THE IMPACT OF VIDEO GAMES ON COGNITIVE DEVELOPMENT

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ABSTRACT

Video games and internet gaming have been more popular with individuals of all ages in recent years. Over the course of the previous 50 years, the number of people who play games on a regular basis has risen from a few thousand to an estimated 2.2 billion people globally. Most studies on how these games influence the brain have focused more on the detrimental than the beneficial consequences, such as games that make players feel powerful emotions like aggression, fear, and wrath. Video games have been connected to gamer lassitude, poor performance at work and school, as well as dismal social behavior and relationships, according to studies that have shown how addictive they can be. Recent research has shown the positive effects of playing these games on human development in general. Additionally, studies have shown that playing these games has a positive impact on a variety of crucial cognitive abilities, such as multitasking, self-empowerment, control, and quick and precise decision-making. This article uses data from studies of the selected population to compare and contrast the cognitive abilities of gamers with those of non-gamers in areas including response speed, task completion under time constraint, and multitasking. The findings from these studies might be useful in assessing how internet use and video games affect key aspects of human cognition.

KEYWORDS: Video games; online games; Cognitive skills; multi-tasking; reaction time.

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INTRODUCTION

In today's world, video games are a very common source of amusement and pleasure. The need to comprehend how video games affect numerous facets of human development, especially cognitive development, has expanded along with their popularity. The growth and maturity of cognitive skills including memory, attention, problem-solving, and critical thinking are referred to as cognitive development. The impact of video games on cognitive growth is a much debated and investigated topic. While there have been some worries expressed about the possible harms of excessive gaming, there is also evidence to support a favorable influence of video games on cognitive abilities. Parents, educators, and researchers must be aware of the possible advantages and disadvantages in order to make wise judgments and suggestions about the use of video games.

This study will examine how video games affect cognitive growth, emphasizing both the positive and negative effects that might occur. We can better understand the intricate interactions between video games and cognitive development by looking at many facets of gaming and how they relate to cognitive abilities. Video games have developed into a substantial kind of entertainment and a well-liked platform for

engaging interactions. They have progressed from simple, pixelated games to complicated, immersive virtual worlds with cutting-edge visuals and challenging gaming mechanisms. Research into video games' influence on different facets of human behavior, including cognitive development, has expanded as a result of their popularity.

The growth and development of cognitive skills, which include mental activities like attention, memory, problem-solving, reasoning, and perception, is referred to as cognitive development. These abilities are essential for how people receive information, make choices, and interact with their surroundings. Video games may either favorably or adversely affect cognitive development since they require players to perform cognitive activities. Video games and cognitive development have been the focus of much research and discussion. Researchers have looked at the advantages and disadvantages of playing video games. Attention, visual-spatial ability, hand-eye coordination, problem-solving skills, and the capacity to multitask are all improved. Additionally, certain educational games have been specifically created to improve cognitive abilities and encourage learning.

On the other hand, worries about possible adverse consequences have been voiced. Overindulging in video games and being sedentary may result in a lack of physical exercise, which is crucial for growth and general health. Video game addiction has also been acknowledged as a serious problem, with people struggling to control their gaming behaviors and disregarding other crucial aspects of their life. In addition, although being complicated and poorly understood, the effect of violent video games on hostility and aggressive conduct is still up for debate.It is crucial to remember that the impact of video games on cognitive development might change based on the genre of the game, how long the player plays for, their age, and other variables. Ongoing study attempts to provide a thorough knowledge of these impacts and direct the creation of recommendations for a healthy and sensible usage of video games.Overall, even though playing video games may have both beneficial and negative effects on cognitive development, getting the most out of them while avoiding any hazards requires moderation, age-appropriate material, and a healthy lifestyle.

