Unraveling autism spectrum disorder mechanisms through rigid-autonomous phase sequences

November 21 2023

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A recent study delves into the behavioral complexities of autism spectrum disorder (ASD) by introducing the rigid-autonomous phase

sequence (RAPS) formation concept. RAPS may be responsible for the cognitive, sensory-motor, and memory-related challenges faced by individuals with ASD. By uniting these insights under a single theoretical framework, this research paves the way for innovative treatments, promising a brighter future for those with ASD.

Autism spectrum disorder (ASD) is a complex neuropsychiatric condition marked by diverse cognitive and sensorimotor challenges, difficulties with social communication, and distinct behavioral patterns. While genetic factors are known to play a role, the intricate mechanisms driving this condition remain elusive. Moreover, a unified and comprehensive theoretical framework that can explain behavioral abnormalities associated with ASD is lacking.

In a study published online in *Perspectives on Psychological Science*, Professor Kenkichi Takase from the Department of Psychology, Chuo University, Japan and Professor Eiichi Nojiri from the Graduate School of Human Sciences, Osaka University, Japan, expanded on the pioneering work of psychologist Donald Olding Hebb to explore underlying mental functionalities and their role in ASD.

Their work sheds light on the intricate connections within the brain by aiming to bridge existing gaps in our understanding of the neurodevelopmental condition.

Hebb's insights focused on the animistic nature of the mind, emphasizing that higher mental functions, such as learning, memory, and attention, are deeply rooted in the activities of the nervous system. These insights offered a comprehensive explanation for the generalization of perceptual learning, memory stability, and attention variability, forming a coordinated pattern of neural change.

But how does Hebb's theory relate to autism ASD? This study picks up

where Hebb's work left off. "We have extended Hebb's theory, which showed how the mind works in the brain, to determine the cause of ASD," Prof. Takase and Nojiri state. Researchers theorize that individuals with ASD exhibit an altered state of neural connections, which they refer to as RAPS. Unlike flexible neural pathways that allow for adaptability, RAPS can lead to cognitive, sensory-motor, and memory-related disorders.

One can think of RAPS in the brain like train tracks that have become stuck in one direction. This inflexible track makes it difficult for individuals with ASD to learn new things as the train is always arriving at the same station. It also causes the brain to remember certain things very well, like vividly recalling specific objects or events. This unique brain pattern, characterized by its inflexibility, has the potential to explain many of the challenges individuals with ASD face in their daily lives.

This paper proposes that RAPS can explain a wide range of symptoms in individuals with ASD, encompassing social, cognitive, and motor difficulties. The theory suggests that RAPS interferes with the activation of other neural circuits, leading to the observed impairments in various functions. Hence, the concept of RAPS can serve as a theoretical framework to understand the underlying neural mechanisms that contribute to the diverse symptoms associated with ASD.

These discoveries carry immense potential for reshaping our understanding of ASD, offering a unifying framework that transcends earlier models. By explaining the vast array of symptoms associated with ASD through the lens of RAPS, the theory opens doors for the development of innovative treatments targeting these neural patterns.

"If the cause of ASD can be identified, treatments for ASDs that were previously untreatable may be found," Prof. Takase says. The findings inspire the autism research community to delve deeper into this novel

perspective, fostering the development of interventions aimed at enhancing the lives of individuals with ASD.

In essence, this study illuminates the possibility of more impactful therapies, instilling hope for a promising future for individuals within the autism spectrum.

More information: Eiichi Nojiri et al, Understanding Sensory-Motor Disorders in Autism Spectrum Disorders by Extending Hebbian Theory: Formation of a Rigid-Autonomous Phase Sequence, *Perspectives on Psychological Science* (2023). DOI: 10.1177/17456916231202674

Provided by Chuo University