomized into the seven main components, with a range of 0 to 3 per each component, and a maximum score of 21 and a minimum of 0 for the whole questionnaire. A total score of <5 indicates good overall sleep quality whereas a total score ≥ of 5 indicates poor sleep quality.

Personal sleep diary and sleep log [19]

A sleep diary is a daily record of important sleep-related information. Sleep diaries are also called sleep journals or sleep logs. Although not all sleep diaries are identical, they commonly include details about: Bedtime and/or lights-out time, Wake-up time, how long it takes to fall asleep, The number and duration of sleep interruptions, The number and duration of daytime naps, Perceived sleep quality, Consumption of alcohol, caffeine, and/or tobacco, Daily medications, Daily exercise.

PROCEDURE

93 College students were taken, 60 subjects met the inclusion criteria and were allocated into two groups based on the 5-item physical activity questionnaire, very high

level, high level and acceptable level are categorized in group– A (N= 20, Physically active) and low active level and inactive level are categorized in group – B (N= 40, Sedentary). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The questionnaire is valid, reliable and consists of ten main questions comprising of 19 self-rated subjective questions [20]. Each participant was given brief information about the questions and was provided with assistance to explain some of the questions when necessary. The answers to the questions generate seven component scores. These components include sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication use, and daytime dysfunction. The scores of these questions were dichotomized into the seven main components, with a range of 0 to 3 per each component, and a maximum score of 21 and a minimum of 0 for the whole questionnaire. A total score of <5 indicates good overall sleep quality whereas a total score ≥ of 5 indicates poor sleep quality.[21]

GROUP – A (PHYSICALLY ACTIVE):
20 Subjects performing moderate to vigorous physical activity since past month are taken into group A. According to 5 item physical activity questionnaire very high active to acceptable level of physical activity includes performing aerobic exercise & sports (walking, biking, jogging, swimming, aerobics, basketball, softball, soccer, golf, table tennis, badminton, football, etc.), flexibility exercises (stretching, yoga, Pilates, calisthenics, etc.) muscular exercises (weight training, free weight training) almost every day, 4–5 days/week, 3 days/week for more than 60-90 minutes and their scoring range from 100-36[17]. Subjects were asked to maintain a personal sleep diaries/sleep logs (hand written or computerized or smart phone recordings). After 4 weeks (1 month) of regular physical activity Pittsburgh Sleep Quality Index (PSQI) questionnaire was interviewed to the participants. Each participant was given brief information about the questions and was provided with assistance to explain some of the questions when necessary.

GROUP – B (PHYSICALLY INACTIVE):
40 Subjects with sedentary lifestyle are taken into Group –B. According to 5 item physical activity questionnaire very low active and inactive levels of physical activity includes people indulged in arts & cultural activities (reading, writing, playing cards, dance & music, painting, etc.), and sedentary activities (spectator sports, movies, television, etc.) [17] According to Sedentary Behavior Research Network (SBRN) sedentary behavior is any activity involving sitting, reclining or lying down that has very low energy expenditure. And their scores range from 35-4. Each participant was interviewed with Pittsburgh Sleep Quality Index (PSQI) questionnaire and given brief information about the questions and was provided with assistance to explain some of the questions when necessary.
4 Point Likert Scale that offers with two poles linked with intermediate answer options i.e., not during the past month, less than once a week, once or twice a week and three or more time a week. The scores of these questions were dichotomized into the seven main components, with a range of 0 to 3 per each component, and a Global score was derived with maximum score of 21 and a minimum of 0 for the whole questionnaire.

STATISTICAL ANALYSIS
Statistical analysis was done using the statistical software SPSS 20.0 version for this purpose the data was entered into Microsoft Excel – 2010 spreadsheet, tabulated and subjected into statistical analysis. For all statistical analysis, $p<0.05$ was considered as statically significant. Descriptive statistical data was presented in the form of mean +/- standard deviation, and also graphical representation.
Between the groups: Independent student “t” test was performed to assess the

statistically significant difference in mean value between the groups for sleep quality.

RESULTS

The aim of the study was to find the effectiveness of Exercise on improving Sleep Quality in student population. The consort flow chart of the study showed the study organization in terms of subject screening, allocation and analysis.

