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“Development of a Touchscreen Based Platform to Measure Cognitive Function in SIV Infected Rhesus Macaques”

In 2025, approximately 1.2 million people worldwide were newly diagnosed with HIV, with a total of 41 million people worldwide currently living with the virus. Antiretroviral therapies have been lifesaving, yet rates of cognitive decline, chronic pain, and alcohol use disorder remain elevated in people living with HIV. Ongoing bidirectional translational studies performed at the Comprehensive Alcohol/HIV Research Center (CARC) at LSU Health New Orleans have demonstrated this relationship in their longitudinal human study and are using a nonhuman primate model, SIV infected rhesus macaque undergoing chronic binge alcohol (CBA) administration, to understand the underlying neurobiological mechanisms for cognitive decline in order to develop therapeutic interventions. Recent findings from our lab indicate SIV+ alterations in neuronal excitability and synaptic transmission in the anterior cingulate cortex (dACC), a brain region which has been implicated in attention, cognitive flexibility, pain, and alcohol use disorder. While this proposes a neurobiological mechanism, there is a need to correlate this data with cognitive function testing in animal models to quantify and qualify cognitive dysfunction, as well as correlate experimental animal data with data from a human HIV+ cohort, for preclinical drug trials.

Based on a similar protocol developed at the Oregon National Primate Research Center, we sought to develop an operant touchscreen-based platform to measure emotional reactivity, attention, and cognitive flexibility during the touchscreen training on Attentional Set-Shifting Task (ASST). To develop this platform, we first re-coded the procedure from Lab Basic programming language to a fully Python-based coded program to improve adaptability and adoptability of the testing procedure. Next, we interfaced the program with a camera to measure pupillometry which can be used to assess cognitive engagement and is associated with anterior cingulate function. Hardware development required fabrication of a 3-inch thin transportable housing encased in a protective aluminum panel that contained liquid reward delivery system, electronics box, laptop, infrared sensing matrix, and camera port. Following completion of the response panel we will now begin implementing the ASST in the rhesus macaques. The program records data on each subject's correct and incorrect choices, response time, error rate, number of completed trials, and how many correct/incorrect stimuli are chosen in a row. By comparing performance between SIV+ and SIV- macaques under CBA exposure, we aim to characterize the cognitive effects of SIV and chronic alcohol exposure, evaluate the extent to which metformin is associated with the preservation of cognitive function, and extend NHP data to inform treatments for people living with HIV.