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A digital biomarker for remote self-assessment of Alzheimer's Diseases: development and validation

Abstract

Background

Online data-collection provide an opportunity for Alzheimer's Disease research to collect large datasets crucial for understanding important public health concerns. However, the reliability of online tasks as compared to those administered in the lab is poorly examined. Our goal is to validate an online version of the short-term memory-binding task (STMBT), a potential digital biomarker sensitive to Alzheimer's Disease (Parra et al., 2010), to understand if data collected online in two environments, at-home and in the lab, is comparable.

Method

We created an online version of the STMBT task using Psytoolkit (Stoet 2010; Stoet 2017). Development involved piloting, group and user discussions to explore how such a novel tool could be best presented for self-assessment. Useful insights led to refinement of the online tool (i.e., instruction videos, images, and text). The validation stage involves test-retest reliability assessment of cognitively fit participants (aged >40 years) who complete the two conditions of this paradigm (i.e., shape only and binding). Task Environment (home and in the lab) and conditions (shape and binding) were fully counterbalanced. Measures of general cognitive abilities, anxiety and at-home environment were also taken.

Result

Recruitment is on-going, but preliminary data (n=10) has already proved informative. A repeated measures ANOVA looking at task-accuracy with factors of Environment (home vs. lab) and Condition (shape vs. binding) revealed no significant effects of Environment: $F(1, 9) = 0.308, p = .591$; Condition: $F(1, 9) = 2.202, p = .172$; or Interaction: $F(1, 9) = 0.308, p = .591$. For the shape condition, all participants performed near ceiling regardless of testing environment. In the binding condition, we observed good-to-excellent test-retest reliability between environments using single measures interclass correlation ($ICC = 0.954, CI 0.83-0.99, (F(9, 9) = 39.62, p < .001)$).

Conclusion

These preliminary results indicate the STMBT can provide reliable data when self-administered using an online version of the task which has important implications for public health researchers. For our fully powered sample, we will provide summary of other measures.