A total of 93 subjects were screened for eligibility, among them 60 subjects were included in the study trail. All 60 subjects undergone baseline assessment and subjects who met the inclusion criteria were conveniently sampled by using 5 item physical activity questionnaire into two groups consisting of 20 and 40 subjects.

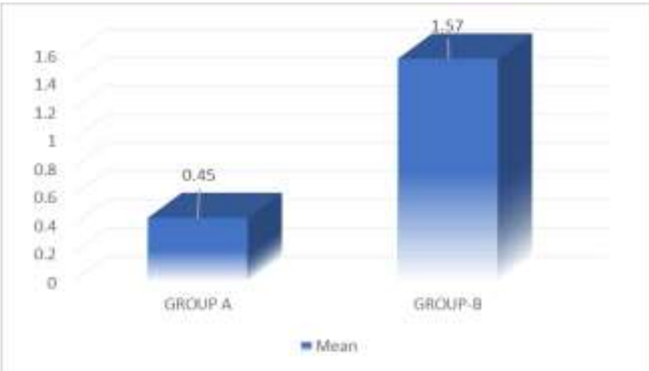
In this study, 20 subjects completed the entire study session in Group A and 40 subjects completed the entire study session in Group B.

To observe the subjective sleep quality in the groups, the analysis was carried out using statistical tests, for the outcome measures – Pittsburgh Sleep Quality Index (PSQI). Both the groups have shown difference in their global score as well as in component scores. Hence there was statistical difference in between two groups, and also there was difference between means in the groups. The differences are checked using independent student-T test.

TABLE-1: Analysis of Mean scores of PSQI Sleep Quality between the Group A&B

PSQI sleep Quality	Mean	SD	P-value	Inference
GROUP A	0.45	0.51	0.000	Highly Significant
GROUP-B	1.57	0.63		

GRAPH – 1

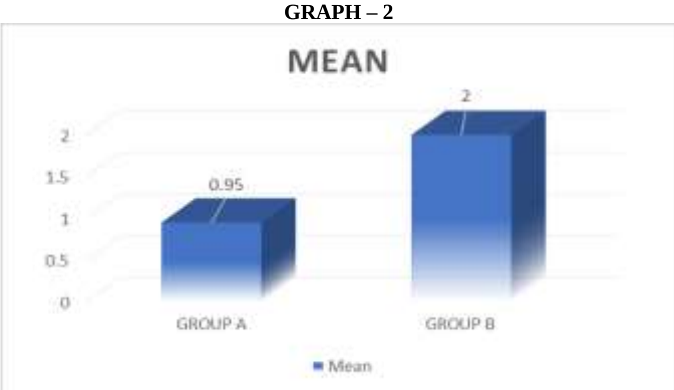


Results: The above table and graph shows that mean scores of PSQI Sleep Quality inGroup - A (0.45) and Group-B (1.57) were found to be statistically significant.

TABLE-2: Analysis of Mean scores of PSQI Sleep latency between the Group-A&B

PSQI Sleep Latency	Mean	SD	P-value	Inference
GROUP A	0.95	0.22	0.000	Highly Significant
GROUP B	2	0.39		

GRAPH – 2

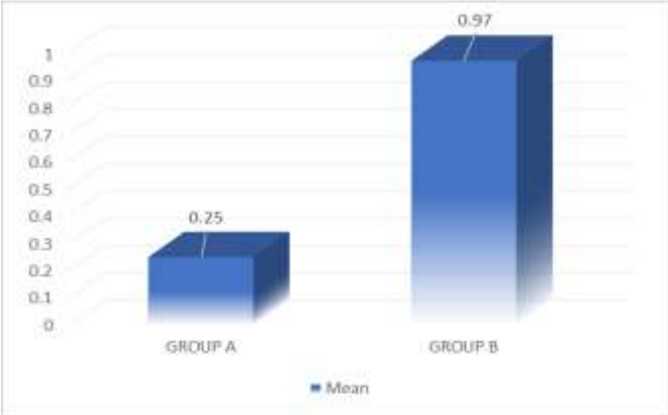


Results: The above table and graph shows that the mean scores of PSQI Sleep latencyin Group – A (0.95) and Group – B (2) were found to be statistically significant.