LITERATURE REVIEW

Wan, Ailinet.al (2020). The fast emergence of new media is a result of the era of technological growth. Among these, playing video games may have both good and bad consequences on a child's development. According to research, playing video games improves fundamental mental functions like decision-making, perception, memory, and attention; it sharpens children's thinking skills by teaching them idea development techniques; it aids in children's social development and protects them from risks like stress and depression; and it allows them to work together to complete cooperative video game missions. Video games will also impair children's knowledge acquisition, encourage children's aggressiveness, antisocial conduct, and social isolation. But the more time kids spend playing games, the worse they do in school. In other words, it has been shown that playing video games helps kids grow positively by teaching them virtues like perseverance and healthy competition. Children have learned the importance of collaboration and teamwork via these activities, which is another crucial aspect of child development. Video games also encourage aggression, discourage professional social conduct, and even lower academic achievement. Video games should be properly assessed in this perspective.

Green, C. et.al(2015). Video game culture has permeated American society at large. As the video game industry has exploded in popularity, so has interest in the possible psychological and behavioral consequences. Research to date suggests that some commercial video games, but not all of them, may dramatically modify a variety of aspects of human behavior, including the cognitive skills under discussion here.

Hisam, Aliya et.al (2018). The purpose of this study is to examine the effects of video game playing on adolescents' mental abilities. The percentage of gamers who got all five questions right across tests of general knowledge, analogy, processing speed, logical reasoning, and mathematical intelligence ranged from 61.3% to 78.5%. There was no statistically significant relationship between gaming experience and IQ (p=0.188). Conclusion Gamers tend to have a broader range of cognitive abilities, especially in the areas of reasoning, processing speed, and mathematics. According to these findings, frequent video game players have higher cognitive abilities than individuals who don't play video games.

Smirni, Daniela et.al (2021). Young people of all ages are spending increasing amounts of time in front of video gaming consoles. The present Coronavirus pandemic has significantly cut down on people going outside and interacting with one another. Thus, stress and the fear of becoming ill may be behind the rise in VG consumption. The intellectual, pedagogical, and career-related implications of VGs are attracting the attention of scholars, parents, teachers, physicians, and aspiring public policymakers of all ages. Twelve papers were disregarded because they were not relevant to schooling whereas 99 studies were assessed and included. Any discussion of the efficacy of VGs must take a binary stance in which VGs are either categorically "good" or "bad." The complexity of VGs should be considered, and they should be distinguished by many dimensions interacting with one another.

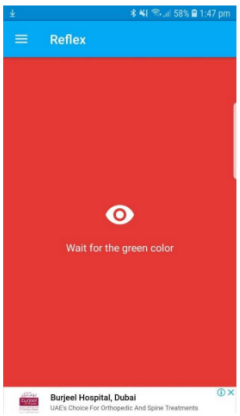
Reynaldo, Charles et.al (2021). Some research suggests that gaming might improve mental acuity. Many different types of cognition may be affected by playing various game genres. The purpose of this paper is to investigate whether or whether gaming may improve cognition and judgment, and if so, how different games affect different mental processes. The authors evaluate earlier research on video games and cognitive abilities. The essay looked at both experiments and literature reviews. The results of the review confirmed that playing video games had positive effects on cognition and decision-making. Participants' cognitive skills, including perception, attention management, and decision-making, were enhanced by video game instruction. Although FPS gamers often have lower switching costs on the job, RTS players do better in terms of cognitive flexibility. Health care workers, such as nurses and doctors, learned more effectively via immersive simulation games. Students who played video games in high school or college outperformed their peers who did not play video games on exams measuring cognitive capacity. Further study is needed to conduct a bigger experiment to verify our findings.

RESEARCH METHODOLOGY

Memory, multitasking, and functioning under time pressure, as well as visual response quickness, are all extensively examined. Primary and secondary data were used to compile this research. The primary research included 8 healthy individuals, four gamers and four non-gamers. An online tool called "Reflex" was employed to get reliable data for the first ability, which measured participants' response times. After giving each person five times to answer, all abnormalities were removed before calculating each participant's average response time. The "2 cars" web application was used to measure participants' multitasking skills for the second cognitive ability. Participants had to drive two automobiles at once to get the highest score. Each participant was given five opportunities to react, and after eliminating any irregularities, the average multitasking score for each was determined. Finally, an online application called "Indefinite" was used to test the third cognitive ability, working under time constraints and memory. The user must respond to each question within a specific time limit and remember their previous responses in case they are revisited. Five responses were provided to each participant, after which the average was calculated and outliers were eliminated.

