

# Effect of Circuit Training vs Aerobic Exercises on Sleep and Cognition in Young Adults with Poor Sleep Quality

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**Abstract:** *Background:* Poor sleep quality is increasingly common among young adults and is associated with impaired cognition and delayed reaction time. Exercise is known to improve sleep and mental performance, but the comparative effects of circuit training and aerobic exercise are not well established. *Aim:* To compare the effects of circuit training and aerobic exercise on sleep quality and cognition in young adults with poor sleep quality.

*Method:* A total of 42 young adults aged 20–30 years were randomly divided into two groups: Group A: Circuit Training (n = 21) Group B: Aerobic Exercise (n = 21)

Both interventions were performed three times per week for 3 weeks. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Cognition and reaction time were assessed using the Stroop Colour and Word Test (SCWT) and Ruler Drop Test (RDT). Pre- and post-test scores were analysed using paired and independent t-tests.

*Results:* Both groups showed significant improvements in sleep quality and reaction time ( $p < 0.001$ ). Circuit training demonstrated significantly greater improvement in PSQI ( $p < 0.003$ ) and RDT ( $p < 0.010$ ) compared to aerobic exercise. Although both groups improved in Stroop performance, between-group differences were not statistically significant ( $p > 0.05$ ).

*Conclusion:* Circuit training is more effective than aerobic exercise in improving sleep quality and reaction time among young adults with poor sleep quality. Both interventions benefit cognitive performance, but circuit training offers a superior overall effect.

**Key Words:** Circuit Training Aerobic exercise, Poor sleep quality, cognition.

## 1. INTRODUCTION:

It has been widely acknowledged that sleep is an important component for people health and wellness across the whole life. It is Biological necessity and insufficient Sleep and untreated sleep disorders affect the health and wellbeing of the person. Healthy brain and systemic process include metabolism, hunger regulations, immunity, hormone balance, and the cardiovascular system depend on the biological process of sleep(1) Poor sleep quality refers to difficulty falling asleep, staying asleep, or experiencing restful and restorative sleep. It can manifest as frequent waking during the night, restless sleep, or feeling tired even after a full night's rest. Sleep quality is caused by various factors such as stress, unhealthy lifestyle, environmental disturbances, medical conditions, or unhealthy sleep habits. Prolonged periods of poor sleep can negatively impact mental and physical health, leading to issues like fatigue, impaired cognition, mood swings, weakened immune function, and a higher risk of chronic conditions such as heart disease or diabetes. There is study done on factor affecting sleep Quality in young adults. According to these study, factors affecting the quality of sleep in young adults included Sleep mood (a sub category of night eating syndrome), the Effects of pain over the last four weeks, and social networks(2) . Night-eating syndrome is worsened by emotional factors such as stress, In addition, physical problems such as pain and reduced health status in young adults directly affect the quality of sleep. Finally, young adults value social Networks and are forming social networks through direct relationships and indirect relationship by social network services or smartphone. Exercises is proposed as an alternative non-pharmacological treatment of insomnia, characterized by safe, Inexpensive and easily means to

improve sleep(3) . Sleep quality can be measured with objective like Polysomnography (PSG), Subjective instrument like sleep diary and Pittsburgh Sleep Quality Index (PSQI). Of those, the PSQI is the most widely used measure of global sleep quality which cover subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction and use of (4) .

According to the cut-off Pittsburgh Sleep Quality Index (PSQI) score $>5$ , a German man community study indicated that the prevalence of poor sleep quality among people aged 18-80 year was 36%(5) Sleep Quality affect number of psychological function, including cognition function.(7) Cognition change is natural changes that occur with a ageing. According to previous study poor sleep quality can cause decline in cognition. Poor sleep quality can affect Concentration, reduce alertness. Good sleep quality is important not only for physical health but also for mental health and cognition status.

Circuit training is a form of conditioning combining resistance training and high intensity aerobics. It is designed to be easy to follow and target strength training as well as muscle endurance.(6) . An exercise “circuit” Training comprises of 6-10 strength exercise that are completed one after another. Each exercise is performed for a specified number of repetition Or for set time before moving on to next exercise. Total number to circuits performed during a training session may vary from two to six depending on your training level. Traditionally, Resistance training is often perform separately from aerobic exercises. Typically on two or three consecutive days each week. Circuit training is effective and convenient, it combined different types of exercise to perform together through a circuit. It combine of both Resistance and Aerobic exercises into a single exercise bout. It’s advantage is take less time to yield a better fitness results. According to American Academy of sleep medicine (AASM) exercise may be non pharmacological intervention for better sleep. (8) Moreover studies have shown that physical activity has the biggest effect on working memory, spatial memory and executive attention. In large survey up to 80% spontaneously report exercise as a factor in promoting sleep. However, the experimental evidence for a positive effect on sleep is sparse and conflicting(9)

