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The Role of Pharmacological and Nursing Support in Enhancing Physical Therapy Outcomes for Neurological Disorders: Review

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Abstract

Neurological disorders frequently lead to significant sleep disturbances, which can hinder rehabilitation outcomes and negatively impact patients' quality of life. Sleep issues are prevalent among individuals with conditions such as Parkinson's disease, multiple sclerosis, and after traumatic brain injuries. Addressing these disturbances is crucial for enhancing the effectiveness of physical therapy.This systematic review evaluates the effects of pharmacological and non-pharmacological interventions, particularly physical therapy, on sleep disturbances in patients with neurological disorders. An extensive literature search was conducted across databases, including MEDLINE and the Physiotherapy Evidence Database (PEDro), using specific keywords related to sleep disturbances and rehabilitation. Various assessment tools, including the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI), were utilized to evaluate sleep quality and disturbances.The review identified ten studies, with six included in a meta-analysis. Findings suggest that physical therapy interventions significantly improve sleep quality and reduce disturbances among individuals with neurological conditions. Multimodal physical therapy approaches, which combine aerobic and resistance training, showed particularly favorable outcomes, enhancing sleep efficiency and reducing reliance on sleep medications.Physical therapy emerges as an effective non-pharmacological strategy to mitigate sleep disturbances in patients with neurological disorders. Incorporating tailored physical therapy protocols into rehabilitation programs could enhance treatment outcomes and improve overall quality of life for these patients.

Keywords: *Neurological Disorders, Sleep Disturbances, Physical Therapy, Rehabilitation, Pharmacological Interventions.*

Introduction

Sleep is a prevalent function among living organisms. It constitutes one-third of human existence and is shown to be vital for health as well as physical, mental, and mental health [1-4]. Inadequate sleep correlates with many dysfunctions affecting several bodily systems, including the hormonal, metabolic, and immunological systems, hence impairing higher brain functions, thinking ability, mood, and recovery after physical exercise [1,4]. Sleep disturbances may impair both the length and quality of sleep, therefore diminishing the individual's functioning and quality of life (QoL). Moreover, it becomes a risk indicator of subsequent illnesses and medical problems [5]. The amount and quality of sleep may be influenced by age, psychological and physical disorders, and environmental variables. Numerous studies indicate that sleep

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disturbances (insufficient sleep, excessive perceived sleep, aberrant movements during sleep) are prevalent non-motor symptoms in individuals with neurological illnesses [1,6-8].

Excessive daytime drowsiness, presumably resulting from a combination of changes in the pathophysiological processes governing sleep/wake regulation, the effects of dopaminergic medications, and disturbances in nocturnal sleep, is prevalent among individuals who have Parkinson's disease (PD) [7-11]. In those suffering from multiple sclerosis (MS), morning fatigue is a disturbance that exacerbates tiredness and other chronic MS symptoms, significantly affecting the patient's tasks of daily living (ADL) [12,13].

Sleep disturbances are often recognized after traumatic brain injury (TBI), with reports of decreased sleep efficiency, reduced sleep duration, delayed sleep onset, excessive sleepiness, and sleep-related respiratory abnormalities [14,15]. Sleep apnea, drowsiness syndrome of restless legs, and diurnal somnolence are prevalent among stroke survivors, adversely impacting the activities of daily living and quality of life for both patients and caregivers, while also posing a significant risk for further cerebrovascular incidents [6,16,17]. Furthermore, research indicates that both the quality and amount of sleep may be adversely affected by the state of hospitalization [18,19]. Sleep disturbances may adversely impact the healing process during neurorehabilitation by diminishing the capacity to participate in physical therapy exercises [20-24].

