



EFFECT OF SLEEP QUALITY ON COGNITION AND VISUAL REACTION TIME

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ABSTRACT

Introduction: Sleep duration and quality is affected in college students because of educational and social factors. This affects their learning, behavior, performance and development. **Methodology:** This study was aimed to assess the effect of sleep quality in cognition and reaction time. 65 healthy students were recruited by social media and oral referrals. After they were screened using Pittsburgh Sleep Quality Index (PSQI) they were divided into two groups of good and poor sleepers, 20 and 45 students respectively and assessed for cognition using MoCA. SPSS was used for statistical assessment and $p < 0.05$ considered as significant. **Result:** The control group of 20 had better MoCA scores and visual reaction time compared to case group 45 with poor sleep quality index score. **Conclusion:** Sleep quality affects cognition of the young adult college students.

KEYWORDS: Cognition, Sleep quality, Reaction time, Young adults

Introduction

Sleep disturbance is an increasingly common complaint in modern life. (1) Transition from school to college, new atmosphere, workload, social life and modern gadgets all decrease sleep duration and quality of sleep in students during college life. Electronics of modern day mobile phones and computers along with social media and 24/7 availability of internet chatting in mobiles are affecting sleep and thereby health of young adults. (2) Sleep is essential for growth and development and normal functioning of endocrine system. (3) It is also important for performance, behavior, mental and social development. (4)

Poor sleep quality is associated with cognitive impairment in young adults. (5) Awareness about sleep quality and cognition is lacking in the community. The Pittsburgh Sleep Quality Index (PSQI) questionnaire is widely used method and has established reliability. (6) PSQI depends on the subject's cognition and ability to recall events such as quality of sleep, medicines dreams and it is subjective in nature.

Materials and Methods

Participants: 65 healthy male students from colleges around Puducherry were recruited by social media referrals. Study was conducted in department of physiology, Sri Balaji Medical College, Chennai. Subjects with history of smoking, alcoholism, neurological, respiratory and cardiovascular diseases were excluded. Written informed consent was taken and clinical examination was done before the study.

Sleep quality: Pittsburgh Sleep Quality Index (PSQI) questionnaire was used for evaluation of sleep quality. (7) It contains 19 questions scaled 0-3 organised to 7 component scores. Score ranges from 0-21. Participants were divided as good sleepers with score 5 and below (20) and poor sleepers (45) with scores 6 and above.

Cognition: Montreal Cognitive Assessment (MOCA) test was used for assessment of cognitive impairment. (8) It is a test for assessment of visuospatial skills, naming, memory, orientation, attention, language and thinking aspects of cognitive skills. Scores of 26 less than 26 out of 30 denotes cognitive impairment.

Visual reaction time was used to assess the concentration skills and to supplement the MOCA test. Visual reaction time was tested using online tool. (9)

Statistical analysis

Data analysis was done using SPSS version 20. Data are presented as mean and standard deviation. Student "t" test was used to compare

MOCA and Visual reaction time scores between the poor sleep and good sleep group. Correlation and regression analysis were done between PSQI and MOCA scores between two groups using Pearson's correlation test. P value < 0.05 was considered significant.

Results

A total of 65 subjects were evaluated as two groups based on initial assessment. 20 good sleepers and 45 poor sleeper groups by using PSQI scores. Montreal cognitive assessment and Visual reaction time were also assessed in those two groups.

Age and demographic parameters are given in Table-1. Both groups have similar BMI and age variables.

Table 1 – Demographic Data

	Parameters	Good Sleepers	Poor Sleepers	p value
1	Age in years	20.05±2.01	20.77±1.97	0.178
2	Height in cm	172.35±5.67	170.91±4.91	0.303
3	Weight in kg	69±4.35	69.37±4.26	0.744
4	BMI kg/m ²	23.24±1.4	23.73±0.68	0.155

Values are expressed in Mean ± Standard deviation

Using PSQI score (Table-2), subjects were divided into good sleepers and poor sleepers with their Montreal Cognitive Assessment (MOCA) scores also compared between groups

Table 2 – PSQI, MOCA and VRT

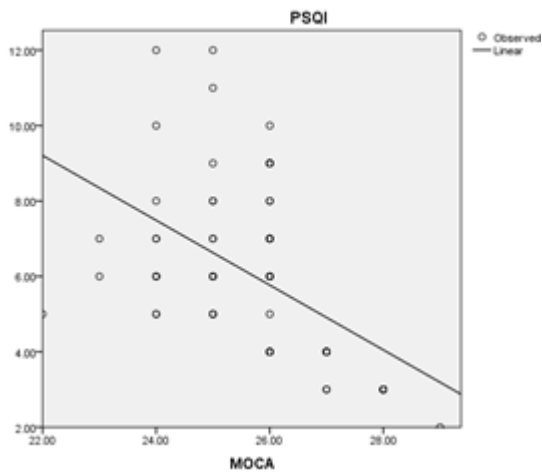
	Parameters	Good Sleepers	Poor Sleepers	p value
1	PSQI	3.5±0.6	7.17±1.83	0.02
2	MOCA	27.15±0.87	25.02±1.01	0.03
3	Visual reaction time	0.52±0.07	0.73±0.11	0.008

Values are expressed in Mean ± Standard deviation

Visual reaction time (Table-2) was better in good sleepers denoted by lower latency compared to poor sleepers.

Relationship between PSQI and MOCA. In correlation and regression analysis R² score of 0.263 indicating higher effect size (Graph 1)

Graph 1 - Relationship between PSQI and MOCA scores



Discussion

In this study there was a significant association between poor sleep quality and cognition. Participants of same age group were chosen by recruitment via online messaging and clinical examination was done for them to exclude conditions which can affect the results. They were divided into two groups as given above by Pittsburg sleep quality index (PSQI) questionnaire. They were divided into poor and good sleepers based on PSQI score and further assessed for cognitive impairment using the Montreal cognitive assessment score (MOCA). (10)

Visual reaction time was assessed using online tool with red and green reaction time. Visual reaction time was compared between two groups and showed significant differences. (11) Poor quality of sleep affects physical actions, sensory and visual perceptions and affects their visual reaction time. (12) Sleep deprivation affects cognition by affecting psychomotor perception. (13)

Today's generation has decrease in the perceived sleeping time compared to the previous generations. (14) Sleep reduces their ability to respond over long duration and having sustained effort. Sleep deprivation reduces their motivation for sustained effort and learning. (15) This reduces their academic performances, achievements and progress in college life, predisposing them to substance abuse. (16)

Social media usage and 24/7 connectivity is also taking a toll on sleep and their academic performance. (17) Internet connectivity and instant messaging affects their sleep patterns and causes sleep cycle disturbances. (18) This affects their hormonal secretion patterns, onset of sleep, memory and temperature, metabolic regulations. (19)

Conclusion

Awareness about sleep quality and its effects on health and academics is to be improved in students and educational institutions. Long term effects like increased risk of chronic non communicable diseases due to changes in inflammatory responses and metabolic disturbances should be addressed by future studies and public should be educated in addition to the effects on cognition. (20)

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