## **2. LITERATURE REVIEW:**

I. Wirat Sonchan et al.(2017): The Effects of a Circuit Training Program on Muscle Strength, Agility, Anaerobic Performance and Cardiovascular Endurance: The study involved 24 freshmen male students of the Faculty of Sport Science, Burapha University. They sample study were randomly divided into two groups: Circuit Training group (CT; n=12) and a Control group (C; n=12). The circuit training program included one circuit of eight stations of 30/60 seconds of work/rest interval with two cycles in Week 1-4, and 60/90 seconds of work/rest interval with three cycles in Week 5-8, performed three times per cycle. The results of this study suggest that the circuit training program improved muscle strength, agility, anaerobic capacity and cardiovascular endurance of the study subjects.

II. Mohit kumar et al. (2024) : Effect of Circuit training on sleep and cognition in Collegiates with poor Sleep Quality : These study was conducted among 30 subjects having poor sleep quality, who was randomly allocated to either a circuit training group or a control group i.e., a treadmill running group. These interventions is given for 3 weeks, with 3 session of 30 min per week. Each subject is assessed for poor sleep and cognition at the beginning and end of the 3<sup>rd</sup> week. 3 week of circuit training showed significant improvement in sleep and also in working memory and attention

III. Juan J madrid et al. (2016) : Age and gender effects on the prevalence of poor sleep quality in the adult population: 2,144 subjects aged between 43 and 71 years belonging to the Murcia (Spain) Twin registered. Sleep quality was measured by self-report through the Pittsburgh Sleep Quality Index (PSQI). Univariate logistic regression analyses showed that women were almost twice as likely as men to have poor quality of sleep. Age was directly and significantly associated with a low quality of sleep. He prevalence of poor sleep quality is high among adults, especially women. There is a direct relationship between age and deterioration in the quality of sleep. This relationship also appear to be more consistent in women.

IV. Yi Xie et al. (2021) : Effect of exercise on sleep quality and insomnia in adults: The study was conducted a meta analysis to assess the effect of different regular exercise on self report and physiological sleep quality in adults. Varied exercise intervention contained tradition physical exercise (eg., walking, cycling) and mind body exercise characterized by gentle exercise with

V. Coordination of the body (eg., yoga) Self reported outcome includes varied ratings scales of PSQI. Twenty-two randomized controlled trials were included in the analysis. The Overall analysis on subjective outcomes suggests that exercise interventions significantly Improved sleep quality in adults compared with control interventions with lower PSQI. Results of this systemic review suggest that regular physical as well as mind body exercise primarily improved subjective sleep quality rather than physiological sleep quality in adults

VI. Brett Klika et al. : High Intensity Circuit Training Using Body Weight: To understand the health benefits and practical applications of a high intensity circuit training protocol. To address limitations of traditional exercise protocol and provide an effective and efficient program for clients, one of the exercise strategy used is high intensity circuit training (HCIT) using body weight as resistance. These approach combine aerobic and resistance training into single exercise bout lasting approximately 7 minutes can repeat the 7 minutes bout 2 to 3 time, depending on the amount of time they have.

VII. Hye Jin Joo et al. : Association Between Quality and duration of sleep and subjective cognitive decline: a cross-sectional study in South Korea: aim to investigate the association between the quality and duration of sleep and cognitive decline in Korean population. The study population comprised 206,719 individual aged 19 year and over. We used multiple logistic regression for the analysis. Individual of both sexes with poor sleep quality were more likely to experience subjective cognitive decline compare with reference group. U shape association were found between sleep duration and subjective cognitive decline

VIII. Nalin Singh et al. : A Randomized Control Trail of the Effect of Exercise on Sleep: We tested the hypothesis that exercise would improve subjective sleep quality and activity in depressed elders. A 10 week randomized control trail was utilized. A total of 32 subjects aged 60-84 year with the mean age of 71.3 year was used. Intervention consisted of A supervised weight training program three time a week or attention control group. Result show that exercise significantly improve all subjective sleep quality and depression measure. In conclusion, weight lifting exercise was effective in improving subjective sleep quality, depression, strength, and quality of life with significantly changing habitual activities

### **3. OBJECTIVES :**

- To evaluate effectiveness of the circuit training in poor sleep quality and cognition in young adults
- To evaluate of effectiveness of aerobic exercise in poor sleep quality and cognition in young adults
- To compare effectiveness of circuit training vs aerobic exercise on poor sleep quality and cognition in young adults

### **4. AIMS :**

- To Investigate the effect of Circuit Training vs Aerobic exercise on Sleep and cognition in young adults with Poor Sleep Quality

### **5. RESEARCH METHOD :**

- Study design : Experimental Study
- Study setting- Chh. Sambhajinagar city
- Study Duration : 6Months
- Sampling Method : Random Sampling Method
- Sample Size : 42 Participants (n-21 in each group)

For calculation of sample size for present study, G. Power software is used. Alpha = $\alpha$ =0.05, Power =0.80, Large effect size will be consider = 0.80. Using G\*Power software sample size each group will be found to be 21 samples.

