

## Project proposal – A mobile application for multitasking training

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### Background and objective

Nowadays, multitasking behaviors are prevalent in our daily life and even in workplace. Many multitasking situations require much more effort than single task situations and can lead to severe impairment of performance. The ability to multitask is hence important for good and efficient task performance. In our project, we plan to construct a mobile application of multitasking training to improve people's ability to multitask.

### Can training improve multitasking performance?

The impairment of performance during multitasking was suggested to be caused by our limited mental resources (e.g. Kahneman, 1973) or a stubborn bottleneck of human cognition (e.g. Pashler, 1994). Training studies (e.g. Ruthruff, Van Selst and Johnston, 2006) showed that practice can reduce dual-task interference by shortening the bottleneck stage of multitasking. This stage-shortening hypothesis of multitasking practice effect was supported by a later fMRI study (Dux et al., 2009) which concluded that training can improve multitasking performance by increasing the processing speed in prefrontal cortex.

### Task variety and implementation

There are various multitasking paradigms adopted in the empirical research in the field of human multitasking. Representative examples include the Psychological Refractory Period (PRP) paradigm, dual-task paradigm, and task-switching paradigm. In laboratory research, these paradigms mainly contain simple stimulus classification task, for example, to judge whether a letter is vowel or consonant. In our proposed mobile application, we plan to design and include different interesting and complicated tasks which may be also more relevant to our daily life. The way of multitasking, however, will be similar to those aforementioned multitasking paradigms such that people will be asked to perform the tasks either concurrently or in a rapid switch.

The tasks will be framed in a casual gaming environment, with in-app tracking of progresses and milestones. At every given point of time, players will be engaged in two separate tasks, and the goal is to finish both tasks within a reasonable level of performance, as well as under fixed time pressure. The overlaps between conflicting task natures, which are informed by psychological research, can serve as different categories of challenges. For instance, two concurrent tasks that demand focal visual attention will be labelled as visual challenges, and two concurrent tasks that demand a working representation of a word or digit string will be labelled as memory challenges. Players will be able to either choose their preferred area of training, or be assigned a randomized sequence of task combinations.

To increase playability, a basic high-score and levelling system will be implemented. Multitasking costs for each particular category can be readily read and compared using a fan diagram. If the application framework and running cost permits, player-to-player (P2P) connection in which two players can be connected via Bluetooth or Internet and challenge each other.

### Implementation plan

The mobile application will be written in the Objective-C programming language using Apple's Integrative Development Environment (IDE), Xcode. The programming work will be shared among the whole team as well as one assistant programmer proficient in Objective-C. In order to create an application in concordance to Apple's design rules and principles, a graphic designer will be in charge of user interface design to ensure high accessibility and professional outlook. Collaborative works will be conducted on the GitHub platform. After internal beta-testing, the finished application will be submitted to and released on the Apple App Store.

In order to attract maximum exposure, the application will be free to download, but to unlock certain features, such as more levels, more combinations, reduced time lapse between competitive play, or personalization of profile, players will need to pay. Due to the small starting capital, network marketing will be our primary method to promote. This includes sharing the application on social media and inviting new users in exchange of the aforementioned perks. Some stationary advertisement within the campus will also be put up.

We do not resist the possibility that the application will turn into a business venture in the long run. The highest goal of ours is to have real impact on the society.

### Comparison to existing applications

Currently, there are relatively few mobile applications specifically tailored to training of multitasking performance, compared to the plethora of cognitive or 'brain' training programs and games. One of the most popular applications in terms of cognitive training is Brain Wars, a competitive brain training game which pits random players on the network against each other to three rounds of 20-second puzzles. The games usually involve basic math or memory elements with low requirements for new players. However, it did not involve concurrent multitasking in the game design.

Other more specifically designed multitasking apps include BrainLock, which is a coordination game which divides your smartphone screen into the upper and the lower halves. Each half displays a game which demands the player to balance an object or direct an object away from obstacles by tilting the smartphone. However, it is thusly a primarily eye-hand coordination training.

Another app, Concurrency, relies on interruption training, which will, according to preset schedule, stop users from doing whatever they are doing with simple puzzle tasks that take up to

one minute of time to finish. It has less of a casual orientation, and is geared towards a formal training paradigm for people highly motivated to improve multitasking performance. It also provides users with statistics including number of interruption responded and ignored, performance, response time, etc.

#### Budget plan

Item	Description	Amount
Graphic designer	App Interface Design	\$2000
Apple developer program membership	Apple's official account for distributing apps on app store	\$769 (= USD\$99)
Promotion	Online social media promotion and offline in-campus promotion	\$1000
Assistant Programmer	An assistant to share the workload	\$1200

#### Referenecs

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