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A Touchscreen Assay to Probe the Role of the Serotonergic System in Learning and Visual Information Processing

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ABSTRACT

The neurotransmitter serotonin is involved in numerous processes in the brain such as behavior, learning, memory, mood, and neurodevelopment. Serotonin signaling is regulated by the serotonin transporter protein (SERT), which maintains normal serotonin levels. Mutations in the SERT gene are known to correlate with cognitive and behavioral deficits seen in psychiatric disorders, such as anxiety disorders, depression, and autism spectrum disorder. Researchers study these deficits using SERT knockout (KO) mice, a model that lacks functional SERT and displays changes in anxiety, learning, and motivation. We are interested in how the absence of SERT affects visual processing and learning. A popular method of evaluating learning in mice is a touchscreen-based learning paradigm, similar to tests used with both humans and primate models. We have applied this paradigm in our laboratory to study the effect of SERT KO on learning and the visual discrimination of global motion. Mice were first taught to select a visual stimulus for a food reward, then trained to discriminate between left and right coherent dot motion. Our results demonstrate that mice can learn to discriminate between different types of visual stimuli, giving us an experimental platform for future studies of learning and perception in SERT KO mice.

KEYWORDS

Serotonin, operant conditioning, sensory processing, global motion perception, vision, knockout mice