

The interaction between sleep disruption and autism genes in neuronal plasticity and behavior

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Abstract

The ability of neurons to respond to the environment and change behavior is a fundamental process of the nervous system. However, these behavioral changes can be beneficial or detrimental depending on timing, prior experiences, and genetic background. We work at the intersection of neuroscience and genetics to further our understanding of how genes influence experience-dependent changes in neurons, circuits, and behavior. Sleep is important for the development, maintenance, and function of neurons and sleep disruption can impact neurons and behavior, especially during critical/sensitive developmental periods. Autism is a spectrum of neurodevelopmental conditions defined by changes in social interaction, communication, and repetitive/restricted behaviors, but also often includes sleep disruption. Interestingly, behavioral, and pharmacological modification of sleep behavior can improve some autism behavioral phenotypes, suggesting a link between sleep health and autism behaviors. Environmental exposures to noise, light, air pollution, toxins, and stress can disrupt sleep, and could represent environmental risk factors that contribute to autism and may interact with genetic risk factors of autism. Despite the connections between sleep and autism, we still know very little about the interaction between autism genes and sleep disruption. We propose here to study the role of autism associated genes in neuronal and behavioral responses to sleep disruption, and the impact of sleep disruption on behavioral phenotypes of autism associated genes. This will provide evidence that environmental exposures that disrupt sleep represent modifiable risk factors for autism behavioral phenotypes, which will be dependent on genetic susceptibility.