

# Association between Sleep Quality Disturbances and Motor Learning Outcomes in Cerebral Palsy: A Systematic Review

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## ABSTRACT

**Introduction:** Cerebral Palsy (CP) is a non-progressive neurodevelopmental disorder characterised by persistent motor impairments that limit functional performance. Motor learning is central to physiotherapy interventions in CP and depends on repeated practice, retention, and neuroplastic mechanisms. Sleep plays a critical role in motor memory consolidation and synaptic reorganisation. Individuals with CP frequently experience sleep disturbances, including insomnia, sleep fragmentation, sleep-disordered breathing, pain-related awakenings, and medication-related sleep alterations. These disturbances may adversely influence motor learning and rehabilitation outcomes; however, the evidence has not been comprehensively synthesised.

**Aim:** To systematically review and synthesise evidence on the association between sleep quality disturbances and motor learning outcomes in individuals with CP.

**Materials and Methods:** This systematic review was conducted in accordance with the PRISMA-2020 guidelines. A comprehensive search of electronic databases identified studies examining sleep quality or sleep disturbances in relation to motor learning outcomes in individuals with CP. Observational and interventional studies reporting subjective and/or Aim sleep measures alongside

motor learning outcomes were eligible. Thirteen studies met the inclusion criteria and were included in the qualitative synthesis. Due to heterogeneity in study designs, outcome measures, and assessment tools, a narrative synthesis was performed.

**Results:** Across the 13 included studies, poor sleep quality in individuals with cerebral palsy was consistently associated with reduced motor skill acquisition, impaired retention, and suboptimal consolidation of learned motor tasks. Both subjective and aim sleep disturbances were reported to negatively affect motor learning, particularly for tasks requiring sustained attention, repetition, and practice-dependent adaptation. Variability in findings was observed according to age, type of sleep disturbance, and the nature of motor learning tasks.

**Conclusion:** Evidence from 13 studies suggests that sleep quality disturbances are negatively associated with motor learning outcomes in individuals with cerebral palsy. Identification and management of sleep-related problems may enhance motor learning capacity and improve physiotherapy and rehabilitation outcomes. Future research employing standardised sleep assessments and motor learning measures is needed to strengthen the evidence base and inform clinical practice.

**Keywords:** Neuroplasticity, Physiotherapy, Sleep disturbances.

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