

The relationship between sleep and cognitive functioning in adult people

Sara Sitara Qureshi¹, Basit-Ansari^{2*}, Masood A Qureshi³ and Raheela Rahmat Zohra⁴

¹Department of Psychology University of Karachi

²Department of Health, Physical Education & Sports Sciences, University of Karachi

³Department of Physiology, Dow International Medical College & Director, Institute of Basic Medical Sciences, Dow University of Health Sciences, Karachi

⁴Department of Biotechnology, University of Karachi

Abstract: The purpose of the current study is to find out if subjective sleep complaints will have less cognitive functioning in older people (50 years and above). Sleep was assessed with the subscale Sleep Problems of the Symptoms Checklist-90 (Arrendell & Ettema 1986). Cognitive performance was measured with the Mini Mental Status Examination (Folstein, *et al* 1975) which is used as a dependent variable. Subjective complaints would be negatively associated with cognitive performance, since in elder people biological sleep is likely to be related with cognitive changes. A group of 12 people were given the task of collecting data through purposeful sampling techniques. Sample size of 120 participants was assessed. Each member of the group collected data from 10 subjects. Pearson Correlation Moment was applied for data analysis. In older persons the coefficient of falling asleep difficulty was -0.05 ($p=0.33$) and for waking up too early the coefficient was -0.13 ($p=0.012$) while for restless sleep coefficient was calculated as -0.09 ($p=0.094$). The assumption was verified that sleep problems negatively associated with cognitive functioning.

Keywords: Sleep, cognitive functioning, old age people.

INTRODUCTION

Sleep is the golden chain that ties health and our bodies together" Thomas Decker, English dramatist (1572-1632) A sleep which is deemed refreshing consists of sufficient total sleep time as well as synchronization with the subject's circadian rhythm. Apart from biological perspective, aging is a process of switching social roles as structured by the social system of a society for different age groups (Ayranci & Ozdag, 2005). With the growing age, numerous physiological changes occur which alter the appearance and functions of a human body. Generally, organ systems are significantly affected by such changes in the shape of gradual decline in cellular activity. The pace and scope of such decline may vary from individual to individual; it may range from trivial to rapid. The common problems that elderly patients experience, regarding sleep management, are troubles in falling asleep, less time spent in the deeper stages of sleep, unplanned and unintentional awakening in early morning, and insufficient sleep duration. Sleep disorders in the elderly may beget deplorable affects on the physiological system; these may include inadequate production of different hormones, such as growth hormones. In addition, a decline can also be experienced in metabolic and cognitive functioning. Majority of people accept sleeping disorders as a by-product of growing age, whereas the source may be unhealthy lifestyle, rather than the aging phenomenon.

Although sleep troubles are common among all ages, research identifies older people as the most frequent subjects. In a "National Institute on Aging" study of over 9,000 individuals, more than fifty percent of the subjects reported chronic sleep complaints. Both the subjective and objective measures of sleep quality provide for age-related sleep changes. Subjectively, older adults report increased sleep onset latency, early wake-ups, longer time spent in bed, napping, nighttime awakenings, and decreased total sleep compared to younger adults.

The relationship between inadequate sleep and deficient cognitive functioning with increasing age is well established and appears obvious. Sleep problems and age-related cognitive declines may have negative effects on everyday activities which are essential for leading a happy life and successfully progressing through the aging phase. Cognition and sleep are two aspects which are deemed to have significant contribution in proper everyday-functioning in older adults. Although these areas are different, they are interconnected in a dynamic relationship. Research suggests that with growing age, the sleep architecture of an adult becomes fragmented, consequently resulting in low energy and motivation to perform daily activities (Ancoli-Israel, 2009). Likewise, cognitive aging research shows that several cognitive capabilities, such as attention, processing speed, and memory, become weak with the growing age. This weakening of the cognitive abilities can culminate into poor performance of daily-life chores, e.g. personal financial management (Ball, *et al*, 2004, 2007). There are

*Corresponding author: e-mail: basitansari@hotmail.com

at least two obvious mechanisms that contribute in the impairment of cognition:

Inadequate supply of oxygen to the brain
Disruption and fragmentation of sleep architecture

Respiratory distress, such as apnea and respiratory awakenings during nighttime, can also serve as a cause of sleep disorder. Such sleep problems may decrease the level of oxygen saturation in the body, which then deprives the brain of the required amount of oxygen needed for optimal performance; as a result, lower cognitive efficiency is obvious (Slater *et al.*, 2009). Movements during sleep due to inadequate oxygen saturation, restless legs syndrome, and insufficient sleep hygiene have a substantially negative impact on a subject's sleep architecture. These disturbances in sleep architecture have been proved to impair not only cognitive functioning but also specific domains of cognitive functioning, such as psychomotor ability.