Experiment 1

An online tool named "Reflex" was used in experiment 1 to evaluate the individuals' visual reflexes in order to assess the first cognitive skill, response time. This was accomplished by having the screen become red once the user selected the START button in the program, with the message "Wait for the green color," followed by a prompt to "tap the green color." The application then calculated the amount of time that had passed between the green screen and the subject's tap. Below is a description of the screen's visual representation:



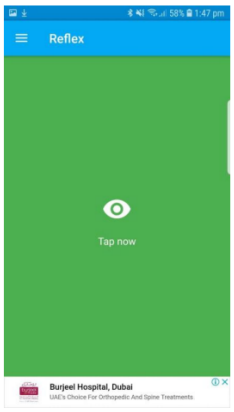


Figure1. Before touching the screen

Figure2. When the app prompts to tap the screen

A stopwatch was used to time how long it took each participant to touch the screen properly on every opportunity after they had completed the task five times for each topic.

Experiment 2

In experiment 2, a web application named "2 cars" was used to test subjects' ability to multitask. Each participant was required to concurrently maneuver two vehicles, one on each side of the screen. The subject would be disqualified and the game would stop if they had struck a square or missed a circle. In order to maneuver two automobiles and gather one shape while rejecting the other, the subject had to pay attention to both cars and the shape collection while ignoring or rejecting the other. This is referred to as multitasking. Below is a description of the screen's visual representation:

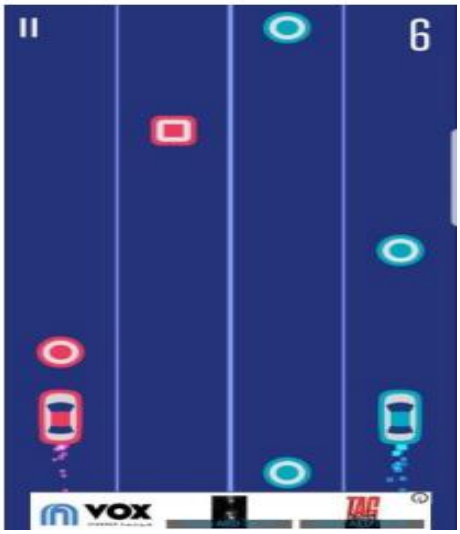
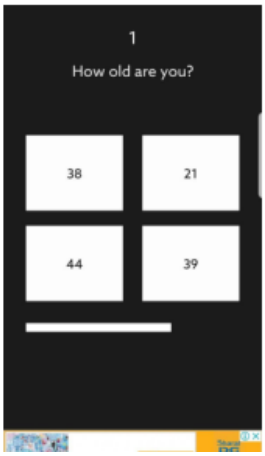


Figure3. Visual Representation of the App "2cars"

Experiment 3

The respondent was also expected to have committed to memory the responses provided, since they would be asked again later on in the game with a reduced time restriction. Since the individual would be under increasing time pressure during the course of the exam, this method was useful for gauging both memory and performance under pressure, but would also be required to memorize every response and repeat it when requested. Below is a description of the screen's visual representation:



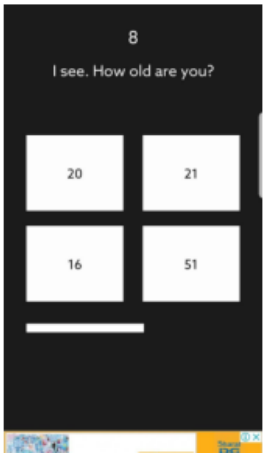


Figure 4. Question About Age Figure 5. Same question being Figure 6. End of Game

As is clear, the individual's age was the topic of the first question, which was then asked again as question 8.