### **6. INCLUSION CRITERIA**

- Both male and female are included
- Person Between the age group of 20- 32 are included
- BMI <29 kg/m<sup>2</sup>
- Subject who are categories under poor sleep quality i.e PSQI score >5

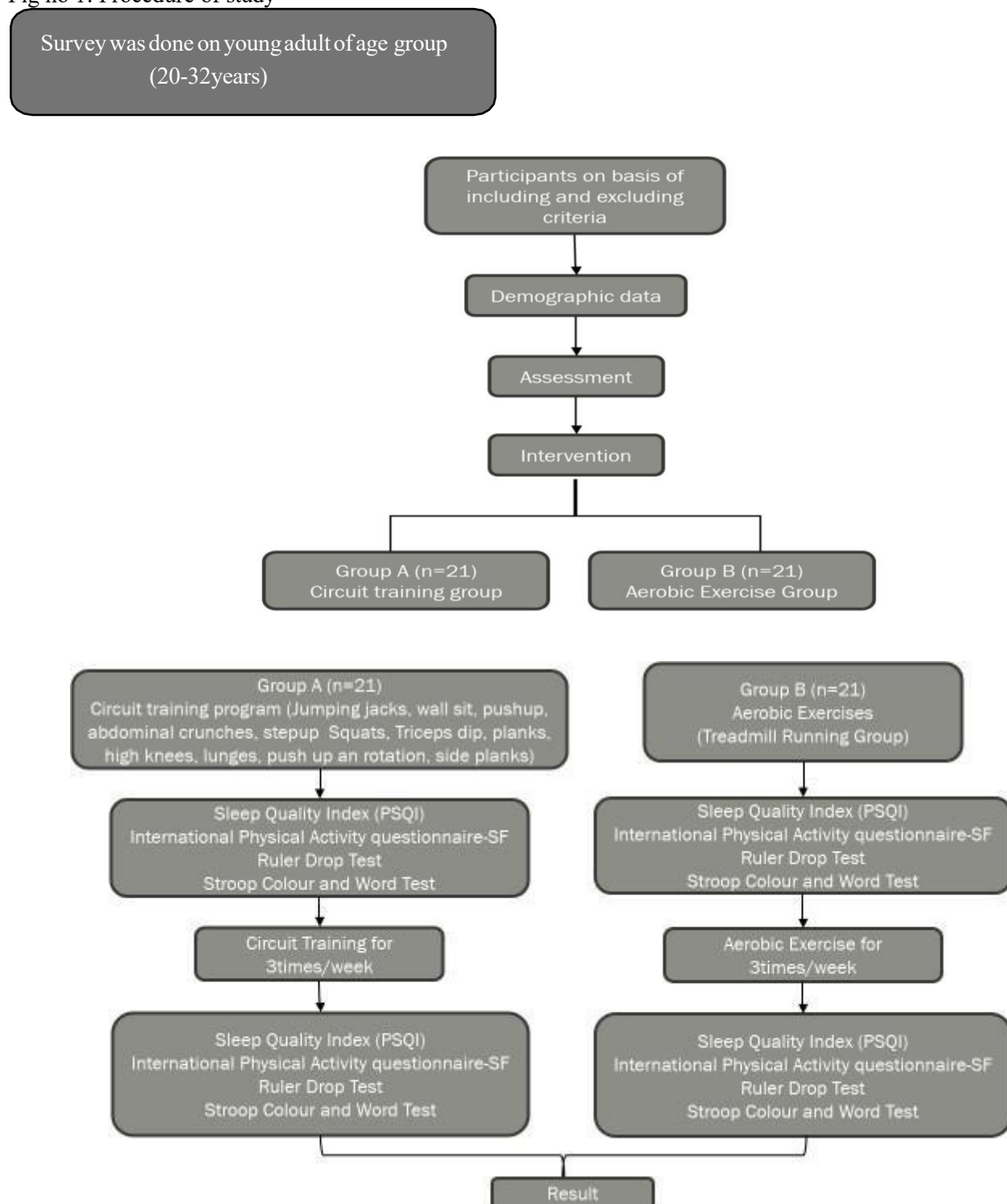
### **7. EXCLUSION CRITERIA**

- BMI >29 kg/m<sup>2</sup>
- Smoker or Any other Addictions
- Use of acupuncture Or other complementary medicine over the last 6 months
- Presence of physical and mental illness
- Surgical history -in last 6 months
- Absent for 5 consecutive days