TABLE – 3: Analysis of Mean scores of PSQI Sleep duration between Group A&B

PSQI SleepDuration	Mean	SD	P - value	Inference
GROUP A	0.25	0.44	0.000	Highly Significant
GROUP B	0.97	0.61		

GRAPH – 3



Results: The above table and graph shows that mean scores of PSQI Sleep Duration in Group - A (0.25) and Group-B (0.97) were found to be statistically significant.

TABLE – 4: Analysis of Mean scores of PSQI Sleep efficiency between Group A&B

PSQI Sleep Efficiency	Mean	SD	P - value	Inference
GROUP A	0.15	0.37	0.000	Highly Significant
GROUP B	1.12	0.51		

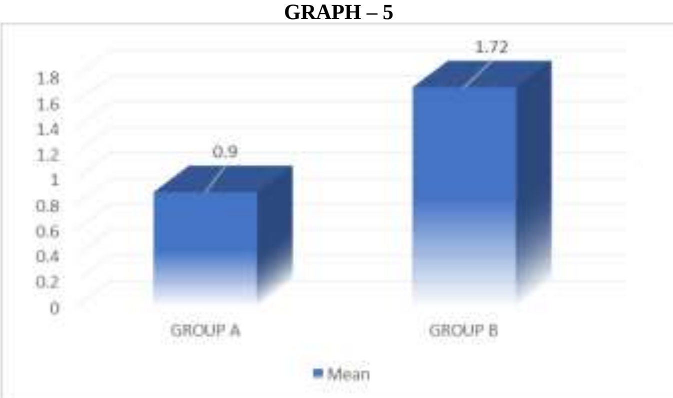
GRAPH – 4

Results: The above table and graph shows that mean scores of PSQI Sleep Efficiency in Group - A (0.15) and Group-B (1.12) were found to be statistically significant.

TABLE – 5: Analysis of Mean scores of PSQI Sleep disturbances between GroupA&B

PSQI Sleep Disturbances	Mean	SD	P - value	Inference
GROUP A	0.9	0.44	0.000	Highly Significant
GROUP B	1.72	0.45		

GRAPH – 5

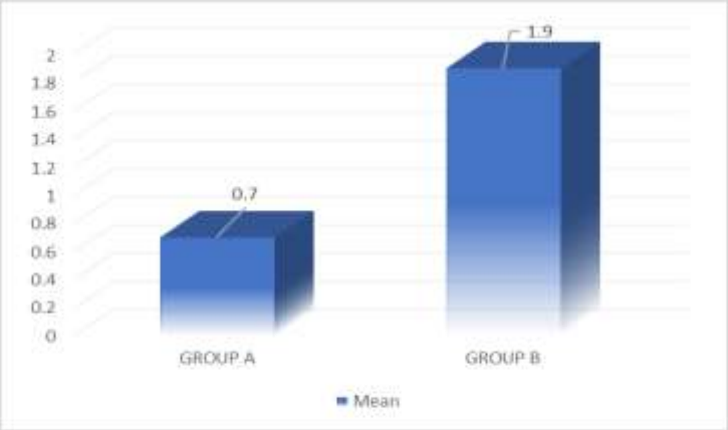


Results: The above table and graph shows that mean scores of PSQI Sleep Disturbancesin Group - A (0.9) and Group-B (1.72) were found to be statistically significant.

TABLE – 6: Analysis of Mean scores of PSQI Daytime dysfunction between GroupA&B

PSQI Daytime Dysfunction	Mean	SD	P - Value	Inference
GROUP A	0.7	0.47	0.000	Highly Significant
GROUP B	1.9	0.70		

