

Brain-training Games: Play as a Tool for Cognitive Enhancement

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EXTENDED ABSTRACT

Brain-training games are digital games intended to exercise and improve specific aspects of cognitive function and behavior. The prospect of cognitive enhancement has a long history with the young seeking to boost performance and the old to stave off mental decline through pharmacological products. However, using digital games for cognitive intervention is a fairly recent cultural phenomenon. Mobile brain-training games like Lumosity and Peak claim to help improve thinking through gamified tasks, challenges that exercise various cognitive skills (e.g. working memory, attention) and rewards to increase engagement and learning. Such assertions are so irresistible that consumer purchases of this genre increased over 400% since 2012 (Sharp Brains, 2019).

Interest in brain-training games may be growing; but scientists have expressed, at best, moderate optimism about their efficacy (Stanford Center on Longevity, 2014). Although users significantly improve at cognitive skills directly relevant to in-game tasks, there is lack of evidence on how transferable these abilities are to real-life performances (Simons et al., 2016). Also, there is scant knowledge about *how* users evaluate the usefulness of digital games for brain-training. While evidence of gains from brain-training games is lacking, studies suggest that people continue to play because of a digital placebo effect (Torous et al., 2016; Foroughi et al., 2016); optimism about brain-training games' potential efficacy (Rabipour, & Davidson, 2015; Torous et al., 2016); and preference of games over other strategies for cognitive enhancement (Rabipour et al., 2017). The discrepancy between established and perceived benefits could be attributed to producers' aggressive marketing strategies. For instance, one study showed the knowledge that playing the experiment's games can potentially boost performance on a cognitive task made an actual difference in participants' performance (Tiraboschi et al., 2019). While gamification elements have been associated with user engagement strategies (Hamari et al., 2014), the role of play in cognitive training, however, remains unclear.

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There is a need to address how games as an intervention tool and their marketing efforts are used to engender a digital placebo effect. In our investigation of use cases absent in the current, primarily survey-based literature, we probe players' dispositions and how they experience play as a mode of cognitive intervention. We also examine how the positioning of brain-training within the wider ambit of the app culture legitimizes their evaluation as games as opposed to cognitive interventions. We argue that brain-training games represent a classic example of ludification of cultural practices (Raessens, 2006), in this instance cognitive interventions, using the app economy.

For our study, we are conducting an inductive thematic analysis (Braun & Clarke, 2006) of user reviews of brain-training games. This methodology produces decidedly different data from that garnered by existing surveys. We expect rich qualitative expressions of values and perceptions about game-based cognitive interventions; for example, thematic analyses of game reviews have been employed to understand user-experience in VR-exercise games (Farič, et al., 2019). We first identified the top three most sought-after brain-training apps in 2017, 2018 and 2019 from popular press articles (e.g. ProDietReviews, 2019): Lumosity, Elevate and Peak. Reviews were gleaned from the Google Play Store, where a substantial portion of such games are downloaded in the US. Following the six-part phases of qualitative thematic analyses, we will review the entire corpus to ensure trustworthy, credible and transferrable findings (Nowell et al., 2017). Our analysis will reveal themes concerning user experiences and perceptions that arise naturally from the data.

Although research is ongoing, potential findings have already emerged. A primary examination of user reviews of brain-training programs suggests that players tend to associate their experience more with enjoyable play activity than interventional engagement that impels investment into the games: "This is a really good game to test your brain." Challenges, rewards and achievements engineer experiences that are arduous enough to engender the sense of cognitive load but short enough that users feel motivated to keep engaged. "I really like the enhancement to seeing my status and next badges available. . . And I especially love the new streak [function]!" Reviewers refer to these games as exercises and workouts akin to physical activity that stimulate the mind which indicates both the psychological and behavioral affordances of play elements (Hamari et al., 2014). One user writes, "Great mental exercise each morning" while another reports, "The work outs are great I just use the daily one which fits well. . ."

Expectations are largely contingent, however, on the free-to-play economics of mobile games and the app economy (Nieborg, 2015): games should be free or reasonably priced, customizable and frequently updated for new content. For example, one review states, "I play the free games but have honestly been playing the same ones everyday which are helpful but not the point of wanting to upgrade." Generally, benefits are seen as a form of self-improvement. References to perceived cognitive benefits include greater attention and memory efficiency: "Using it (Lumosity) to increase my memory and speed up my brain processes." Users mention learning and honing math and language skills for Elevate, "[i]mproved my reading and writing skills tremendously. I spot errors in grammar." Users of Lumosity and Peak, on the other hand, speak of learnt behavior: ". . . improving my productivity and my decision making in day to day life; taught me how to organize my thoughts and plan better."

While use of games for serious purposes and gamification (Hamari et al., 2014, Deterding et al., 2011) has been associated with productive benefits of game-elements, the resulting dynamics in domains like cognitive interventions is important

to understand especially since they are less traditionally associated with play. Ultimately, the goal of this analysis is to reveal the role of games in user appreciation and adoption of smart-phone based brain-training interventions.

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