## 8. MATERIALS

- Pen
- Data collection sheet
- Pittsburgh Sleep Quality Index (PSQI)
- International Physical Activity Questionnaire – Short form
- Treadmill
- 30cm Ruler
- Stroop Colour and Word chart
- Pulse Oximeter

Fig no 1: Procedure of study



## 9. PROCEDURE

A Survey was done on Young Adult population by PSQI Question created on google form and then circulate between people of different occupation and different age between (20-32) age. Total 57 people had participated in survey out of which 27 people have PSQI score  $>5$  i.e. 46.5%. Those categories under poor sleep quality

All the subjects in the study underwent a basic assessment for sleep and cognition i.e., PSQI, Simon game, Stroop test, and Reaction time, and then they were assigned into one of two groups:

Group A-Experimental Group (n=21) i.e., Circuit Training. In Circuit-training which consisted of 12 key Aerobic and Resistance Exercise of all major muscle group in rapid succession with 10 sec of rest between exercise. These interspersed into same session was given for 3 consecutive weeks and 3 times per week. Exercise are perform for 30 sec, with 10 seconds of transition time between bouts. Total time for entire circuit workout is approximately 7 minutes. The circuit can be repeated 2-3 times.

Sequence of each session include in these i.e., Jumping jacks, Wall sits, Push up, Abdominal crunch, step up on chair, Squats, Triceps dips on chair, planks, High knees/running in place, Lunges, Pushups and rotation, side plank

Group B- Aerobic Exercising Group (n=21): In Aerobic exercise group the participants were asked to do Running on treadmill for 30 min (3 times a week) on alternate day for 3 consecutive weeks. Intensity of Running is kept between 70-80% of HRmax It is measured by Pulse oximeter

After completion of 3 weeks of Running, the next day participants were analysed for sleep quality and cognition test and there values are noted

## 10: OUTCOME MEASURE :

- Pittsburgh sleep quality Index (PSQI)
- International Physical Activity Questionnaire-Short Form (IPAQ-SF)
- Ruler Drop Test
- Stroop Colour and Word Test

## 11. FINDINGS :

Within-Group Comparison

Group A : Circuit Training

Group

Participants in Group A (n = 21) had a mean age of 25.62 years (SD = 2.32) and Mean BMI of 22.43 kg/m<sup>2</sup> (SD=2.32) According to Physical activity Questioner-SF, Physical activity status of Participants is 5 participant categories under minimally active and 16 Participants into Inactive Category

| Table1: Variables           | N  |           | Mean     | Std. Dev | Tests                 | p-value |
|-----------------------------|----|-----------|----------|----------|-----------------------|---------|
| PSQI                        | 21 | pre_PSQI  | 8.38     | 1.532    | Paired Samples t-test | <0.001  |
|                             | 21 | post_PSQI | 6.43     | 1.964    |                       |         |
| Ruler Drop test             | 21 | pre_RDT   | 18.9219  | 2.82497  | Paired Samples t-test | <0.001  |
|                             | 21 | post_RDT  | 16.1105  | 2.64988  |                       |         |
| Stroop colour and word test | 21 | pre_SCWT  | 101.8724 | 17.61134 | Paired Samples t-test | <0.001  |
|                             | 21 | post_SCWT | 90.5495  | 14.75507 |                       |         |

Table 1. Presents the results of within-group comparisons for Group A, which received Circuit training Exercise

The paired samples t-test was used to compare pre- and post-intervention scores for three variables: PSQI, Ruler Drop Test, and Stroop Colour and Word Test.

PSQI (Pittsburgh Sleep Quality Index): The mean PSQI score decreased significantly from  $8.38 \pm 1.53$  to  $6.43 \pm 1.96$  ( $p < 0.0001$ ), indicating a significant improvement in sleep quality after the intervention.

Ruler Drop Test (RDT): The mean reaction time reduced from  $18.92 \pm 2.82$  cm to  $16.11 \pm 2.65$  cm ( $p < 0.0001$ ). This suggests a statistically significant enhancement in reaction speed and reflex performance following the intervention.

