



Investigating the Correlation between Sleep Disorders and Cognitive Impairment in Older Adults

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ABSTRACT

This study evaluates the effectiveness of technology-assisted interventions, such as wearable devices and robotic exoskeletons, in enhancing mobility among older adults. It includes a meta-analysis of clinical trials, highlighting improvements in gait, balance, and overall mobility. As the global population ages, concerns about the health and well-being of older adults become increasingly pertinent. Among the many health challenges faced by seniors, sleep disorders and cognitive impairment stand out as two interconnected issues with significant implications for quality of life. While it is well-established that sleep plays a crucial role in cognitive function, the relationship between sleep disorders and cognitive decline in older adults is complex and multifaceted. Understanding this correlation is essential for developing effective strategies to promote healthy aging and improve the overall well-being of older individuals.

Keywords: Cognitive impairment; Sleep disorders; Circadian rhythm disorders

INTRODUCTION

Sleep is essential for cognitive processes such as memory consolidation, learning, problem-solving, and decision-making. When sleep is disrupted or inadequate, cognitive function can be significantly impaired. Sleep disorders, including insomnia, sleep apnea, restless legs syndrome, and circadian rhythm disorders, are common among older adults and can have a profound impact on cognitive health. Insomnia, characterized by difficulty falling asleep or staying asleep, is associated with deficits in attention, concentration, and memory.

Sleep apnea, a condition marked by pauses in breathing during sleep, leads to fragmented sleep and oxygen deprivation, contributing to cognitive impairment, including deficits in executive function and memory. Restless legs syndrome, which causes uncomfortable sensations in the legs and an irresistible urge to move them, can disrupt sleep and impair cognitive performance. Circadian rhythm disorders, such as delayed sleep phase syndrome, disrupt the natural sleep-wake cycle, leading to sleep deprivation and cognitive dysfunction.

The relationship between sleep disorders and cognitive impairment in older adults is bidirectional, with each condition exacerbating the other. Poor sleep quality and sleep disorders increase the risk

of cognitive decline and dementia in older adults. Conversely, cognitive impairment, such as Alzheimer's disease and other forms of dementia, can disrupt sleep patterns and exacerbate sleep disorders. This bidirectional relationship underscores the importance of addressing both sleep disturbances and cognitive decline in older adults to prevent further deterioration in overall health and functioning.

Several mechanisms may explain the correlation between sleep disorders and cognitive impairment in older adults. Chronic sleep deprivation and sleep fragmentation lead to increased inflammation, oxidative stress, and neuronal damage, which are associated with cognitive decline and neurodegenerative diseases. Sleep disturbances also disrupt the glymphatic system, the brain's waste clearance system, impairing the removal of toxic proteins such as beta-amyloid and tau, which are implicated in Alzheimer's disease.

Furthermore, sleep plays a crucial role in the consolidation of memories and the pruning of synapses, processes essential for learning and cognitive function. Disrupted sleep can interfere with these processes, leading to deficits in memory formation and cognitive performance. Sleep disturbances also affect neurotransmitter systems involved in cognition, such as

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acetylcholine, dopamine, and serotonin, further contributing to cognitive impairment.

Given the significant impact of sleep disorders on cognitive function in older adults, early detection and management of these conditions are crucial. Healthcare professionals should screen older adults for sleep disturbances as part of routine clinical assessment, particularly those presenting with cognitive complaints or at risk for cognitive decline [1-3]. Treatment strategies for sleep disorders may include cognitive-behavioral therapy for insomnia, continuous positive airway pressure therapy for sleep apnea, medications for restless legs syndrome, and light therapy for circadian rhythm disorders.

LITERATURE REVIEW

In addition to treating sleep disorders, adopting healthy sleep habits and lifestyle modifications can promote better sleep and cognitive health in older adults. These may include maintaining a regular sleep schedule, creating a relaxing bedtime routine, optimizing the sleep environment, engaging in regular physical activity, managing stress, and avoiding substances that interfere with sleep, such as caffeine and alcohol. Expanding on the investigation of the correlation between sleep disorders and cognitive impairment in older adults opens avenues for further exploration and potential interventions.

Conducting long-term studies tracking sleep patterns and cognitive function in older adults can provide valuable insights into the progression of both sleep disorders and cognitive decline over time. Longitudinal data can help identify risk factors, biomarkers, and predictive models for cognitive impairment associated with specific sleep disturbances. Investigating whether sleep quality or quantity has a greater influence on cognitive function in older adults could offer valuable information for targeted interventions. Understanding whether improving sleep quality alone, regardless of total sleep duration, can mitigate cognitive decline would inform personalized treatment approaches.

Designing and implementing intervention studies to assess the effectiveness of various treatments for sleep disorders in improving cognitive function is essential. Comparative studies evaluating the impact of pharmacological interventions, behavioral therapies, and lifestyle modifications on both sleep and cognitive outcomes would help identify the most effective strategies for managing sleep-related cognitive impairment. Exploring potential biomarkers for sleep disturbances and cognitive impairment, such as markers of inflammation, oxidative stress, or changes in brain structure and function, using advanced neuroimaging techniques could enhance our understanding of the underlying mechanisms.

Identifying biomarkers associated with both sleep disorders and cognitive decline may facilitate early detection and targeted interventions. Developing and evaluating educational programs aimed at promoting sleep hygiene and healthy sleep habits in older adults could have significant public health implications. Assessing the impact of sleep education interventions on sleep quality, cognitive function, and overall well-being would provide valuable insights into the feasibility and effectiveness of preventive measures. Leveraging telemedicine and remote monitoring technologies to assess sleep patterns and cognitive function in older adults remotely could improve accessibility to care and facilitate early intervention.