The objective of the present study is to explore the subjective sleep complaints in relation to that of cognitive functioning in older people (above and equal to 50 years). It is a hypothesis that older people with subjective sleep complaints will have less cognitive functioning. A sample size of 120 older people was approached to proceed with the study.

MATERIALS AND METHODS

Participants

The researcher recruited 120 older people (above and equal to 50 years) through purposeful sampling. Research design was Cross-sectional and Correlation method.

Measures

Sleep Problem Checklist-90 (SCL-90)

Sleep complaints were measured using subscale Sleep Problems of the Dutch Version of the symptoms Checklist-90 (SCL-90: Arrindell & Eterna, 1986), which consists of three items relating to sleep troubles. These are:

Extent of distress due to difficulties in falling asleep

Extent of distress due to waking up too early

Extent of distress due to restless or disturbed sleep

A 5 point likert scale (1=not at all, 5=very much) was used by subjects to indicate how much they suffered from sleep problems. The items were summed, and a score was calculated ranging from 3 (depicting no problem) to 15 (depicting several problems).

Mini-mental status exam (MMSE)

The MMSE is comprised of 20 items (Folstein, *et al* 1975). It is a popular test of cognitive function among the elderly and includes tests of attention, orientation, memory, language and visual-spatial skills. The Scores range from 0-30.

STATISTICAL ANALYSIS

Scoring of Sleep Problems and Cognitive Functioning was done according to the standard scoring system given along with the scales. Statistical Analysis was conducted by employing the Statistical Package for Social Sciences (SPSS) program. Pearson's method of correlation was used to study relationship between sleep problems and cognitive functioning.

Ethical considerations

Firstly, the participants were asked for permission to perform the task. After getting consent from participants, they were briefed about the purpose of the study. From the very start, the participants were given and made aware of their right to cease participating in the study. Moreover, at the conclusion of the study, all participants had and were made aware of a final opportunity to withdraw the data they provided for the research.

Procedure

Initially, purposeful sampling was used for selecting the participants. Participants were provided with two measures, Sleep Checklist and Mini- Mental Status Examination. Sleep was assessed with the subscale Sleep Problems of the Symptoms Checklist-90 (Arrindell & Etema 1986). Cognitive performance was measured with the mini mental status examination (Folstein, *et al* 1975) that was employed as a dependent variable. A group of 12 people were given the task of collecting data. Sample size of 120 participants was assessed. Each member of the group collected data from 10 subjects. They were asked to record their responses and Pearson's correlation coefficient was used for result analysis.

Hypothesis

Sleep problem is negatively associated to cognitive decline.

RESULTS

The study was conducted to find out the relationship between sleep and cognitive functioning. For this purpose the study was conducted on older persons of age 50 years and above. The sample size selected was 120 persons. Sleep complaints were measured using subscale Sleep Problems of the Dutch Version of the symptoms Checklist-90 (SCL-90: Arrindell & Eterna, 1986), which consists of three items relating to sleep troubles. In older persons the coefficient of falling asleep difficulty was -0.05 (p=0.33) and for waking up too early the coefficient was -0.13 (p=0.012) while for restless sleep coefficient was calculated as -0.09 (p=0.094). The MMSE is comprised of 20 items. By this test cognitive function among the elderly that is attention, orientation, memory, language and visual-spatial skills were tested. It was found true that sleep problems affects on the

Table 1: Pearson coefficient (95% CI) of the association between sleep problems and cognitive decline (MMSE score), adjusted for sex, age, and educational level (n=120).

	Coefficient	95%CI	p-value
Individual items			
Falling asleep difficulty	-0.05	(-0.16, 0.06)	0.330
Waking up too early	-0.13	(-0.24, -0.03)	0.012
Restless sleep	-0.09	(0.20, 0.02)	0.094
Overall scores			
Continuous scores	-0.05	(-0.09, -0.00)	0.033
Dichotomous Score	-0.38	(-0.71, -0.05)	0.025

physiological system. Life style plays major role in sleep disorders rather than aging. The assumption was verified that sleep problems negatively associated with cognitive functioning.