Stroop Colour and Word Test (SCWT): The mean completion time decreased from  $101.87 \pm 17.61$  s to  $90.55 \pm 14.76$  s ( $p < 0.0001$ ), reflecting a significant improvement in cognitive processing speed and attention control post-intervention.

Overall, the results indicate statistically significant improvements in sleep quality, reaction time, and cognitive performance following the intervention, with all p-values less than 0.001

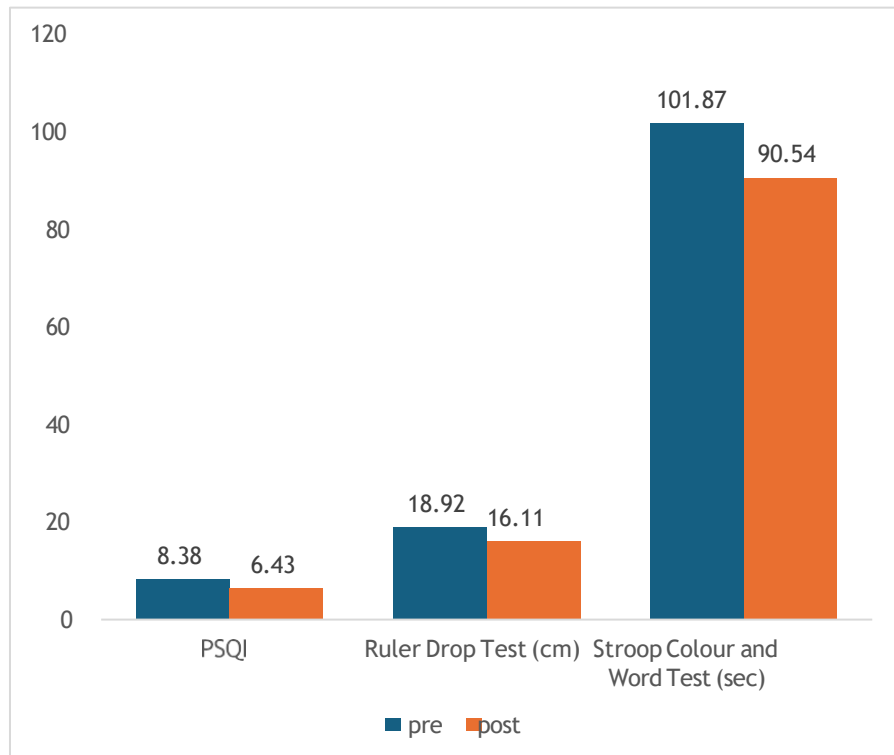


Fig no 1: Group A: Circuit Training Group

#### Group B : Aerobic Exercise

Participants in Group B (n = 21) had a mean age of 25.05 years (SD = 3.14) and mean BMI of 23.36 kg/m<sup>2</sup> (SD= 2.94) According to Physical activity Questioner-SF, Physical activity status of Participants is 8 participant categories under minimally active and 13 Participants into Inactive Category

| Table2: Variables                | N  |           | Mean     | Std. Dev | Tests                 | p-value |
|----------------------------------|----|-----------|----------|----------|-----------------------|---------|
| PSQI                             | 21 | pre_PSQI  | 8.19     | 1.778    | Paired Samples t-test | <0.001  |
|                                  | 21 | post_PSQI | 7.00     | 1.612    |                       |         |
| Ruler Drop Test(cm)              | 21 | pre_RDT   | 20.4281  | 2.99521  | Paired Samples t-test | <0.001  |
|                                  | 21 | post_RDT  | 18.8129  | 2.68556  |                       |         |
| Stroop Color and Word test (sec) | 21 | pre_SCWT  | 100.6257 | 24.1331  | Paired Samples t-test | 0.243   |
|                                  | 21 | post_SCWT | 94.6362  | 11.9862  |                       |         |

Table 2. Presents the results of within-group comparisons for Group B, which received Aerobic Exercises.

The paired samples t-test was conducted to compare pre- and post-intervention scores for three parameters: PSQI, Ruler Drop Test, and Stroop Colour and Word Test.

PSQI (Pittsburgh Sleep Quality Index): The mean PSQI score decreased from  $8.19 \pm 1.78$  to  $7.00 \pm 1.61$ , and this reduction was statistically significant ( $p < 0.001$ ), the result suggests a significant improvement in sleep quality after the intervention.

Ruler Drop Test (Reaction Time): The mean ruler drop distance decreased from  $20.43 \pm 2.99$  cm to  $18.81 \pm 2.69$  cm, which was statistically significant ( $p < 0.001$ ). A smaller distance indicates faster reaction time, implying enhanced reflexes and neuromuscular coordination after the intervention.