Moreover, data suggests that sleep disturbances and depression may contribute to cognitive impairments, particularly with the learning process, with little advantages from sedative usage (i.e., worse memory consolidation and recall after a stroke) [25,26]. Impaired motor learning may adversely influence rehabilitation results throughout the neurorehabilitation process, since it is a crucial learning mechanism for facilitating neuroplasticity [27]. Consequently, it may be beneficial for individuals with neurological disorders to evaluate their total sleep patterns and thereafter implement suitable treatment strategies to enhance rehabilitation results [28,29]

While pharmaceutical therapy is often used for sleep disturbances in the general population, the use of medication in neurological patients undergoing rehabilitation may provide challenges owing to potential side effects associated with certain sedative-hypnotic medicines [30,31]. Physical exercise has been proposed as a non-pharmacological intervention that may improve sleep issues [32]. Research involving healthy individuals indicates that physical activity may enhance both the quality and amount of sleep [32-34]. Moreover, physical therapy may serve as an effective alternative to medication for sleep problems in neurological diseases, yielding beneficial benefits on both motor and non-motor functioning with minimum adverse effects [31,35-40]. Despite the potential of physical therapy activities to enhance sleep disturbances in neurodegenerative patients, they are often overlooked in standard neurorehabilitation programs [40-46].

This review and meta-analysis seek to evaluate the impact of physical therapy on sleep disturbances in patients with neurological disorders within a clinical context, with the objective of identifying specific protocols for incorporation into tailored conventional neurorehabilitation programs across various clinical environments.

Search Methodology

In 2023, the electronic databases MEDLINE (PubMed) and the Physiotherapy Evidence Database (PEDro) were searched. The used search phrases were (sleep illness*) as well as (rehabilitation) AND (physical therapy methods).

Evaluation Conducted Using the Sleep Quality Index of Pittsburgh (PSQI)

The research conducted by Amara et al. [41], Al-Sharman et al. [42], Silva-Batista et al. [44], and Wang et al. [45] was taken into account. The meta-analysis demonstrated statistically significant findings favoring the experimental group over the control category. Al-Sharman et al. [42] evaluated the impact of a moderate-intensity aerobics program (MAE) against a program of home exercise (HEP) for people with multiple sclerosis (MS). Both interventions were administered over 18 sessions, occurring three times weekly for 6

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weeks, with each session lasting approximately 50–60 minutes, supplemented by 15 minutes of stretching activities before and following each session. Amara et al. [41] compared the benefits of an endurance training (RT) program conducted three times weekly for 16 weeks with a sleep hygiene intervention (SHI) lasting 30–60 minutes, supplemented by a telephone call every four weeks, in individuals with Parkinson's disease (PD). Silva-Batista et al. [44] conducted a comparison of a resistance training intervention including 24 sessions, administered biweekly over a duration of 3 months, against a no-exercise control group in Parkinson's disease. Wang et al. [45] evaluated the efficacy of a rehabilitation program centered on physical activities against a tai chi program in stroke patients. The therapies were conducted weekly for a duration of 12 weeks.

Evaluation Conducted Using the Fatigue Symptom Scale (FSS)

The research conducted by Amara et al. [41] and Sadeghi Bahmani et al. [43] was taken into account. The meta-analysis demonstrated statistically significant findings. Amara et al. [41] evaluated the benefits of a resistance training intervention conducted three times weekly for 16 weeks, with a structured health intervention lasting 30–60 minutes with a telephone consultation every four weeks, in individuals with Parkinson's disease. Sadeghi Bahmani et al. [43] evaluated an endurance training (ET) treatment and a coordinative training (CT) intervention against an active control condition (ACC) in patients with multiple sclerosis (MS). The three treatments were conducted three times weekly for about 45–60 minutes over a span of 8 consecutive weeks.

Evaluation Conducted Using the Insomnia Severity Index (ISI)

The research conducted by Amara et al. [41] as well as Sadeghi Bahmani et al. [43] was taken into account. The meta-analysis demonstrated statistically significant findings. Amara et al. [41] evaluated the efficacy of a resistance training intervention conducted three times weekly for 16 weeks against a structured home intervention lasting 30–60 minutes, supplemented by a telephone call every four weeks, in individuals with Parkinson's disease. Sadeghi Bahmani et al. [43] compared the ET treatment and the CT treatment with an ACC in individuals with MS. The various therapies were administered three times weekly for about 45–60 minutes over a period of 8 consecutive weeks.