DATA ANALYSIS

Experiment 1

Table1. Reaction Time Comparison for Gamers Vs Non-Gamers

Reaction time								
	Name	**Try 1**	**Try 2**	**Try 3**	**Try 4**	**Try 5**	**Average**	**Total average**
Gamers	Johnathan	0.225	0.224	0.231	0.213	0.211	0.2208	0.2346
	William	0.243	0.233	0.265	0.244	0.212	0.2394	
	Danial	0.235	0.244	0.212	0.255	0.247	0.2386	
	Sarah	0.265	0.212	0.254	0.234	0.233	0.2396	
Non-gamers	Savraj	0.253	0.282	0.252	0.284	0.272	0.2686	0.2714
	Ankur	0.292	0.285	0.315	0.291	0.266	0.2898	
	Hannah	0.301	0.263	0.291	0.285	0.251	0.2782	
	Isbah	0.254	0.244	0.245	0.243	0.265	0.2502	

Experiment 2

Table 2. Multi-tasking Capacity Comparison for Gamers Vs Non-Gamers

Multi-tasking								
	Name	**Try 1**	**Try 2**	**Try 3**	**Try 4**	**Try 5**	**Average**	**Total average**
Gamers	Johnathan	54	34	21	71	65	49	31.65
	William	23	20	12	43	13	22.2	
	Danial	53	10	35	34	31	32.6	
	Sarah	13	23	33	21	24	22.8	
Non-gamers	Savraj	12	20	21	18	23	18.8	20.25
	Ankur	31	23	11	14	23	20.4	
	Hannah	12	18	23	19	29	20.2	
	Isbah	23	16	21	25	23	21.6	

Experiment 3

Table3. Analyzing How Gamers and Non-Gamers Perform Under Time Pressure and Memory Tests

Working under time pressure / memory								
	Name	**Try 1**	**Try 2**	**Try 3**	**Try 4**	**Try 5**	**Average**	**Total average**
Gamers	Johnathan	32	40	24	29	42	33.4	36.7
	William	43	48	37	30	51	41.8	
	Danial	32	23	39	41	42	35.4	
	Sarah	34	21	53	41	32	36.2	
Non-gamers	Savraj	30	34	29	41	31	33	30.45
	Ankur	29	26	31	35	29	30	
	Hannah	23	32	35	31	24	29	
	Isbah	25	27	31	34	32	29.8	

According to earlier research and experiments, the average human response time for visual reflexes was determined to be 0.253 seconds. Subjects in the present research showed significantly faster response times than those of non-gamers; the average reaction time for gamers was 0.2346 seconds, while the average reaction time for non-gamers was 0.2714 seconds. (Table 1).

This clearly shown that young adults and teens' response times may be improved by exposure to video games. Data also showed that the average of the gaming group's slowest reaction time was often lower than the non-gaming group's fastest reaction time, lending credence to the hypothesis that gamers may have a slower response time.

One possible explanation is because being successful in video games often requires the player to act or move ahead of the competition. First-person shooters like "Call of Duty" reward players for having slower response times since having a faster reaction time than the adversary almost guarantees defeat.

According to the data obtained, the gamers group's total average score for the second ability, multitasking, was 31.65, whereas the non-gamers group's total average was 20.25 (Table 2). Both 31.65 and 20.25 belonged to the second talent. to the participants' "2 cars" score on the online application. As shown, there was a noticeable 11.4 point difference between the averages of the Gamers and Non-gamers groups.

CONCLUSION

It is evident from the experiments that the gamers group had a faster overall reaction time than the non-gamers group, as their total average reaction time was better and their highest average reaction time was still slower than the lowest average reaction time from the non-gamers group. Although the average performance of gamers was higher than that of non-gamers, the fact that one non-gamer performed better than some gamers suggests that games may not be the best way to increase people's capacity for multitasking. This study's main goal was to understand how gaming might enhance certain cognitive capacities and skills in

people. For people to comprehend and learn, they need to have seven key cognitive abilities. This study focused on the beneficial effects of exposure to internet and video games on a select subset of these abilities. Researchers in the same field may utilize the results to probe more into the ways in which internet and video games affect people's controllable cognitive capacities. Additionally, providing the volunteers with the proper training sessions might help the research' overall effectiveness by ensuring consistency throughout.

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