Stroop Colour and Word Test (Cognitive Performance): The mean completion time decreased from  $100.63 \pm 24.13$  s to  $94.64 \pm 11.99$  s, but this difference was not statistically significant ( $p = 0.243$ ). Although the mean

time improved slightly, the lack of significance suggests that the intervention did not produce a measurable effect on cognitive processing speed or attention control.

Overall, The results indicate that the intervention led to significant improvements in sleep quality and reaction time, while cognitive performance (Stroop test) remained largely unchanged.

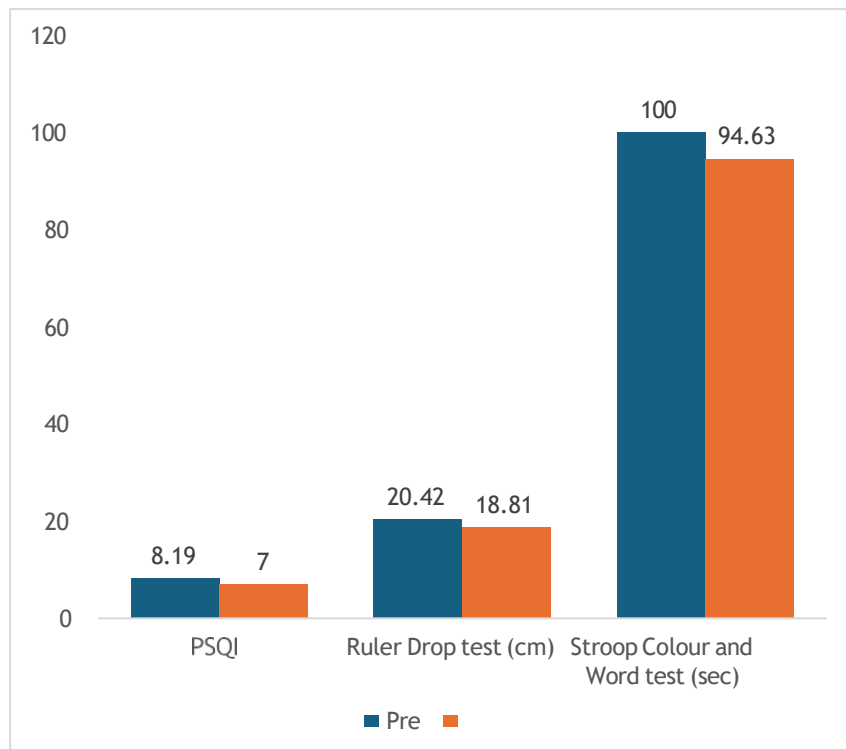


Fig no 2: Group B: Aerobic Exercises Group

#### Between-Group Comparisons

| Table 3: Variables                 | Group | N  | Mean    | Std. Dev | Tests          | p-value | Significance    |
|------------------------------------|-------|----|---------|----------|----------------|---------|-----------------|
| Change_PSQI                        | A     | 21 | 1.95    | 1.024    | Independent    | <0.003  | Significant     |
|                                    | B     | 21 | 1.19    | 0.402    | Samples t-test |         |                 |
| Change_Ruler Drop Test             | A     | 21 | 2.8114  | 1.1538   | Independent    | <0.010  | Significant     |
|                                    | B     | 21 | 1.6152  | 1.668    | Samples t-test |         |                 |
| Change_Stroop Colour and Word test | A     | 21 | 11.3228 | 6.2424   | Independent    | 0.308   | Non-Significant |
|                                    | B     | 21 | 5.9895  | 22.8079  | Samples t-test |         |                 |

Table 3 presents the between-group comparison results for changes in various measures between Group A (Circuit training Exercises) and Group B (Aerobic Exercise).

The independent samples t-test was used to compare the mean changes in performance variables between Group A and Group B following their respective interventions.

**Change in PSQI (Sleep Quality) :** Group A showed a greater mean improvement in PSQI ( $1.95 \pm 1.02$ ) compared to Group B ( $1.19 \pm 0.40$ ). The difference between groups was statistically significant ( $p < 0.003$ ). Since lower PSQI indicates better sleep, Group A experienced a more pronounced improvement in sleep quality than Group B. This suggests that the intervention used in Group A was more effective in enhancing sleep quality.

**Change in Ruler Drop Test (Reaction Time) :** Group A demonstrated a larger mean improvement ( $2.81 \pm 1.15$  cm) compared to Group B ( $1.62 \pm 1.67$  cm). The between-group difference was significant ( $p < 0.010^*$ ), indicating that Group A improved more in reaction speed and reflexes than Group B. This points toward a greater enhancement of alertness or neuromuscular coordination in Group A.