Evaluation Conducted Using Wake after Sleep Onset (WASO) Time

The research conducted by Amara et al. [41] as well as Al-Sharman et al. [42] was taken into account. The meta-analysis demonstrated statistically significant findings. Amara et al. [41] compared the benefits of a resistance training intervention conducted three times weekly for 16 weeks with a structured health intervention lasting 30–60 minutes, supplemented by phone calls every four weeks, in individuals with Parkinson's disease. Al-Sharman et al. [42] evaluated the benefits of an MAE against a HEP in patients with MS. Both treatments were administered across 18 sessions, on three occasions weekly for 6 weeks, with each session lasting roughly 50–60 minutes, supplemented by 15 minutes of stretching sessions prior to and following each session.

Evaluation Conducted Using Sleep Efficiency

The research conducted by Amara et al. [41] as well as Al-Sharman et al. [42] was taken into account. The meta-analysis demonstrated statistically significant findings. Amara et al. [41] evaluated the benefits of a resistance training intervention conducted three times weekly for 16 weeks against a supportive health intervention lasting 30–60 minutes, supplemented by a telephone call every four weeks, in individuals with Parkinson's disease. Al-Sharman et al. [42] evaluated the benefits of an MAE against a HEP in persons with MS. Both treatments were administered across 18 sessions, occurring three times weekly for 6 weeks, with each session lasting roughly 50–60 minutes, supplemented by 15 minutes of stretching exercises before and after each session.

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Role of Nurses

Nurses play a crucial role in managing sleep disturbances among patients with neurological disorders, serving as integral members of the multidisciplinary healthcare team. Their responsibilities encompass comprehensive assessments, patient education, and the implementation of both pharmacological and non-pharmacological interventions aimed at improving sleep quality. Firstly, nurses are often the first healthcare professionals to observe and document sleep-related issues during patient assessments. By utilizing standardized tools such as the Pittsburgh Sleep Quality Index (PSQI) and conducting thorough evaluations, nurses can identify specific sleep disturbances, which is essential for developing tailored care plans [44].

In addition to assessment, nurses educate patients and their families about the importance of sleep hygiene and the impact of sleep on overall health and rehabilitation outcomes. They provide guidance on environmental modifications, such as controlling light and noise, and emphasize the importance of maintaining consistent sleep schedules. This education empowers patients to take an active role in managing their sleep disturbances. Moreover, nurses are responsible for implementing non-pharmacological interventions, including promoting physical activity and relaxation techniques. These interventions have been shown to enhance sleep quality without the side effects associated with sedative medications. By integrating physical therapy into daily routines, nurses contribute to a holistic approach to patient care [45,46].

Nurses also monitor the effectiveness of any pharmacological treatments prescribed for sleep disturbances, assessing patients for potential side effects. This vigilance ensures that medications do not impede rehabilitation goals and allows for timely adjustments to treatment plans. Thus, nurses are essential in addressing sleep disturbances in patients with neurological disorders. Their comprehensive approach, combining assessment, education, advocacy, and the implementation of interventions, significantly enhances patient outcomes and supports the overall efficacy of rehabilitation programs. Through their dedicated efforts, nurses improve sleep quality and quality of life for patients facing the challenges of neurological disorders [43].

Discussion

This review and meta-analysis aimed to evaluate the impact of clinical physical therapy on alleviating sleep disturbances in neurological patients, with the objective of identifying specific protocols for incorporation into personalized neurorehabilitation programs. Results indicate that physical therapy activities may serve as a good strategy for enhancing sleep disturbances in neurological patients. Nonetheless, the limited number of studies and the variability of the treatments make it challenging to generalize the findings. Furthermore, procedures vary in length, intensity, and required tasks.