GRAPH – 6

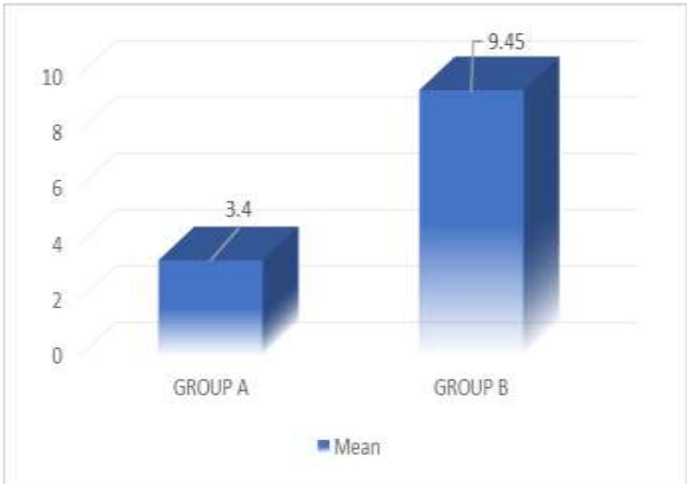


Results: The above table and graph shows that mean scores of PSQI Daytimedysfunction in Group - A (0.7) and Group-B(1.9) were found to be statistically significant.

TABLE – 7: Analysis of Mean scores of Global PSQI scores between Group A&B

GLOBAL PSQI Score	Mean	SD	P - value	Inference
GROUP A	3.4	1.39	0.000	Highly Significant
GROUP B	9.45	1.58		

GRAPH – 7

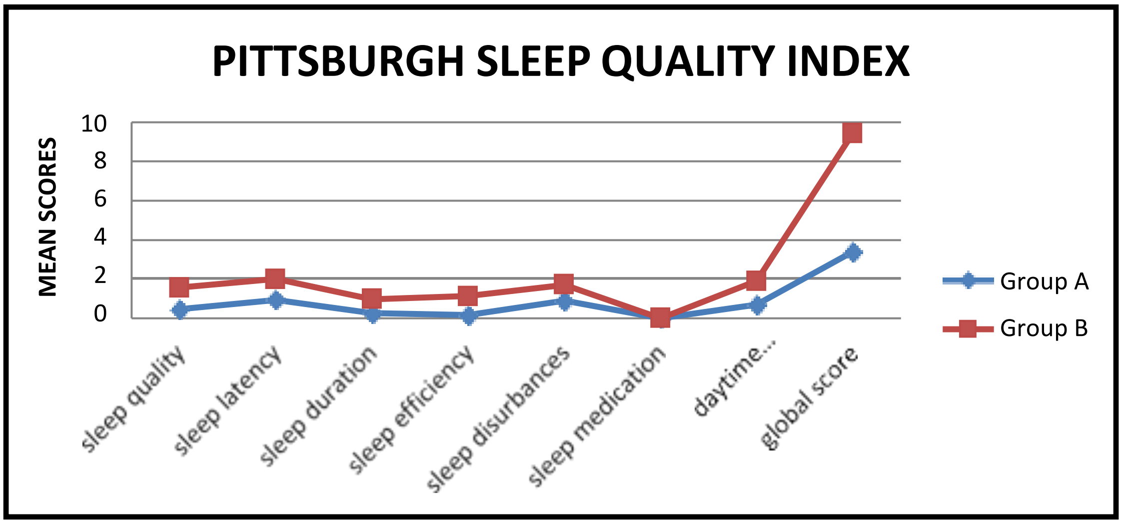


Results: The above table and graph shows that mean scores of PSQI Global scores inGroup - A (3.4) and Group-B (9.45) were found to be statistically significant.

Table 8: PITTSBURGH SLEEP QUALITY INDEX

PSQI	GROUP A MEAN (SD)	GROUP B MEAN (SD)	P VALUE
SUBJECTIVE-SLEEP QUALITY	0.45 (0.51)	1.57 (0.63)	0.000
SLEEP LATENCY	0.95 (0.22)	2 (0.39)	0.000
SLEEP DURATION	0.25 (0.44)	0.97 (0.61)	0.000
HABITUAL-SLEEP EFFICIENCY	0.15 (0.37)	1.12 (0.51)	0.000
SLEEP DISTURBANCES	0.9 (0.44)	1.72 (0.45)	0.000
SLEEP MEDICATION	0 (0)	0 (0)	0.000
DAYTIME DYSFUNCTION	0.7 (0.47)	1.9 (0.70)	0.000
GLOBAL SCORE	3.4 (1.39)	9.45 (1.58)	0.000

GRAPH – 8



Results: A global score of <5 indicates good overall sleep quality whereas a global score ≥ of 5 indicates poor sleep quality. So, group A shows good sleep quality whencompared to group B.