Change in Stroop Colour and Word Test (Cognitive Performance) : Group A showed a higher mean improvement ( $11.32 \pm 6.24$  s) than Group B ( $5.99 \pm 22.81$  s), but the difference was not statistically significant ( $p = 0.308^*$ ).

Although Group A appeared to perform better, the variability within groups was large, and the difference could be due to chance. Therefore, no meaningful difference in cognitive improvement was observed between the two groups.

Overall Interpretation : me Significant differences were found between Group A and Group B in terms of sleep quality (PSQI) and reaction time (Ruler Drop Test), favouring Group A. No significant difference was observed in cognitive performance (Stroop test). These findings indicate that the intervention given to Group A was more effective in improving physiological outcomes (sleep and reflexes) compared to the intervention in Group B, though both groups showed similar cognitive outcomes.

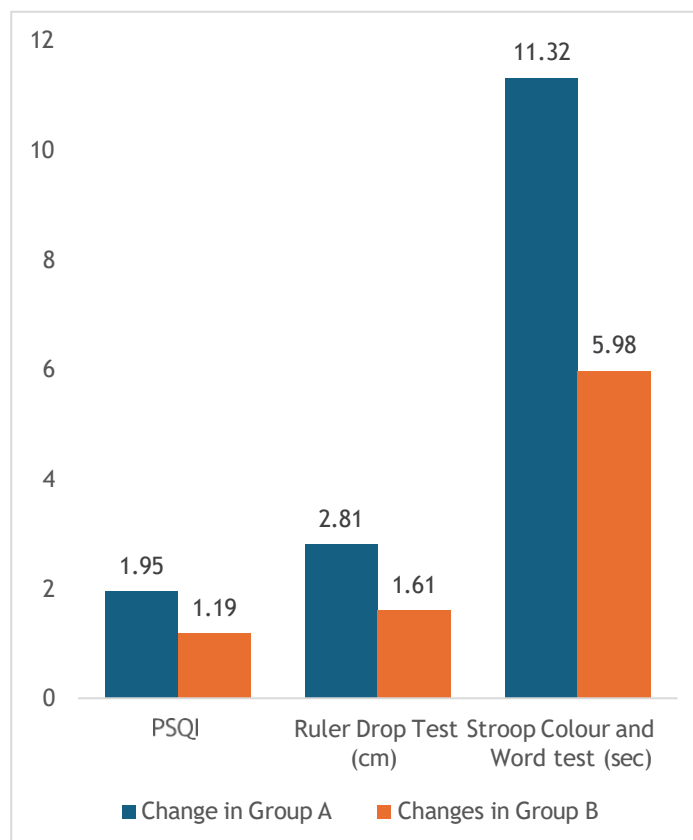


Fig no 3 : Comparison Between Both Group

## 12. DISCUSSION

The present study aimed to evaluate and compare the effects of Circuit Training and Aerobic Exercise on sleep quality and cognition in young adults with poor sleep quality. Total sample size of 42 people of working population is randomly divided in two Group(n=21) 1. Group A(Circuit Training) and Group B(Aerobic Exercise). Intervention duration was 3 week 3times/week Total of 9 sessions. The outcome measures used were the Pittsburgh Sleep Quality Index (PSQI), Ruler Drop Test (RDT), and Stroop Colour and Word Test (SCWT). The results demonstrated significant improvements within both groups for PSQI and RDT, whereas cognitive improvement (SCWT) was significant only in the circuit-training group. Between-group analysis showed that circuit training was superior to aerobic exercise in improving sleep quality and reaction time but not cognition.

International Physical Activity Questioner (IPAQ) is used to measure the physical activity of the participating candidate Which got increased after given protocol due to 3 week of constant training for 3 days/week

Both circuit training and aerobic exercise significantly improved sleep quality in young adults with poor sleep quality. This supports a large body of literature indicating that physical activity enhances sleep efficiency, reduces sleep disturbances, and improves overall sleep quality.

These findings are also seen in Thiago et al. (2017)(16), who reported that combined aerobic and resistance training significantly improved PSQI scores in elderly women. They had sample consisted of 8 sedentary elderly individuals and there protocol consist of aerobic and resistance exercises combined for 3 day per week for 8 weeks.

Similarly, the article by Chen et al.2020.(17) demonstrated significant improvements in sleep efficiency, sleep disturbances, and overall PSQI scores in middle-aged adults. The 24 middle age adults were participants in the multi-component exercise group attend 90 min session per week for 8 weeks. PSQI score were significantly reduce in MCE Group

Circuit training involves alternating resistance and aerobic bouts within the same session. This may contribute to Higher energy expenditure, Improved metabolic regulation, Lower sympathetic arousal, Reduced anxiety symptoms, All of which promote deeper and more restorative sleep.