CONCLUSION

The objective of the study was to investigate the relationship between the quality and quantity of sleep, and cognitive functioning. It was assumed that sleep problems are negatively associated with cognitive functioning; hence, the assumption has been verified.

DISCUSSION

The research study investigated the level of subjective sleep complaints in relation to that of cognitive functioning in older people. The findings of the study revealed that sleep problem is negatively associated with cognitive functioning; hence the assumption was successfully verified.

Although various changes occur with growing age, alteration in the magnitude and quality of sleep are most challenging for numerous older people. Ageing introduces older adults to ordinary changes that include sleep-wake cycles and an overall alteration of the sleep structure; however, there are also other factors that are a by-product of ageing. These are associated with deficient sleep. The use of rigorous exclusion criteria for co morbidities curbs the prevalence of insomnia in healthy adults of growing age. There are different and numerous treatments for the variety of sleep disturbances that older adults go through. Thorough assessment of sleep such as a complete sleep history, and if appropriate, sleep studies should be conducted to diagnose the precise nature of a subject's sleep trouble. Moreover, assessment of a subject's medical history, along with psychiatric history and environmental factors should be thoroughly examined while deciding on treatment modalities. A good treatment shall address the sleep problem, as well as any co-morbidity, to optimize the probability of improvement in quality of life and functioning in older adults. Another research study about sleep efficiency suggested that the secretion of endogenous melatonin reduces with an

increasing age, thus resulting in reduced sleep efficiency and in greater incidence of circadian rhythm disturbance (Touitou, 2001). A study that involved around 6,800 people indicated that a significant percentage of insomnia cases in older people exist without depressed mood and vice versa (Foley, *et al.*, 1999). Another research of the same genre interviewed 6,444 men and women aged over 65. Results showed that people who claimed to be good sleepers were least likely to experience depression at a three year follow-up, whereas those with recent sleep troubles reported depressed moods at a follow-up of the same length (Cricco, *et al.*, 2001).

Absence of physical activity during the daytime might also negatively affect the quality of sleep in elderly people and may also cause circadian rhythm advancement in ageing (Mishima *et al.*, 2000). The relationship of lifestyle factors, such as walking and exercise, with sleep-health were inspected in a large cohort of persons ageing between 60 and 93 years (Uezu *et al.*, 2000). These factors were found to be conducive to sleep health.

The less active elderly persons also had substantially reduced subjective sleep efficiency as compared to those who take greater participation in exercise. The individuals who engaged themselves in lower rates of activity and physical work also reported to experience more fatigue and sleepiness (Bazargan, 1997; Uezu *et al.*, 2000).

In this respect, an uncontrolled experiment study was conducted by Richards, Sullivan, Philips, Beck and Overton-McCoy which involved five nursing home residents. The subjects were asked to engage themselves in greater physical activity for approximately two hours a day. To assess the quality of sleep, sleep-diaries and wrist actigraphy were employed. The participants of this experiment experienced better nocturnal sleep, with an approximate increase of seven percent in sleep-time (Richards, *et al.*, 2001). A study encompassing health and social problems of the elderly was conducted in Udupi Taluk, Karnataka. Around 73 percent of the participants, almost half of whom were illiterate, belonged to the age group of 60-69 years. Approximately 48 percent respondents believed that they were unhappy in life. Around 68 percent of the participants said that the general

attitude towards elderly people was that of neglect and ignorance. The results supported the notion that there was a need for geriatric counseling centers that could cater for their physical and psychological needs (Lena, *et al* 2009).

There are few but comprehensive components that are essential for successful aging; these entail increased and active participation in life, maximization of cognitive and physical functioning, and prevention of diseases and disabilities. The findings of the above-detailed study are indicative of the fact that cognition on everyday functioning has significant importance for successful aging. Several sleep troubles are unrecognized. Even when they are identified, they are not adequately addressed. This ignorance adds to poorer cognitive and everyday functioning. Sleep troubles also serve as impediments in active engagements in life. Likewise, sleep irregularities may add to diseases and disabilities, and may also indicate the presence of a disease or various neurological problems. Unfortunately, when patients report to experience problems related with sleep and cognition, such issues are often ignored. It is because they may not appear significantly connected at first glance, or even medically salient as compared to other medical conditions, e.g. heart disease or prostate cancer for that matter.

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