DISCUSSION

Implementing telehealth platforms for sleep assessments and cognitive screenings in aging populations could help identify individuals at risk for sleep-related cognitive impairment and

provide timely interventions. Collaborating across disciplines, including sleep medicine, neurology, geriatrics, psychiatry, and psychology, to develop comprehensive care plans for older adults with sleep disorders and cognitive impairment is essential. Integrating expertise from multiple fields can lead to holistic approaches that address both the physiological and psychological aspects of sleep-related cognitive decline. Considering cultural and socioeconomic factors that may influence sleep patterns, attitudes toward sleep, and access to healthcare is critical. Exploring how cultural beliefs, social support networks, economic status, and environmental factors impact sleep disorders and cognitive function in older adults can inform culturally sensitive interventions and health policies [4,5].

By pursuing these prospects, researchers and healthcare professionals can advance our understanding of the complex relationship between sleep disorders and cognitive impairment in older adults and develop targeted interventions to improve the sleep and cognitive health of aging populations. Longitudinal studies involve observing the same subjects repeatedly over a long period. In the context of sleep disorders and cognitive impairment in older adults, researchers could follow a cohort of individuals over several years, regularly assessing their sleep patterns and cognitive function. By analyzing data collected at multiple time points, researchers can identify patterns of change, risk factors, and potential predictors of cognitive decline associated with specific sleep disturbances.

While total sleep duration is often emphasized, the quality of sleep is equally important for cognitive health. Research could investigate whether improving sleep quality, through interventions targeting sleep architecture, sleep efficiency, or sleep continuity, has a greater impact on cognitive function than simply increasing sleep duration. Understanding the relative importance of sleep quality versus quantity could guide personalized interventions for older adults experiencing sleep-related cognitive impairment.

Intervention studies involve implementing specific treatments or interventions and assessing their effects on outcomes of interest. For instance, researchers could conduct randomized controlled trials to compare the effectiveness of different interventions for sleep disorders, such as cognitive-behavioral therapy for insomnia, continuous positive airway pressure therapy for sleep apnea, or exercise interventions for improving sleep quality. Evaluating the impact of these interventions not only on sleep outcomes but also on cognitive function would provide valuable insights into the causal relationship between sleep and cognitive health.

Biomarkers are measurable indicators of biological processes or disease states. Advanced neuroimaging techniques, such as magnetic resonance imaging, positron emission tomography, or functional MRI, can help identify structural and functional changes in the brain associated with sleep disorders and cognitive impairment. Researchers could explore potential biomarkers, such as markers of neuroinflammation, amyloid deposition, or alterations in brain connectivity, that may serve as indicators of both sleep disturbances and cognitive decline.

Sleep hygiene refers to behavioral and environmental practices that promote healthy sleep. Educational programs aimed at improving sleep hygiene could include information on establishing a regular sleep schedule, creating a conducive sleep environment, practicing relaxation techniques, and managing stress. Researchers could design studies to evaluate the effectiveness of sleep hygiene

education interventions in improving sleep quality, cognitive function, and overall well-being in older adults [6].

Telemedicine involves using telecommunications technology to provide healthcare remotely. Remote monitoring devices, such as wearable sensors or smartphone applications, can track sleep patterns and cognitive function in older adults outside of traditional clinical settings. Implementing telehealth platforms for sleep assessments and cognitive screenings could improve access to care, facilitate early detection of sleep-related cognitive impairment, and enable timely interventions, particularly for individuals in rural or underserved areas.

Given the multifaceted nature of sleep disorders and cognitive impairment, collaboration across disciplines is essential for comprehensive care. Multidisciplinary teams comprising professionals from fields such as sleep medicine, neurology, geriatrics, psychiatry, and psychology can develop personalized care plans that address the complex interactions between sleep, cognition, mental health, and medical comorbidities in older adults. By integrating expertise from diverse disciplines, healthcare providers can offer holistic approaches that consider the unique needs and preferences of each individual.

Cultural beliefs, socioeconomic status, and environmental factors can significantly influence sleep patterns and attitudes toward sleep in older adults. Researchers could conduct qualitative studies to explore how cultural norms, family dynamics, socioeconomic factors, and access to healthcare services impact sleep behaviors and cognitive health in different populations. Understanding these contextual factors can inform the development of culturally tailored interventions and health policies that address the specific needs and challenges faced by diverse groups of older adults.

By exploring these prospects through rigorous research, collaboration, and innovation, we can advance our understanding of the complex relationship between sleep disorders and cognitive impairment in older adults and develop targeted interventions to promote healthy aging and improve the quality of life for seniors.

CONCLUSION

The correlation between sleep disorders and cognitive impairment

in older adults highlights the intricate interplay between sleep and cognitive function. Addressing sleep disturbances is essential not only for improving sleep quality but also for preserving cognitive health and reducing the risk of cognitive decline and dementia. By recognizing and managing sleep disorders in older adults, healthcare professionals can help promote healthy aging and enhance the overall quality of life for seniors. Further research is needed to elucidate the underlying mechanisms linking sleep disturbances and cognitive impairment and to develop targeted interventions for this vulnerable population.

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CONFLICT OF INTEREST

None.

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