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Video gaming and Fluid Intelligence

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Abstract

Objectives: There is not much research to explore the impact of gaming on fluid intelligence.

Material & methods: A non -systematic literature search was performed from the search engines and other sources from 2009 to 2019.

Results: The findings revealed that the number of hours of play was associated with fluid intelligence. A significant association was found between fluid intelligence and video gaming.

Conclusions: There is a need to explore it longitudinally for the relationship as well as for its therapeutic implications for cognitive retraining.

Keywords: Fluid Intelligence; Video gaming; Cognitive abilities.

Introduction

Video-gaming has become an emerging mode of entertainment and a promisingly widespread industry over the past couple of decades. It is a preferred choice of activity over offline hobbies among an increasing number of people, especially young individuals worldwide.

Extensive researches have revealed possible positive and negative effects of both online and offline video-gaming on a wide array of psychological correlates and mental health outcomes. Shreds of evidence of its impact on neuropsychological and cognitive factors are gradually coming into prominence as well. Today's games, especially those as Strategy, Simulation, Puzzles, First Person Shooters and Multiplayer Online Battle Arenas, demand advanced analytical, visuospatial, and problem -solving capacities and tap several other facets of cognitive resources. One such attribute which can have positive or negative association is fluid intelligence. Fluid intelligence involves thinking and reasoning abstractly and solving problems, which is considered independent of learning, experience and education. The complexity of this new-generation gaming and its correlation with cognitive factors makes them intriguing targets for scientific investigation.

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A vast number of researches have validated the impact of video gaming on individual's psychological and behavioral factors. Several studies have also explored the content and characteristics of several categories of video games and its relationship to gamer's behavioral outcomes. However, a relatively less number of studies have explored the gaming's impact on cognitive factors, especially fluid intelligence. Systematic reviews or meta-analytic studies in this area are also sparse, with a broad variability of findings. Hence more researches is needed to establish the nature and direction of relationship between fluid intelligence and video gaming. Such knowledge of outcome is also required to design, enhance, or improvise training and intervention modalities. The current narrative review is exploring the effect of video games on fluid intelligence.

Methods

We used non-systematic review approach to search the electronic databases using combinations of keywords associated with video game play, cognitive factors, fluid intelligence ,articles, dissertations, and book chapters that were eligible for inclusion for the present purpose . The search included articles published between 2009 and 2019. Studies from any country were eligible for inclusion, and those published in languages other than English were eligible for inclusion as long as they could be translated into English.

Results

Researches have revealed the benefits of experiment -based web-gaming as a tool for 'brain-training' for cognitive skills.

Practiced performance on a non-commercial videogame developed by psychologists, Space Fortress, was shown to correlate positively with intelligence [1].

A plethora of studies has also evidenced a direct relationship between fluid intelligence and enhanced performance in commercialized video-gaming [2,3,4]. Fluid intelligence measured by the WASI II Matrix Reasoning Subtest and Raven's advanced progressive matrices showed a significantly positive correlation with rank of performance among players [5,6].

It was seen that exposure to video games might improve fluid intelligence [7]. Playing commercial video games for about 8 hours provides statistically significant advantages in the measures of problem- solving, spatial skill and persistence [8]. Video-game players who reported playing first-person shooter games for more than 5 hr per week for over a year were found to have outperformed non-gamers on measures of fluid intelligence [9]. Games like a puzzle, First Person shooter, action strategy and MOBA's although created and commercialized for entertainment primarily, are rather complex and require the use of multiple cognitive abilities [10].

The relationship between casual video games, categorized according to task based performance, and several cognitive ability measures were explored. It was found that games categorized to tap working memory and reasoning were robustly related to performance on working memory and fluid intelligence tasks, with fluid intelligence best -predicting scores on working memory and reasoning games [11].

Discussion

With the invention and easy accessibility of play stations, Xboxes, consoles, touch screen mobiles and high -end computers and the interesting and mind engaging characteristics involved in various games, more and more children of the Generation Z are being attracted to this mode of play. As such, Individuals are exposed to video gaming as early as in their early childhood years. There has been a debate about whether having higher fluid intelligence inclines players more to play games or whether playing games influences fluid intelligence. A longitudinal study investigated the relationship between gaming and fluid intelligence from an effects or a selection perspective. The results partly confirmed the effects perspective for fluid intelligence, that is, an increase in children's digital gameplay results in a subsequent increase in children's fluid intelligence over time, while the selection perspective was not supported. A limited number of studies have shown contrary pieces of evidence. These have reflected on the lack of transfer effects between video gaming and cognitive skills. The training of young adults on casual video games do not reflect improvements in reasoning, working memory, episodic memory, or perceptual speed [12].

Playing video games has shown effectiveness in cognitive training. Few studies have shown structural and functional changes in brain areas and neural network systems due to hours of playing video-games in laboratory experiments. These changes have been reflected in brain areas, especially known to be associated with intelligence and executive functions. It was also seen that in comparison to inexperienced controls, long-term trained Baduk players (a popular video game) developed larger regions of white matter with increased Fractional Anisotropy (FA) values in the frontal, cingulum, and striato-thalamic areas that are related to attentional control, working memory, executive regulation, and problem-solving. Brain image analyses using optimized Voxel-Based Morphometry (VBM) revealed gray and white matter changes in the practice group of females who played *a commercial video game for 4 hours* per week for four weeks. Gray matter changes theoretically relevant for intelligence were observed for the practice group mainly in frontal clusters (Brodmann areas 9 and 10) and smaller parietal and temporal regions. White matter findings were focused on the hippocampal cingulum and the inferior longitudinal fasciculus. These gray and white matter changes presumably induced by practice did not interact with intelligence tests' scores [13].

There have been several arguments regarding methodological pitfalls concerning researches in this area of cognitive skills and gaming. These primarily include incorporating extreme groups and large variability among gamer participants.

Conclusions & implications

Most studies in this area have focused on the positive effects of video gaming on fluid intelligence, while very few studies have published outcomes reporting a negative correlation between the two. Fluid intelligence might also be impacted by several psychological and behavioral correlates proven to be associated intrinsically with video gamers. Thus, in consideration of including such variables and through overcoming methodological barriers, there is ample scope for scientific exploration in this area, following which conclusive evidence regarding the impact of video gaming and fluid intelligence and its implication for interventions/psychoeducation would be established.

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