TITLE: Temporal Structure Affects Attention Allocation in a Sequential Learning Paradigm

AUTHOR: Tamika Crane and Kimberly M. Ross

SPONSORS: Christopher M. Conway, Department of Psychology

Introduction: Sequential learning (SL) is the ability to encode ordinal patterns in our surrounding environment. We hypothesized that being exposed to synchronous versus asynchronous temporal conditions would modulate learning effects.

Method: Nineteen participants (10 females, 18-34 years old) were recruited. Each participant performed two visual sequential learning tasks (synchronous and asynchronous), while event related brain potentials (ERPs) were recorded. The sequential learning task involved a sequence of colored circles that appeared in the middle of a black screen. The participants were told to press a button when a specific colored circle appeared, called the "target". Unknown to the participants, the target was preceded by one of three random "predictor" circles, the high predictor (target followed 80% of the time), the low predictor (target followed 20% of the time), and the zero predictor (target never followed). Each task lasted for twenty-five minutes and included 180 trials of 6 blocks of 30 trials each. Once both of the tasks had been completed, the participants were tested on their overall level of consciousness of the sequence's probabilistic structure.

Results: Mixed measures ANOVA revealed an interaction between timing condition and whether the participant completed the synchronous or the asynchronous task first ($F=(1,17) = 11.14$, $p = .004$, $\eta_p^2=.40$), 300 to 700ms post predictor onset in the posterior regions of interest (ROIs). There was also an interaction between block and which timing condition was completed first (($F(1,17) = 11.19$, $p =.04$, $\eta_p^2=.22$). The results indicated that mean ERP amplitudes were increased for the synchronous task in the second half of the experiment, if the asynchronous task was completed first.

Conclusion: These neurophysiological data suggest that attention was heightened after seeing the asynchronous task first, perhaps due to an inability to entrain to stimuli onset in the first task, creating a heightened response to the subsequently viewed regular temporal structure in the second task, and thus improving the ability to learn the ordinal sequential patterns.