Craniometrix: Using Sensory Dissonance to Identify Cognitive Decline, Year Three

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Cognitive impairment can be induced by conditions ranging from PTSD to the early onset of dementia (a symptom of Alzheimer's). However, there is currently no way to inexpensively, non-invasively, and accurately identify mild cognitive impairment. This study reports on the development and initial assessment of a tool that measures cognitive processing speeds under conditions of sensory dissonance (where a subject is presented with simultaneous and conflicting sensory cues) as a leading indicator for mild cognitive impairment. When presented with two conflicting sensory stimuli, a subject's brain discards one and perceives the other. As the gap between the two stimuli presented increases, there is a point at which dissonance sets in and the subject's cognitive "confusion" is reflected by a slower response time. This paper uses these response times to quantify and predict a subject's degree of impairment. Initial results indicate that it takes longer for a subject with mild cognitive impairment (7.4 seconds) than the demographic equivalent without that impairment (3.1 seconds) to process and respond to the conflicting sensory cues under conditions of sensory dissonance. This supports the hypothesis that a subject's response times to cues during sensory dissonance monitoring could indeed be used to identify mild cognitive impairment. A Bayesian classifier was then created to compute the probability of a subject having a cognitive impairment based on their test performance. This classifier was deployed as an iPad app, with results showing that the model is accurate.

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