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## How Do Video Games Affect the Brain?

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Kenneth Lee

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### How do video games affect the brain?

Video games are a wildly popular past time in not only America, but other countries as well. Its popularity has done nothing but increase in an exponential fashion, engulfing more and more members of society in its reach; however, its gaining traction in combination with behavioral observations and frequent violent events compelled many to question its effects on those who play them. Some attribute tragedies like recent school shootings to the vast array of First Person Shooter(FPS) games, blaming it for engraining in adolescents' and adults' brains a sense of increased aggression and violence. Others praise educational games for stimulating the brain, teaching it essential logic and knowledge to thrive in the real world. Regardless of ones' stance, it is a baseline fact that video games' effects loom large in America. This paper will target this aspect of our society, focusing primarily on video games' effects on adolescents in America. Video games encompass a vast array of mediums, including arcade machines, computers, individual consoles, and much more; however, the focus of this paper will be on computer games and consoles, as its combined reach is much larger. It is important to focus on a larger demographic so that the examples are diversified. The "effects" of video games can be specified as brain functionality, social-behavioral patterns, and physical impacts. Brain functionality include aspects of the brain such as memory, attention span, sense of logic. Social-behavioral patterns outline patterns of an individual's behavior such as aggression, empathy, intelligence, and kindness. Lastly, physical impacts include eating patterns and diets, and overall health. Studying these three topics will allow us to define the impacts of video games on an individual's life.

It is very common for the brain to be influenced based on an individual's activity. In this case, video games are a great point of measurement, as adolescents spend hours a day on video games. Since the brain is a muscle, it is subconsciously being trained during long gaming sessions depending on the game. If it is an educational game, for example, presenting questions related to mathematics or logic, repetitions cause the brain to form a connection, training the brain to think a certain way. Whether an individual's stance is positive or negative on video games' effects on the brain, "games have sometimes been praised or demonized, often without real data backing up those claims. Moreover, gaming is a popular activity, so everyone seems to have strong opinions on the topic" (Palaus). One vital functionality of the brain is its attention span. Many day to day activities, whether it be at a job, in college, or just in a casual setting, require the individual to activate their brain to focus on the task at hand. It requires copious amounts of focus, energy, and willpower to sustain attention on a single topic. Research results from 116 scientific studies found that "gamers show improvements in several types of attention, such as sustained attention or selective attention. The brain regions involved in attention are also more efficient in gamers and require less activation to sustain attention on demanding tasks."(Palaus). This portrays how video games could actually be a useful tool in improving attention span, rather than decreasing it. Because almost all games require the player to focus on a single objective and take incremental steps to reach that objective, it trains the player to consistently think and focus in a way to achieve their goal. Furthermore, because games are in general more enjoyable to play, it is an effective medium to train an individual's attention span as opposed to an exam or another traditional medium. Looking beyond attention span, there are multiple studies that the effects of video games on an adolescent could potentially retain its benefits even in later stages of life. An intervention study was done in which healthy individuals

were trained through video games. The results showed that “the group trained with games showed post-training improvements in visuospatial working memory, and in short-term memory and episodic memory. Some results were maintained during a 3-month follow-up period. The authors concluded that older adults still retain some degree of plasticity and that video games seem to be an effective tool to improve some memory functions in aging.” (Toril). This highlights the fact that playing video games could also improve brain plasticity and the rate at which the brain retains functionality. Since the brain naturally loses its ability to perform and retain memory, this study shows how using video games as a therapy or treatment could have long term benefits to the brain.

Similar to brain functionality, an individual’s social and behavioral patterns can be defined by many external factors. This includes social settings like meetups with friends, messaging online, and also in-game settings where players are playing against each other through various mediums. I will be focusing on aspects of an individual’s social and behavioral patterns such as aggression, empathy, and kindness. It is commonly thought that First Person Shooter games promote aggression and violence in an individual. In first person shooter games, an individual’s character is holding some type of gun and their goal is typically to kill other players in the game. Many argue that this empowers individuals to take it a step further and reproduce this scenario in real life, causing mass school shootings and violent thoughts in adolescents. Although scarce, many have already come to the conclusion that “excessive first-person-shooter-gaming results in a blunted response to negative emotional stimuli, thereby preventing empathy and lowering the threshold for aggressive behavior”(Ko). An emerging technology, functional magnetic resonance imaging (fMRI) was used to test this existing hypothesis. Gamers and non-gamers were both shown photos of gruesome, bloody battle scenes in contrast to neutral,

