

Observed Differences In Goal-Directed Actions Among Individuals Affected By Covid-19

Jude Chavez, Kevin Wilson, Karen Luo, Sarah Ward, John Romero, Ethan Campbell, Darbi Gill,
Richard Campbell, Jeremy Hogeveen, Jessica Richardson, Davin Quinn

Presenting Author: Jude Chavez

The neurological complications of COVID-19 are fearsome and not understood. Ischemic strokes, meningo-encephalitis, peripheral nerve damage, agitated delirium, dysosmia, and psychiatric disturbances have all been extensively documented. SARS-CoV-2 appears to directly invade neural tissue and triggers states of hypercoagulability, immune system activation, and hypoxemia, all of which contribute to severe brain dysfunction and possible damage in the acute phase. The motivation to initiate action is central to adaptive functioning but is impaired in a variety of neurological and psychiatric disorders. In particular, a significant number of patients with traumatic brain injury (TBI) demonstrate clinically-significant apathy - i.e., a negative change in goal-directed actions-which can significantly impact patients' lives and persist long after the injury event. We hypothesize that individuals with COVID-19 diagnosis will show an increase in apathy along with a decrease in willingness to explore novel choice options and greater effort-based discounting of rewards. Here, we merged computational modeling of 'explore-exploit; decision-making (i.e, flexibly deciding whether to explore a novel option versus exploiting a familiar one) and effort-based decision-making during fNIRS in patients with COVID-19 diagnosis. Behavioral results indicated that COVID-19 patients with elevated apathy demonstrate the reduced exploration of novel choice options, and greater effort-based discounting of rewards, suggesting that the anticipated costs associated with flexible decision-making may interact to shape apathy in COVID-19 diagnosis. fNIRS analyses are ongoing but will test the hypotheses that neural computations critical for explore-exploit decision flexibility and effort estimation are both disrupted in individuals with COVID-19 diagnosis and increased levels of apathy. A greater understanding of the neurocomputational bases of apathy in COVID-19 diagnosis could shape the design of more effective brain-based interventions for normalizing goal-directed behavior in patients affected by COVID-19.

Non-Expert Summary

COVID-19 can cause many different neurological problems such as stroke, nerve damage, and psychiatric issues. We propose that the virus may directly attack the brain and cause people to experience apathy, which is a lack of motivation to take action to reach goals. We use brain scans called fNIRS to understand how COVID-19 affects decision-making and effort-based rewards. Understanding these effects may help develop treatments to improve goal-directed behavior in people with COVID-19.