The effect of visual perceptual load on EEG and behavioural measures of sensory time perception in vision and audition

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Despite much evidence that sensory processing of unattended stimuli depends on the level of perceptual load in the attended task, sensory timing (typically concerning sub-second durations) is often considered automatic and independent of attention (e.g. Paton & Buonomano, 2018). We therefore investigated the role of perceptual load in the perception of sub-second time periods. Participants performed a rapid serial visual presentation task under low or high perceptual load (feature vs. conjunction search) and reproduced the duration of either visual targets (250, 450, or 650 ms, Experiment 1) or concurrent auditory tones with post-cued reproduction (500, 700, or 900 ms, Experiments 2–3). The post-cue ensured participants had to track the duration of every tone while performing the primary task (in contrast to only attending to durations of targets in Experiment 1). Results showed that high perceptual load led to shorter reproduced durations, indicating that increased attentional demands in the attended task compressed the perceived durations. EEG revealed that contingent negative variation (CNV) peak amplitudes at central clusters, measured during the perceptual stage (for non-cued intervals), were significantly increased as a function of duration length, but only under low perceptual load. High perceptual load reduced both the overall CNV amplitude and, importantly, also its duration-related gradient. In contrast, auditory N1 amplitudes (peaking at temporal clusters) were unaffected by load (as expected for suprathreshold stimuli, see Molloy et al., 2019). These findings demonstrate a selective effect of perceptual load on the neural correlates of sensory time perception that is not driven by reduced sensory processing of the timing (auditory) stimulus. We discuss these results in relation to current views of the role of attention in sensory timing.

Keywords: Time Perception, Attention, EEG, Neural Sensory Timing, Perceptual Load