Tangra: The Mental Fitness Evaluation Portal

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Domain

The number of mental fitness games claiming a positive outcome on human cognition is growing faster than scientific validation of these claims. This is largely due to the fact that current experimental protocols in cognitive psychology rely on cumbersome in-person methods, making validation studies costly and difficult to arrange and conduct.

Approach

We have created a web portal that alleviates the logistical and financial issues associated with in-person testing by allowing researchers to design and conduct validation studies entirely online. The portal is suitable for testing not only mental fitness games, but also physical fitness games, health awareness regimens and any activity that claims a beneficial outcome.

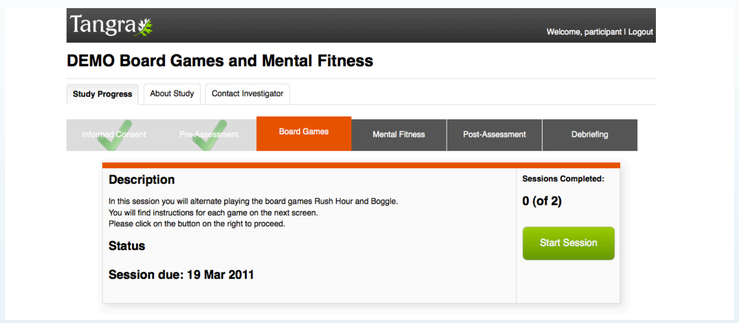
Challenges

We are exploring the broad set of challenges inherent to online experimentation, including:

- Recruitment, Screening and Identity Validation
- Ethics, Consent and Privacy
- Intervention, Assessment and Instrumentation
- Monitoring Conflounding Activity
- Incentive, Retention and Feedback
- Persistence of Effects

Implementation

We called our web portal *Tangra* after the ancient Bulgarian god of thunder. Created using the open-source Django framework, it seamlessly integrates a brower-based user interface with a robust Python-based back end.



With a simple, streamlined interface, Tangra guides participants from informed consent, through intervention to debriefing, focusing on the task at hand and setting completion due dates for each session.

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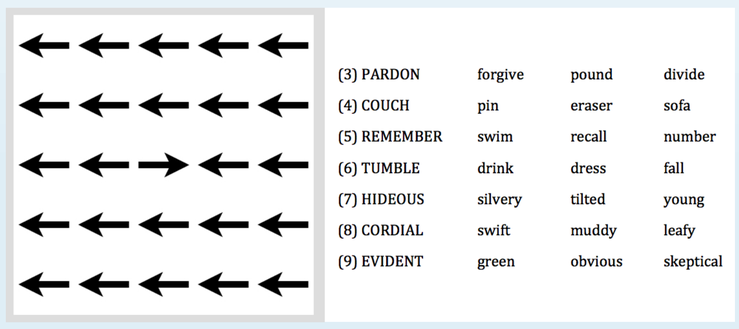
Activity-specific data is stored in a secure database and exported in comma-separated files compatible with most statistical packages. Each datum is customizable to record data from a variety of different tasks.

Experimental Design

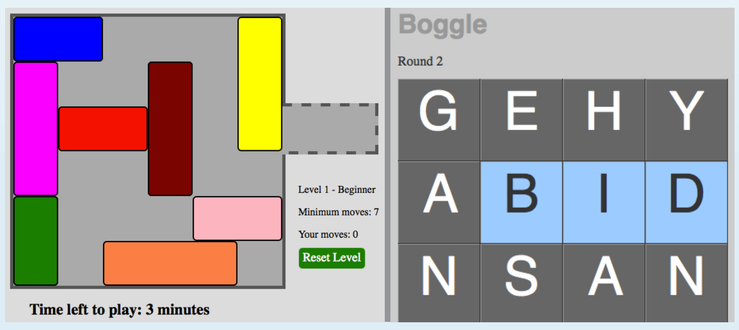
To demonstrate Tangra's viability, we are conducting a proof-of-concept pilot study. 12 participants aged 65–83 are randomly divided among two groups: half are playing two mental fitness games from a Canadian vendor while the other half are playing two standard board games. The study consists of ten 40-minute intervention sessions over a one-month period.

Participants' cognitive performance is assessed before and after on a limited set of cognitive tests. Those equipped with video conferencing hardware are given some additional tests.

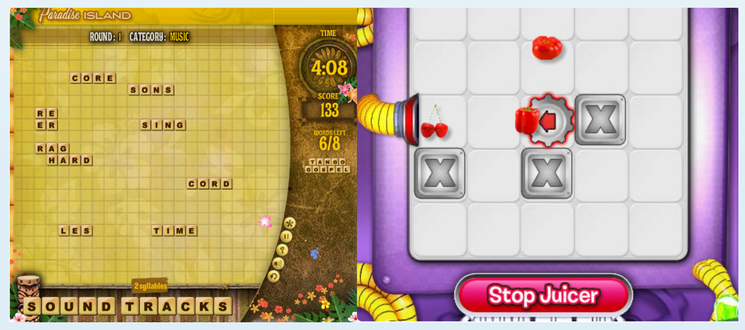
Tasks



A set switching and a Flanker task are administered before and after the intervention, with a subset doing memory and vocabulary tests too.



The board game condition uses *Boggle* (targetting vocabulary and spatial search) and *Rush Hour* (planning and visuo-spatial reasoning).



The corresponding mental fitness games are *Paradise Island II* (a syllable-matching task) and *Wonder-Juice Machine* (a 2-D planning task).

Preliminary Results

The pilot study is nearing completion. While the short intervention period renders the detection of large cognitive improvements unlikely, preliminary qualitative data we have collected about the portal suggest that online cognition studies can be feasibly conducted on seniors with varying levels of technical expertise and previous gaming experience, and will yield accurate, ecologically valid data. We believe that our method offers a logistical advantage without reducing participant motivation and adherence.

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