



Research progress on the main brain network mechanisms of sleep disorders in autism spectrum disorder

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Abstract

Autism Spectrum Disorder (ASD) often co-occurs with sleep disorders, which can exacerbate core symptoms such as social impairments and repetitive stereotyped behaviors. Sleep is crucial for brain function, as it enhances cerebrospinal fluid circulation, clears metabolic toxins, and consolidates memories. Despite the high prevalence of these sleep issues in individuals with autism, the specific brain networks involved remain poorly understood. This study reviews recent advancements in identifying the brain network mechanisms underlying sleep disorders in ASD. By focusing on the interplay between autism-related sleep disturbances and brain network functionality, we synthesize current findings to highlight key mechanisms involved. Our research provides a preliminary theoretical framework that advances understanding of how sleep disorders impact brain networks in autism, offering a valuable reference for future investigations in this area.

Keywords Autism spectrum disorder · Autism · Sleep disorders · Brain network

Introduction

Sleep disorder is not considered a core symptom of autism, however, it frequently co-occurs as a prevalent comorbidity, displaying a notably high clinical incidence (Bougeard et al., 2021). And the main manifestations are unstable sleep, prolonged sleep onset latency and sleep fragmentation (Ming & Walters, 2009). Sleep disorders possess the potential to exacerbate not only core symptoms but also other associated manifestations, consequently impacting mood regulation, daily adaptability, and, notably brain development (Ballasco et al., 2022; Linke et al., 2023; Wintler et al., 2020; Liu et al., 2023). Depending on the specific window of development, sleep affects the maturation of the brain and behavior,

and potentially lead to phenotypes of neurodevelopmental disorders (Milman et al., 2023). The brain is significantly influenced by sleep, with adolescence being a critical phase for brain restructuring. Sleep plays a pivotal role in brain development, facilitating learning and the consolidation of memory by selectively eliminating and preserving newly formed synapses (Li et al., 2017). Undoubtedly, sleep disorders during this developmental phase can yield irreversible effects on children's brain maturation (Klein et al., 2000; Weber et al., 2018). Consequently, sleep disorders exert a profound impact on the quality of life for autistic children, potentially giving rise to symptoms such as communication challenges and depression, and even impeding the normative trajectory of growth and development in children (Richdale & Schreck, 2009; Zhang et al., 2021). Studies indicate that children with autism exhibit a substantially higher prevalence of sleep problems, approximately around 80% (Al-Beltagi, 2021), compared to children without autism. Furthermore, while the incidence of sleep disorders tends to decrease as typically developing children grow and mature, this decline is not observed in children with autism (Polimeni et al., 2005). Given the prevalence of sleep disorders in individuals with ASD and their significant impact on quality of life, it is imperative to enhance research attention on sleep issues in autism.

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