ICCTF Conference Abstract

Title: Developing a Response Time Modeling Approach to Assess Cancer Cognition

Keywords: response times, modeling, accumulator models, neuropsychological tasks, measurement

For many cancer patients, cancer-related cognitive decline can cause small but astoundingly impactful shifts in cognitive processes. Capturing these small shifts has added another layer of difficulty in understanding the mechanisms driving cognitive changes in cancer patients. Perhaps, by combining mathematical psychology techniques with the quantitative tasks used to evaluate cancer cognition, we can develop a more precise and informative approach to capturing cognitive changes in a cancer population. We believe that a response time modeling approach could provide many benefits to current cognition assessments. Firstly, response time modeling does not rely on assumptions of linearity and normalcy, so it can create models that better fit participants’ response time distributions. Additionally, modeling provides parameters that represent the underlying cognitive processes (such as non-decision time, response caution, and the decision drift rate) that are more informative than the means and standard deviations from traditional analyses. Finally, through these parameters, we can parcel out within-participant noise, capturing slight changes in cognition, even when a mean-based assessment may not. In the current study, we evaluate the efficacy of implementing a response time modeling approach to capture cognitive changes in a population of healthy undergraduate students. In this branch of the study, undergraduate students complete neuropsychological tasks that assess attention, working memory, and executive control. We then fit the response time distributions with response time models, such as the linear ballistic accumulator model and a modified drift diffusion model. We utilize Bayesian statistics to gauge model fit, and then assess how model parameters change across the final weeks of the academic semester. We then evaluate how measures of stress (including cortisol levels and self-report questionnaires) drive changes in the response time parameters. The results from the current project will be used to inform a larger collaboration, where a response time modeling approach is being implemented in a longitudinal cancer survivor study.