Perceptual Learning on Simultaneity and Temporal Order Judgments

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Introduction: Prior research on bilateral-stream Rapid Serial Visual Presentation (RSVP) displays reveals that participants often perceive left visual field (LVF) targets significantly sooner than right visual field (RVF) targets (Matthews, Welch, Festa & Clement, 2013). The hastened perception of LVF targets occurs for temporal order judgments (TOJs) but not simultaneity judgments (SJs) on the same stimuli. This demonstrates task-specific neural events for *time perception*. Here, we investigated the extent to which task-specific neural events govern *time discrimination* by evaluating whether training differentially affects the precision of SJs and TOJs.

Method: Twenty Denison University undergraduates viewed bilateral-stream RSVP displays containing two targets, one in each lateral hemifield, shown either simultaneously or at various asynchronies. Half the participants judged the targets' temporal order (TOJ task), and half judged whether the targets appeared simultaneously or not (SJ task). Retinal stimulation remained identical across the SJ and TOJ tasks. Each participant completed two daily training sessions. Collectively, the participants completed 24,000 trials (600 trials per day * 2 days * 10 participants per task * 2 tasks). We assessed temporal precision using standard signal detection procedures to determine d'.

Results: On each task and each day, the precision of SJs and TOJs increased significantly with target-asynchrony magnitude (logarithmic trends, p's≤0.05), demonstrating significant stimulus-control over the participants' responses. At each target asynchrony, mean TOJ precision increased significantly (p's≤0.05) from day 1 to day 2. The practice-based improvement observed on TOJs significantly exceeded that observed on SJs (p's=3.04E-05), which exhibited non-significant precision decreases on day 2.

Conclusion: In principle, precision on SJs and TOJs could depend on a shared computation, namely, the difference between two arrival times. Despite this, our perceptual learning data suggest a dissociation between the neural events mediating SJ and TOJ precision even when stimulation remains identical across tasks.

Word Count: 300