Mouse Performance on a Novel Touchscreen Continuous Performance Task is Dependent on Signaling in the Prelimbic Cortex

Attention is the cognitive processing that facilitates the ability to target and attend to relevant environmental stimuli, while filtering out irrelevant or distracting stimuli. Control over selective attention is theorized to be dependent on organized neural communication that stems from the medial prefrontal cortex (mPFC). To evaluate selective and sustained attention, mice were trained on the novel touchscreen rodent continuous performance task (rCPT), a task designed to emulate the human CPT. In the rodent version, images are continuously presented on a touchscreen, where mice have been trained to selectively respond to one image type while supressing responses to all others. Following training on the rCPT, bilateral cannulas were implanted into the prelimbic region of the mPFC. Immediately prior to cognitive testing, a mixture of GABA A and B agonists were infused into the prelimbic to temporarily inactivate the structure. Inactivating the prelimbic cortex significantly impaired performance on this task, resulting in a reduced ability to discriminate the target from non-target images, as well as a reduction in speed and overall responding. Currently, mice expressing optogenetic receptors are being used to evaluate how parvalbumin interneuron activity within the prelimbic cortex influences attentional performance on the rCPT. As the parvalbumin interneuron population is heavily implicated in generating coordinated neuronal activity and supporting cognition, it is predicted that inhibiting these interneurons and altering synchronous prelimbic activity will impair rCPT performance.