

## Chapter 67

# Effect of Gaming Mode Upon the Players' Cognitive Performance During Brain Games Play: An Exploratory Research

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### ABSTRACT

*An improvement in cognitive performance through brain games play is implicit yet progressive. It is necessary to explore factors that potentially accelerate this improvement process. Like various other significant yet unexplored aspects, it is equally essential to establish a performative (fusion of accuracy and efficiency) insight about players' cognition (memory, vision, and analytics) among the different modes of brain games. This paper presents empirical research (n=117) that investigates the impact of different modes of brain games (single vs. multiplayer) upon the players' cognitive performance. An accumulated result of the research revealed that the cognitive performance in memory stimulating and visual activity-oriented brain games play significantly boosts during multiplayer mode. Similarly, cognitive accuracy in analytical brain gameplay also increases during the multiplayer mode; however, it's rather inefficient. In addition, both the components of cognitive performance in single-player mode are reported as negatively correlated, while in the multiplayer mode it's rather contrary.*

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## 1. INTRODUCTION

Cognitive performance (CP) is a mental capacity that is affected by inhibitory control and executive functions, which are factors responsible for the planning, intellectual organization and behavior control (Diamond., 2013; Ruiz-Ariza et al., 2017). Memory, visual acuity, concentration and numeric-linguistic reasoning abilities appear among the most important components of CP (Ruiz et al., 2010; Diamond., 2013; Esteban-Cornejo et al., 2015; Ruiz-Ariza et al., 2017). It has been observed that young people with high CP have greater self-esteem and self-concept (Fati-Ashtiani et al., 2007), and they show less risk of chronic widespread pain (Gale et al., 2012). However, low CP has been associated with anxiety disorder (Martin et al., 2007), depression (Jaycox et al., 2009), and psychological distress (Gale et al., 2008). Therefore, to ensure a better living of mankind, it's necessary to find an effective mean of CP improvement as well as rehabilitation.

Brain games (BGs) have been enormously being considered for a long time as one of the most cost-effective, entertaining and compelling means for the progressive improvement of CP (Lowery & Knirk., 1982; Dorval & Pepin., 1986; Drew & Waters., 1986; McClurg & Chaille., 1987; Dustman et al., 1992; Okagaki & Frensch., 1994; Subrahmanyam & Greenfield., 1994; Greenfield et al., 1996; Yuji., 1996). Recently, scholars also proposed several BGs that mostly offer single-player gaming mode in this regard (Chuang & Chen, 2009; Byun & Park, 2011; Foukarakis et al., 2011; Vasconcelos et al., 2012; Belchior et al., 2013; Navarro et al., 2013; Cecilia et al., 2014; Lopez-Samaniego et al., 2014; Matsushima et al., 2014). However, in order to achieve their ultimate goal, a challenge is to keep players committed to undertake BGs playing activity on regular bases for a longer period of time (Roschelle et al., 2000; Aison et al., 2002; Garris et al., 2002; Melenhorst., 2002; Eggermont at al., 2006; Ijsselsteijn et al., 2007; Pearce., 2008; O'Donovan., 2012). Single-player games, especially of serious nature such as BGs, normally lack in this regard. To overcome this issue, Faizan et al., 2017 designed a cooperative yet competitive multiplayer gaming environment for the BGs of "*BrainStorm*" game suite, which triggers the psychosocial factors of motivation among the players to achieve their long-term commitment with BGs playing activity. However, the proposed solution didn't delineate against the following contradictory facts about players' CP that potentially induce due to the psychosocial factors during the multiplayer mode of BGs play.

The multiplayer mode of videogames offers a competitive environment that motivates its players to aggressively engage in gaming activity, which consequently improves their efficiency in terms of response time during the gaming session (O'Donovan., 2012). Scientists recently started associating this phenomenon with the improvement of players' overall gaming performance (i.e. the fusion of accuracy as well as efficiency), and thus proposed numerous multiplayer video game solutions (Chen et al., 2016; Marin et al., 2017; Jason et al., 2018; Klopfenstein et al., 2018). On the contrary, it is equally evident that a continuous impel to respond quickly in such an extremely demanding environment often affects players' level of engagement that negatively reflects upon the accuracy of their gaming decisions; especially when rather than frequently performed natural stimulus-response tasks the nature of a particular activity explicitly involves memory and analytics for unanticipated circumstances (Matthias et al., 2005).

Based on the preceding facts, this paper presents empirical research that primarily validates the following two independent hypotheses:  $H_1$  = "In comparison with single-player gaming mode, the competitive environment of multiplayer BGs play induces more arousal in CP" and  $H_2$  = "In comparison

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