Poster #2

The effects of voluntary exercise or methylphenidate on learning a set-shift task during development

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Exercise-related improvements in cognitive control and working memory have been shown in children (Buck et al., 2008; Hillman et al., 2009) and are of particular interest in the context of ADHD, as current psychostimulant treatments, such as methylphenidate (MPH) carry with them several concerns. There is some indication that exercise during development may ameliorate ADHD symptoms, though data suggest that exercise does not affect adults and adolescents identically (Hopkins et al., 2011). We have previously shown that two weeks of exercise in adult rats improves Set 1 performance of a set-shift task (Eddy et al., 2011). Considering these findings, the purpose of these experiments was to explore the effects of exercise or MPH during development on set-shift performance. Set-shifting is a test of cognitive flexibility requiring a discrimination between rewarded and unrewarded arms in a T maze. Set 1 (initial discrimination) relies upon the dorsolateral striatum (DLS) and Set 2 ("shift"), the dorsomedial striatum (DMS) and medial prefrontal cortex (mPFC). Adolescent rats that exercised for two weeks or received two weeks of daily MPH showed improvement on Set 2. When rats were treated as adolescents and treatment stopped for two weeks before testing (i.e., tested as adults) there was only an improvement in Set 2 performance in animals receiving MPH. These data suggest that exercise or MPH during development can improve this DMS/mPFC mediated learning, and only MPH effects persist into adulthood if treatment is discontinued. Future experiments will look at dopamine and norepinephrine transporters in the DLS and mPFC, respectively.