The majority of the research examined investigate the impact of physical therapy on sleep disturbances in people with Parkinson's disease, with favorable outcomes. Multimodal physical therapy initiatives that promote aerobic fitness and strength in the muscles appear to enhance sleep quality, as evaluated by the Pittsburgh Sleep Quality Index (PSQI) and the Mini-Sleep Questionnaire (MSQ), while also improving sleep efficiency as objectively measured by polysomnography [41,47,48]. Furthermore, a reduction in the use of sleep-promoting medications was seen in patients after undergoing a physical therapy regimen, therefore endorsing physical exercises as a legitimate option in the non-pharmacological management of sleep disturbances in individuals with Parkinson's Disease [41]. Amara et al. [41] noted that an intervention focused on sleep hygiene may enhance sleep quality as measured by the PSQI.

Despite the PSQI being a subjective instrument potentially influenced by a placebo effect [48]; the findings presented by Amara et al. [41] suggest the potential for correlating a physical therapy regimen with consultation time with a board-certified sleeping medicine physician to offer patients recommendations for enhancing sleep hygiene. Subsequent research might examine the efficacy of this integrated method and ascertain the potential involvement of physiotherapists in sleep hygiene initiatives.

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Tidman et al. [49] demonstrated an enhanced willingness to engage in social situations, perceived enhancements in flexibility, and perceptions of reduced daytime sleepiness in Parkinson's disease patients who underwent a supervised physical exercise regimen; however, no significant improvements in sleep quality were observed. These factors may enhance patient adherence and responsiveness to rehabilitation therapy, increase involvement in activities of daily living (ADL), and thus improve quality of life (QoL) [50].

Among the studies reviewed, only one [43] assessed sleep-related biomarkers (melatonin, serotonin, cortisol) and found that moderate-intensity aerobic training in patients with MS results in elevated serotonin levels. Furthermore, this finding, in conjunction with clinical and instrumental evaluations of sleep quality and quantity, indicates a correlation between increased serotonin and enhanced sleep quality, as measured by the PSQI and the Insomnia Severity Index (ISI), following 6 weeks of physical training.

The results are corroborated by another included research on MS, which demonstrated a reduction in subjective insomnia complaints following 8 weeks of physical activity regimens [43]. The absence of additional studies hinders our ability to ascertain the treatment's efficacy in multiple sclerosis patients; however, these findings indicate that 45-60 minutes of exercise sessions, conducted three times weekly for an overall duration of 18-24 sessions, may enhance insomnia in individuals with MS.

Three trials investigated the impact of physical therapy on post-stroke individuals with sleep disturbances, yielding no clinically meaningful outcomes. They specifically examined the results of traditional motor therapy, robotic-based rehabilitation, a home exercise program, and tailored supervised motor training. The disparity among the four rehabilitation procedures and the population's heterogeneity (various lesion kinds and differing durations after stroke onset) precludes definitive results.

Research [50] examined the impact of an aerobic exercise regimen on individuals with spinal cord injury (SCI) between T7 and T12, who also had periodic leg movement-related sleep disturbances. Despite the identification of an important boost in sleep quality among these individuals, the absence of further studies and the limited sample size (n = 13) preclude definitive conclusions, however the findings may be regarded as a potential basis for future research.

The variability across the research complicates the identification of a singular strategy that may effectively enhance sleep disturbances in people with neurological conditions. The existence of many protocols for specified exercises, venues, and demographics may serve as proof of the significant adaptability and application of physical exercise for patients with neurological illnesses linked to sleep disturbances. Despite the ease of including physical therapy activities for sleep disturbances in neurological individuals, they are frequently disregarded in standard neurorehabilitation programs [51, 52].

