Neurocognitive and Psychological Health Outcomes

Lasting Deficit in Inhibitory Control with mMild Traumatic Brain Injury

Being able to focus on a complex task and inhibit unwanted actions or interfering information (i.e., inhibitory control) are essential human cognitive abilities, particularly for Service members in combat operations. However, the extent to which mild traumatic brain injury (mTBI) may impact these critical functions remains unknown. Researchers at the Center for Neuroscience and Regenerative Medicine conducted a study with seventeen patients and age-matched healthy controls (*Xu et al. 2017*). The participants performed a variant of the Stroop task and attention-demanding 4-choice response tasks with identical stimuli but two contexts: one required only routine responses and the other with occasional response conflicts (Figure 1). The results showed that mTBI patients performed as well as controls when tasks involved routine responses. However, when tasks involved response conflicts, the mTBI group, even with a single concussion had significantly slower responses and a higher error rate when compared to the controls. Event-related functional magnetic resonance imaging showed altered neural activity in areas that regulate inhibitory control. These results suggest that even without apparent difficulties in complex but routine tasks, patients with mTBI may experience long-lasting deficits in inhibitory control in situations that call for rapid conflict resolutions, thus impacting the return to duty of Service members affected with mTBI.

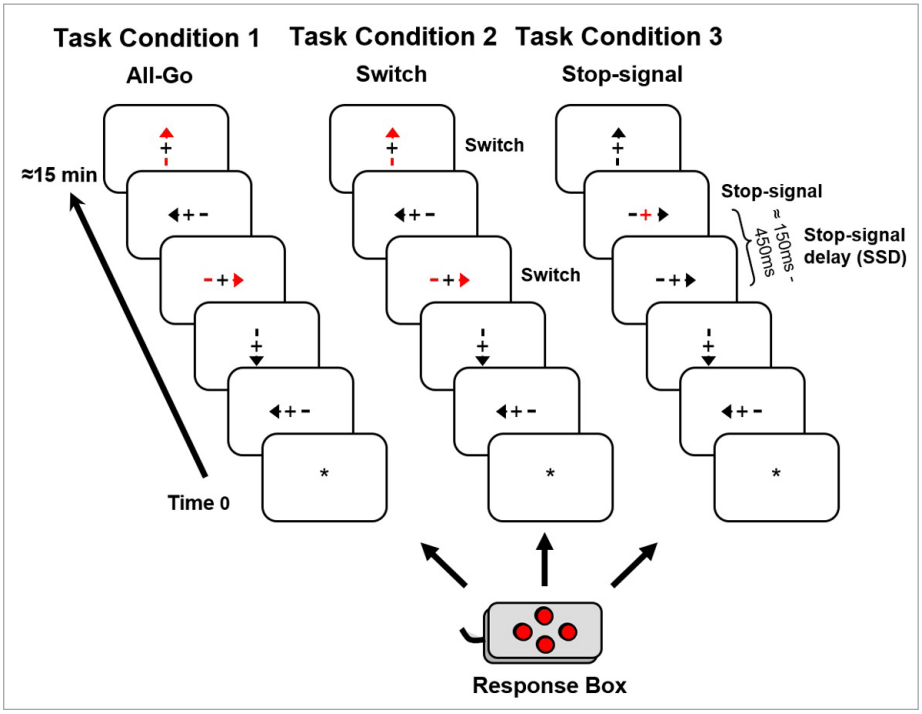

FIGURE 1: Design of the 4-choice response task. Task Condition 1 (All-Go) included only the routine "go" responses (i.e., All-Go) with a total of 80 trials. Task Condition two (Switch) and three (Stop-signal) had identical stimuli as those in Condition one (All-Go). The only difference was that Task Condition two and three included a small number (25 percent) of "conflict" trials. For Task Condition two, participants were told to press the opposite response button (i.e., a "Switch" response) relative to the stimulus orientation when they saw a red arrow (40 out of 160 trials). Task Condition three (Stop-signal) was a variant of the stop-signal task. It included a delayed visual-cue (i.e., the stop-signal) to signal a "Stop" response. The primary "go" trials were identical to those in Condition one and two except that no red arrows were presented and for 40 (25 percent) out of the 160 trials, the "+" sign in the middle of the stimulus would turn red (the stop-signal) with a variable stop-signal delay after the onset of the stimulus. (Figure 4 from Xu et al. (2017) used with permission from the authors)

REFERENCES:

Xu, B., Sandrini, M., Levy, S., Volochayev, R., Awosika, O., Butman, J. A., Pham, D. L., and Cohen, L. G. 2017. "Lasting Deficit in Inhibitory Control with Mild Traumatic Brain Injury." Sci Rep 7 (1):14902. doi: 10.1038/s41598-017-14867-y.