DISCUSSION

The present study is determined to investigate the "Effectiveness of Exercise on Improving Sleep Quality in Student Population" a Cross sectional Study. The reality is that many students are overworked. However, a lack of sleep can severely hurt grades, among other things. This ends up hurting in the long run, as being sleep-deprived. The main objective of the study is to review the impact of physical activity in improving sleepquality in student population.

I sought to investigate the association between reported physical activity and sleep quality. Group A shows statistically more significant improvement in PSQI (P<0.00001). The study showed a moderate inverse association between reported physicalactivity and PSQI, meaning that the more people report being physically active, the better their overall sleep quality. In addition, it was found that a high percentage of people who reported low physical activity also reported poor sleep quality on the PSQI. This may indicate that people with less physical activity are more likely to have overall poor sleep quality.

When it comes to sleep, quantity is important—but so is quality. Most adults need somewhere between seven and nine hours a night to wake up feeling well-rested, but a lot depends on exactly what happens during those hours. The quality of your sleep ensures that you get the essential physical, mental, and emotional benefits you need from your slumber.[22]

Sleep quality is the measurement of how well you're sleeping—in other words, whether your sleep is restful and restorative. It differs from sleep satisfaction, which refers to a more subjective judgment of how you feel about the sleep you are getting. Sleep quality is more complicated to measure than sleep quantity, but it's not entirely subjective. Guidelines give an overview of sleep quality goals, and they include some individual and age differences. Four items are generally assessed to measure sleep quality: they are Sleep latency, Sleep waking, Wakefulness and Sleep efficiency. [23,24]

Moderate physical activities were more popular in scientific research as physiotherapy method to improve sleep quality. It is a good idea to discuss the effects of physical intensity and duration on sleep quality. According to some cross-sectional study showed that neither intensity, nor duration of Physical Activity was associated with sleep quality or quantity.[25] It was highly suggested that regular moderate-intensity exercise programme improves self-rated sleep quality in young adults with moderate sleep complaints.[26]

Regular exercise represents an interesting non-pharmacological treatment for poor sleepers.[27] In Kubitz's meta-analysis, regular exercise (called chronic) was commonly found to be associated with increased SWS, total sleep time (TST) and decreased REM sleep, SOL and WASO in good sleepers [28]

Many studies have reported a clear link between sleep and body temperature. [29,30] Indeed, sleep could be promoted by a decrease in body temperature (0.5 – 1C) [31] whereasan increase in body temperature (1.5 - 2.5 C) alters sleep onset. [32,33] This decrease at the level of the brain, in particular the pre-optic area, seems to trigger sleep.[34] So since exercise affects body temperature both during the exercise and recovery, it has been suggested than exercise could influence sleep.

In addition to physiological changes, it is well known that exercise also improves mood state, [35,36,37] which can also be an important additional factor in improving sleep. Moreover, sleep disorders are associated with an increased risk of anxiety and the development of depression [38]. Physical training is significantly associated with a decrease in anxiety and its physiological indicators and can reduce the prevalence of depression and improve the mental health of large populations [39]. Moreover, regular exercise decreases REM sleep which has a significant anti-depressant effect over time.[40] The anti-depressant effects of exercise have recently been well studied, and the improved mood results from elevated levels of brain-derived neurotrophic factor (BDNF) which is directly attributable to exercise and so indirectly, to improved sleep quality.[41,35,36,39] Such pathway relationships between the acute and chronic effects of exercise and alterations in sleep should be examined in future studies.