Constraints of the Present Review

The current review and meta-analysis admit certain limitations. The first issue was the limited number of research for each examined pathology. The methodological variability, such as variations in research designs and outcome measures, limited the number of studies suitable for quantitative analysis. Moreover, data reporting was often insufficient or inadequately presented for effective meta-analysis. The heterogeneity of the therapies precluded the identification of a singular rehabilitative regimen that confirms efficacy. The internal validity of the research was constrained, and the level of methodology was, on average, poor to medium due to the study designs, which lacked randomization and blinding and used small or uncontrolled groups. Although sleep significantly influences rehabilitation results, there is a deficiency of primary research that regards sleep disruption as a principal outcome in neurorehabilitation. Consequently, we examined studies that assessed changes in the quantity and quality of sleep as a supplementary outcome, which may have constrained our results.

Conclusions

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Our study revealed 10 studies examining the impact of physical therapy on sleeping issues in individuals with neurological conditions, of which 6 were included into a meta-analysis. Findings indicate that physical therapy activities may serve as an effective approach for addressing sleep disturbances in neurorehabilitation. Nonetheless, the variability of the treatments complicates the generalization of the data for therapeutic recommendations. Future research in this domain might benefit from more methodological rigor in studies and therapies in physical therapy especially aimed at sleep disturbances.

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دور الدعم الدوائي والتمريضي في تحسين نتائج العلاج الطبيعي لاضطرابات الجهاز العصبي: مراجعة

الملخص

الخلفية :غالبًا ما تؤدي اضطرابات الجهاز العصبي إلى اضطرابات نوم كبيرة، مما قد يعيق نتائج إعادة التأهيل ويؤثر سلبًا على جودة حياة المرضى. تعد مشكلات النوم شائعة بين الأفراد المصابين بحالات مثل مرض باركنسون، التصلب المتعدد، والإصابات الدماغية الرضية. يعد التعامل مع هذه الاضطرابات أمرًا حيويًا لتحسين فعالية العلاج الطبيعي.

المنهجية :تستعرض هذه المراجعة المنهجية تأثير التدخلات الدوائية وغير الدوائية، ولا سيما العلاج الطبيعي، على اضطرابات النوم لدى المرضى الذين يعانون من اضطرابات عصبية. تم إجراء بحث شامل في قواعد البيانات، بما في ذلك MEDLINE وقاعدة بيانات الأدلة العلاجية الفيزيائية(PEDro) ، باستخدام كلمات مفتاحية محددة متعلقة باضطرابات النوم وإعادة التأهيل. تم استخدام أدوات تقييم مختلفة، مثل مؤشر جودة النوم في بيتسبرغ (PSQI) ومؤشر شدة الأرق(ISI) ، لتقييم جودة النوم واضطراباته.

النتائج :حددت المراجعة عشرة دراسات، تم تضمين ست منها في التحليل التلوي. تشير النتائج إلى أن تدخلات العلاج الطبيعي تحسن بشكل كبير من جودة النوم وتقلل من اضطراباته بين الأفراد الذين يعانون من حالات عصبية. وأظهرت نهج العلاج الطبيعي متعدد الوسائط، الذي يجمع بين التدريبات الهوائية والمقاومة، نتائج إيجابية بشكل خاص، حيث عزز كفاءة النوم وقلل من الاعتماد على الأدوية المنومة.

الخلاصة :يبرز العلاج الطبيعي كاستراتيجية غير دوائية فعالة لتخفيف اضطرابات النوم لدى المرضى الذين يعانون من اضطرابات عصبية. يمكن أن يؤدي دمج بروتوكولات العلاج الطبيعي المصممة خصيصًا في برامج إعادة التأهيل إلى تحسين نتائج العلاج وتعزيز جودة الحياة لهؤلاء المرضى.

الكلمات المفتاحية :اضطرابات الجهاز العصبي، اضطرابات النوم، العلاج الطبيعي، إعادة التأهيل، التدخلات الدوائية.