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ABSTRACT

The Influence of Dopamine Transporter Gene Polymorphisms on Hippocampus Cognitive Function of Generalization.

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The human ability to generalize previously learned information and stimuli to novel situations is essential for adaptation. It has been shown that the interactions between the basal ganglia and the medial temporal lobe may play a role in learning and generalization. Different genes are involved in regulating dopaminergic function in the basal ganglia. Synaptic dopamine signals are regulated by the dopamine transporter (DAT). Despite the significance of dopamine in modulating learning, it is still unclear how generalization can be modulated by the dopaminergic pathways. In this study, we will examine how dopamine regulates generalization by studying a naturally-occurring variable tandem repeats polymorphism, the 3'UTR VNTR, in the dopamine transporter gene (DAT1). The 3'UTR VNTR polymorphism regulates the expression of the DAT. A sample of 400 healthy participants from Al-Quds University completed an acquired equivalence computer-based cognitive task for generalization. This task aimed to evaluate the ability to learn stimulus associations and generalize the learned rules to novel stimuli. Our results showed that participants with the 9-repeat genotype, which is known to be associated with less DAT expression and higher levels of dopamine, exhibited better performance in the learning phase than participants who were 10/10 homozygotes (higher DAT and less dopamine). There was no effect of genotypes on performance in the generalization phase. Our study shows that dopamine levels could play an important role in regulating the learning process that relates to basal ganglia functionality. Dissociating the contributions of dopamine function to the basal ganglia vs. medial temporal lobe cognitive function can significantly further our understanding of these two crucial neural systems.

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