Feedback-based Probabilistic Category Learning is Selectively Impaired in Attention/Hyperactivity Deficit Disorder

Yafit Gabay, Liat Goldfarb

Neurobiology of Learning and Memory, May 2017

Abstract

Although Attention-Deficit Hyperactivity Disorder (ADHD) is closely linked to executive function deficits, it has recently been attributed to procedural learning impairments that are quite distinct from the former. These observations challenge the ability of the executive function framework solely to account for the diverse range of symptoms observed in ADHD. A recent neurocomputational model emphasizes the role of striatal dopamine (DA) in explaining ADHD’s broad range of deficits, but the link between this model and procedural learning impairments remains unclear. Significantly, feedback-based procedural learning is hypothesized to be disrupted in ADHD because of the involvement of striatal DA in this type of learning. In order to test this assumption, we employed two variants of a probabilistic category learning task known from the neuropsychological literature. Feed
back-based (FB) and paired associate-based (PA) probabilistic category learning were employed in a non-medicated sample of ADHD participants and neurotypical participants. In the FB task, participants learned associations between cues and outcomes initially by guessing and subsequently through feedback indicating the correctness of the response. In the PA learning task, participants viewed the cue and its associated outcome simultaneously without receiving an overt response or corrective feedback. In both tasks, participants were trained across 150 trials. Learning was assessed by a subsequent test without a presentation of the outcome or corrective feedback. Results revealed an interesting disassociation in which ADHD participants performed as well as controls in the PA task, but were impaired compared with the controls in the FB task. The learning curve during FB training differed between the two groups. Taken together, these results suggest that the ability to incrementally learn by feedback is selectively disrupted in ADHD participants. These results are discussed in relation to both the ADHD dopaminergic dysfunction model and recent findings implicating procedural learning impairments in those with ADHD.