If we talk about the thermoregulatory process, during an individual performing exercise or gets indulge in an intense physical training, there occurs vasodilatation leading to increase in blood flow to the skin and rise in body temperature that promotes sleep. The Anterior hypothalamus plays an important role in regulating the body temperature (heat loss) and promoting sleep before bedtime. When there is an increase in body temperature post-exercise, there will be an increase in sweating along with decrease in metabolic rate and body temperature during sleep. On considering thermoregulatory hypothesis, exercise has to be intense enough to increase the body temperature, to enhance increase in sleep; low-level intensity exercise would not provide benefit to sleep. Apart from active exercises, findings also prove that passive methods such as sauna bath or hot tub would also promote SWS. Therefore; evidences suggest that there is clear connection among temperature regulation and increase in sleep.[42]

Time of exercise is the most important parameter here that could have an acute effect on sleep. There are common questions that usually arise among individuals regarding the perfect time for performing the exercise. Individuals believe that performing exercise before going to sleep can have a negative impact on their sleep. Though, on observing the findings from research has proved doing exercises 2 hours before going to sleep can actually improve the quality of sleep among individuals or have no effect for others. Another, recent evidence shows that performing 1 hour session of exercise at 60% VO2 max or 3 hours session of exercise at 70% VO2 max by aerobically fit individuals 30 minutes prior going to sleep did not affect the sleep quality.[42]

It is necessary to know the duration of exercise before commencing with any exercise protocol. When talking about the effect of exercise on sleep, it is required to know whether performing exercises for how long may perhaps bring a reliable effect among individuals. A meta-analytical study shows that exercise increases SWS, reduces

REM sleep and delay REM latency in already fit individuals. We are able to see the effects of actual increase in sleep changes when the individuals perform exercise longer than 1 hour a day. However, further research is required to know, if performing exercise for longer period will bring an improvement in sleep quality in individuals.[42]

Physical exercise is a modality of non-pharmacological treatment for sleep disorders. Contradicting results are still found in studies of the effect of exercise on sleep. Among the substances that have been described as sleep modulators, cytokines produced during the recovery period after an acute exercise session are very important. Various studies have verified that physical exercise may alter the plasma concentration of the many pro- inflammatory cytokines that may in turn modulate sleep. A number of factors seem to mediate this effect of exercise, including duration, intensity, and form of exercise, in addition to temperature and metabolic alterations.[43]

Study findings indicating that more people report being physically active, the better their overall sleep quality. In addition, it was found that a high percentage of people who reported low physical activity also reported poor sleep quality on the PSQI. This may indicate that people with less physical activity are more likely to have overall poor sleep quality. Thus, this study concludes that physical activity has a significant effect in improving sleep quality in healthy individuals among student population.

Limitations of the Study

Although all of the studies were strictly selected by the inclusion criteria, limitations exist.

The classification of physical activity levels is poorly defined and not specify explained in scientific research. We classified the term ‘physically active’ and ‘physically inactive’ by figuring out the 5-item physical activity questionnaire.

Obesity was indicated as moderate factor between PA and sleep quality. In this review, bodyweight of the participants was not taken into consideration.

Recommendations Of Further Research

The mechanisms through which exercise promotes alterations in sleep architecture remain to be clarified.

Researchers speculate that many hormones and substances produced bymetabolism may affect sleep. This requires further research.

The effects of exercise and cytokines on sleep, and the relation between these two sleep-regulating components, raising the hypothesis that the alterations in sleep promoted by exercise are mediated by cytokines, which, by increasing the non-rapid eye movement (nREM) sleep phase, would stimulate the regenerating characteristics of sleep. This requires further research.

CONCLUSION

The present study concludes that physical activity shown statistical significance in improving sleep quality. For global and component scores on the PSQI, higher scores indicate more severe complaints. Mean PSQI global scores were higher for Sedentary subjects than physically active subjects ($p = 0.000$), indicating more subjective sleep problems in the sedentary lifestyle. The study showed a moderate inverse association between reported physical activity and PSQI, meaning that the more people report being physically active, the better their overall sleep quality. In addition, it was found that a high percentage of people who reported low physical activity also reported poor sleep quality on the PSQI. This may indicate that people with less physical activity are more likely to have overall poor sleep quality. Thus, this study concludes that physical activity has a significant effect in improving sleep quality in healthy individuals and Regular exercise represents an interesting non-pharmacological treatment for poor sleepers.

Declaration by Authors
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