everyday images such as a cup or chair. Gamers showed a significantly lower activity in the lateral prefrontal cortex compared to the non-gamers, which “can be interpreted as a dampening of experienced empathy elicited by the harm of a third person” (Liebermann). This affirms the hypothesis that playing first person shooter games does dampen the empathy of a gamer. Even after the gamers viewed a bloody scene from a battle, their response was minimal and had a very low activity in the lateral prefrontal cortex. Furthermore, the non-gamers showed higher activity in the lateral prefrontal cortex. There was a recent study that shows that “activity of the lateral prefrontal cortex is able to suppress unwanted memories”, meaning that the non-gamers, or the control group, actively tried to suppress negative thoughts when viewing these gruesome battle scenes compared to the gamers (Levy and Anderson). This illustrates how non-gamers seem to have more of a reaction or sense of empathy when seeing a third person being harmed. The shortcomings of the research, though, state that the gamers could have had less of a negative and empathetic reaction to those pictures as “a consequence of a psychological habituation process because the gamer group is confronted with violent scenes more frequently in their daily life” (Hooker). Since the gamers play first person shooting games frequently, their lack of empathy could also be due to the fact that their brains have already been conditioned to view images like that every day. Although this study is not conclusive, it does present major insight into the fact that video games affect an individual’s social-behavioral pattern, including empathy, aggression, and lack of suppression of negative thoughts.

Playing video games is largely a stationary activity—the individual does not exert any physical activity. Rather, they control their characters using a keyboard, mouse, or console, completely eliminating any need for moving their bodies unlike sports. This, in turn, causes many adolescents to be sitting down and stationary for large periods of time, affecting their

physical stamina, dietary habits, and physical health. There is definitely a difference between online games versus traditional games, though—“online games strive to keep gamers engrossed in the gaming world, often at the cost of real-world activities, such as eating at regular mealtimes or engaging in physical activity. However, in traditional video games, a gamer can press pause when needing to take a break. Furthermore, research has found that online games are more addicting than traditional offline video games and have resulted in death because of over exhaustion”(Cemelli). Because real time games require the player to be present in the moment, it removes all possibilities of the individual being able to momentarily pause and resume the game later on. This illustrates how an individual can forgo essential human activities such as eating, and significantly change their schedules. Furthermore, “research has shown strong positive associations between screen time activities (i.e., television, computer, video games) and adverse health conditions. For instance, research consistently reports a strong positive correlation between screen time activities and obesity, metabolic syndrome, and other poor health outcomes, such as cardiovascular disease. Furthermore, time spent engaged in screen time activities has been positively associated with consumption of energy dense foods and snacking frequency” (Cemelli). This bolsters the hypothesis even more that video games have a negative impact on an individuals’ lifestyle; however, I argue that video games that require the player to move around and exert physical energy can have an inversely positive effect on an individual’s health. Many brands in the game industry, aware of this negative health issue, now create fitness related games that are enjoyable to play yet allow the user to exercise at the comfort of their own homes. Video games such as “Wii Fit”, “Dance Dance Revolution”, and other popular names encourage players to exert physical energy, shying away from the normally sedentary positions that traditional video games require players to be in. In order to combat video games’ negative effects

on health, players should strive to play a variety of not only sedentary but also active video games, to promote and encourage physical activity. Many of these fitness games are intensive enough to be considered moderate physical activity, so it could potentially replace exercising.

Playing video games has swiftly become the favorite pastimes of millions of Americans, with its popularity growing exponentially since the rise of technology and its hegemonic permeation in nearly everyone's lives. Exposure to hours of screen time in a video game conditions or reconditions the brain's cognitive ability, certain aspects of an individual's behavior, and health habits. This paper studied the effects of video games on all three of those aspects, concluding that it had a positive impact on an individual's cognitive ability, negative affect on social behavioral patterns, and an equally negative and positive affect on an individual's health habits. It is important to note, however, that these conclusions are not all-inclusive. Many other internal and external factors affect the results of research, and it should be taken into consideration that video games could affect one individual different than it affects another. Circumstantial conditions affect these results as well; however, my aim is to provide insight into how it could potentially affect an individual's lifestyle given a set of conditions. Video games have come under a lot of scrutiny recently because of the recent school shootings that have been increasing in frequency, causing it to have a largely negative connotation in society. I believe, however, that video games have a largely positive impact on an individual. If an individual is able to control and limit their time playing video games and treat it as a leisure activity, the negative effects of long video gaming sessions would not affect the individual as much, if any. As with almost everything in life, activities, substances, and many other things should be handled in moderation. Instead of deeming video games as the sole catalyst for school shootings, for example, researchers and critics should focus on other mental aspects of the

individual in combination with video games. Furthermore, I believe that educational video games should be more widely used. Because of the strong evidence that shows that educational video games is largely beneficial for a developing adolescent's brain plasticity and logic, I think it would be beneficial to implement such a system in school for example. In conclusion, I do believe that in moderation, video games could be beneficial for an individual's mental and physical health, if played in moderation and in the right circumstances.

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