Comparatively, aerobic exercise alone also improved sleep quality also seen in Maryam et al. (2020)(11) After four and 8 weeks of aerobic exercise, comparing with control group with no physical exercise. Physical activity may improve sleep quality through a variety of mechanisms, Exercise-induced anxiety reduction may be the most possible mechanism by decrease cortisol(18). Another function of sleep could be self-regulation. As a normal biological process, body temperature drops during sleep. The body uses the same mechanisms after exercises to lower body temperature by dilating blood vessels and increasing blood flow to the body's peripheral areas because physical activity raises body temperature (19). Thus, this process serves as a trigger for the onset of sleep.

However, the greater improvement in Group A suggests that multicomponent training provides an additive effect on sleep quality.

Reaction time improved significantly in both groups, with greater improvement observed in the circuit-training group. This finding is in agreement with Dr. D. Abraham Samson (2025)(20), where circuit training significantly improved reaction time and agility in athletes. The neuromuscular demands of rapid, alternating movements in circuit training may enhance Central nervous system activation, Motor responsiveness, Sensorimotor integration

While aerobic exercise is also known to improve reaction speed the more dynamic, high-intensity, and involvement of both muscular strengthening and aerobic exercises circuit exercises may explain the superior improvement seen in Group A.

Cognitive performance improved significantly in the circuit-training group but not in the aerobic group. However, between-group comparisons did not reach statistical significance owing to high variability in Group B.

The significant improvement in Group A aligns with the findings of Hiroki Yanagisawa et al. (2010)(21), who showed that even a single bout of moderate cycling increased dorsolateral prefrontal cortex activation and enhanced Stroop performance.

Similarly, the study of S. Martinsen et al (2018)(22), found that long-term physical exercise improved prefrontal activation and cognitive processing.

Possible mechanism for increase cognition is explained in article of Supriya Komalsingh Patil et al(2017)(22). Acute aerobic exercise improves cognition by increasing arousal levels, which enhances alertness and response speed by increasing neurotransmitters like dopamine, norepinephrine and Serotonin. It boosts cerebral blood flow, supplying the brain with more oxygen and nutrients for better processing. Exercise also increases BDNF levels, supporting neural activity and learning. Additionally, it

Enhances attention leading to faster and more accurate reactions. These combined mechanisms result in improved reaction time and cognitive performance.

The lack of significant cognitive improvement in the aerobic group due to following scenarios

- Individual variability in cognitive performance
- Small Sample Size
- Shorter intervention duration (3 weeks) of the study

- Intensity may not be high enough to stimulate cognitive adaptation
- 

Superiority of circuit training to improve cognition can also be seen in study done by Changjiang Qiu (2025)(23) in these different exercise mode is compared for cognition improvement in mild cognition impaired older adults. Result shown that Combination training is superior then resistance training or aerobic exercises alone. According to these study Combined training more significant increases blood flow in the prefrontal lobe, hippocampus, and cerebellum and activate other mechanism more effectively.

Overall, circuit training which has combination of both resistance and aerobic exercises appears more effective in Sleep Quality and cognition compare to Aerobic exercise alone.

### **13. CONCLUSION :**

The present study compared the effects of circuit training and aerobic exercise on sleep quality and cognition in young adults with poor sleep quality. Both interventions resulted in significant improvements in sleep quality and reaction time, indicating that regular physical activity acts as a beneficial non-pharmacological approach for sleep quality cognition improvement

The findings revealed that circuit training was superior to aerobic exercise in improving sleep quality and reaction time. The combination of resistance and aerobic bouts in circuit training may provide greater physiological stimulation. While both interventions led to improvements in cognitive performance, only circuit training showed statistically significant change. However, between-group differences for cognition were not significant, likely due to variability in response and the short intervention duration.

### **14. LIMITATIONS:**

In Present study some limitations are present

- The study included only 42 participants (21 per group), which may limit the generalizability of the findings to the larger young adult population.
- These Study Protocol doesn't depend on number of repetition of circuit training and speed on aerobic exercises , so patient effort is variable potentially affecting the outcome measures
- Duration of studies is only 3 week, longer effect is not included is these study, whether the improvement sustain over time
- All participants was Young adults Between age range of 20-32 years. These result may vary in other age group of population.

### **15. FUTURE SCOPE OF STUDY :**

- Effect of circuit training and aerobic exercises was noted only for 3 week longer duration effect should be observer for same
- Effect of our protocol can be see in different population of different occupation with different age group
- Use of different and advance outcome measures to measure sleep quality can be used in future studies

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