

A Portal for the Online Evaluation of Serious Games

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Abstract

Aging brings about not only physical, but also mental and cognitive changes and challenges. As our minds begin to slow down in middle age, we become more acutely aware of their functioning, and more concerned with maintaining our mental capacities. Recent findings in neuropsychology indicate that a combination of lifelong factors such as a cognitive commitment to one's career and hobbies, social engagement, higher education and diet contribute to an increased resilience to the adverse cognitive effects of neurodegenerative diseases such as Alzheimer's disease that often occur later in life. This phenomenon, dubbed 'cognitive reserve' by Prof. Y. Stern, seems to suggest that increased mental engagement prepares or 'trains' our brains to resist the effects of aging or disease. As a result, the last decade has seen dozens of companies offering training regimens that claim to improve cognition, boost mental capacities and stave off the effects of mental aging.

Most people tend to begin such regimens in middle age, when the effects of cognitive decline are first felt. However, it is still unclear whether the effects of lifelong engagement can be approximated or replicated by dedicated regimens begun later in life. At the same time, scientific validation of these regimens is a costly and difficult process typically relying upon in-person experimental protocols.

This paper presents an alternative to in-person lab testing: Tangra, a portal for conducting randomized controlled trial experiments online. Built in the Django web application framework, Tangra supports investigators in designing studies, populating them with participants, and managing their progress from initial consent through assessment and intervention to debriefing. Tangra also provides the participants themselves with an integrated interface where they can follow their progress in the study and participate in experimental sessions as required. The purpose of the portal is not restricted to mental fitness. Rather, it is to enable online

experimentation in a variety of fields, reducing the logistical and financial burden on labs and widening investigators' potential base of study participants.

To demonstrate its viability as an experimental platform, Tangra was used to conduct a between-subjects mental fitness study comparing two games from a Canadian mental fitness company to two well-established board games. Fifteen participants recruited online were asked to complete ten 30-45 minute sessions over the course of a month. Their cognitive abilities were assessed before and after the intervention. Data from the intervention, as well as participant retention and motivation rates, were collected and used not to assess the effectiveness of the compared interventions in improving cognitive abilities, but rather to provide sufficient evidence that we have identified and addressed the key issues of conducting such experiments online.

Tangra is a first step towards an integrated online experimental portal. In our design, we have identified and attempted to implement the crucial elements of in-person experimentation in an online protocol. These elements begin with recruitment, screening and identity validation, cover ethics, consent and privacy concerns, and extend beyond intervention, assessment and instrumentation to monitoring confounding activity, motivating retention and providing feedback, ending in evaluating the persistence of an intervention's effects. While Tangra successfully implements some of these elements, future work is needed to further its progress towards a reliable and trusted online validation protocol.