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RESEARCH ARTICLE

Video gaming, physiological responses, and well-being in medical students: An essence of intrigue way of learning

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ABSTRACT

Background: Academically, new media technologies are being used which includes video games as well. Studies in college students show that their learning preferences have been strongly shaped by new media technologies. It is important to understand the positive and negative effects on physiological responses and well-being in the lives of medical students. **Aims and Objectives:** The study aims to assess the effect on blood pressure, resting pulse rate, respiratory rate, and well-being. **Materials and Methods:** The study was conducted in medical students at Dr. DY Patil Medical College Pimpri, Pune, who were assessed before and after gaming and a framed questionnaire was answered by them and further analyzed. **Results:** Result shows video game genre, its description, and examples with its positive impact on physiological responses in gamers than non-gamers and overall a better well-being. **Conclusion:** Video games are becoming a part of the daily lives of people of various age groups and having influence on education, health, and well-being, a more balanced perspective needed.

KEY WORDS: Medical; Technology; Well-being; Health; Video game

INTRODUCTION

The market for video games has been increased steadily and has become an incredibly popular and pervasive form of entertainment. Video games are becoming a part of the daily lives of people of various age groups. Even academically, new media technologies are used which includes video games as well. Studies in college students show that their learning preferences have been strongly shaped by new media technologies like video games, virtual reality environments.[1] Even though video games play an important part in the lives of medical students, there are very few known studies conducted on them. Medical students endure a stressful learning environment that involves dealing with an overload of classes, patient diseases, and conflicting relationships with staff members.[2] When surveyed them, physical well-being was decreased, connected with emotional exhaustion, and low sleep quality. Well-being can be defined in terms of happiness and overall life satisfaction. To relax, students use various coping mechanisms. Some might find video gaming as their stress buster but sooner or later becomes an addiction and leads to detrimental physiological responses and health problems.[3,4] Recent researchers have found both positive and negative effects of video games. The present study seeks to examine the physiological responses such as heart rate, blood pressure, respiratory rate, and well-being in the medical students.

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MATERIALS AND METHODS

The study was conducted at the University of Dr. DY Patil Medical College Hospital and Research Centre, Pimpri,

Pune, after obtaining approval from the Institutional Ethics Committee; the period was from June to August 2016. The study and control groups were included in the study (50 each). Informed consent was obtained. Detailed instructions were given.

Pulse rate: Accuracy is ±2 beats/min. Blood pressure: Omron HEM-7112 monitor was used, placing a blood pressure cuff over the dominant arm, which then self-inflated to provide oscillometric blood pressure reading. Respiratory rate: Counting the respiratory rate considering one inspiration and expiration as one cycle. Questionnaire tool: 14-item/ statements questionnaire of well-being describing the experience of each past 2 weeks by Warwick-Edinburgh Mental Well-being Scale (WEMWBS)© NHS Health Scotland, University of Warwick and Edinburgh, 2006.

Video Game History Questionnaire

Questions asked about the previous use of particular types of video games, frequency, and self-identified as a "gamer." While "non-gamer" was the one who never ever played or either very rarely played.[3] Games were used limbo; an artistic two-dimensional black and white platform puzzle game, a nameless boy searching for his lost sister, a unique approach to game development in which creative decisions. Angry birds, a logic based video game. Piano tiles, a single-player mobile game based on hand-eye coordination. For the tests, the subjects were instructed to use the minimum of clothing, eat at least 3 h before the measurements and refrain from alcohol and smoke the day before. Following gameplay, participants were asked to play the games and three readings were measured with an interval of 5 min. Data were expressed as mean ± standard deviation (SD). Statistical analysis was done by using Student's unpaired *t*-test in Microsoft Office Excel and $P < 0.0000$ was considered as highly significant. Results were taken and statistically matched with the control group.

RESULTS

The results obtained from the observations are summarized in Tables 1-6. A total of 100 medical students (50 gamers and 50 non-gamers aged between 18 and 21 years [M = 19.06, SD = 0.97]) participated in the study. None of the subjects had any past illness. Male students played games regularly with a median 2 h/day more often than female students. Video game preferences and effect on their well-being was analyzed in percentage frequency (%) and the impact of video games on physiological responses was further analyzed by unpaired *t*-test.

Table 1 summarizes the eight genres, all strategy, fantasy, action, adventure, FPS, RPG, and online with the examples. While interviewing the students, most common reasons for playing games, was when they need to pass the time felt so by (11%), few considered as fun (17%), likewise excitement (4%), while some needed to calm themselves when stressed due to their hectic routine (18%), addiction (3%) was observed minimal and relaxation (1%) respectively.

Table 1: Video game genre and its description, examples, and percentage frequency of gamers

Genre	Description	Examples	% of Gamers
All	All genres among the study category	Any	20 (10)
Fantasy	Games that let you assume a fantasy character	Final Fantasy, Legend of Zelda	36 (18)
Strategy	Games that use strategic planning skills	Age of Empire	24 (12)
Action	Game that simulates exciting or violent action	God of War	28 (14)
FPS	Games where you shoot other characters	Quake, DukeNukem	16 (8)
Online	Games that have element of chance.	Rummy, Solitaire	24 (12)
RPG	Games that let you assume character(s)	Elder Scrolls V: Skyrim, Star Wars	24 (12)
Adventure	Games where you go an adventure	Resident evil, tomb raider	24 (12)

Table 2: Pulse rate in gamers and non-gamers

Pulse (per minute)	Gamer	Non-gamer	*P* value
Before game (5 min)	73.9±2.67	76.2±3.05	*0.0001
During game	96.3±4.94	102.2±3.19	**0.0000
After game (5 min)	80.38±4.21	91.58±4.30	**0.0000

Data expressed as mean±SD, $P<0.00001$=Highly significant and $P<0.0001$=Significant. SD: Standard deviation

Table 3: Systolic blood pressure in gamers and non-gamers

Systolic Blood pressure (mm of Hg)	Gamer	Non-gamer	*P* value
Before game (5 min)	114.9±6.97	112.64±7.07	0.11
During game	130.64±2.91	136.24±6.28	**0.0000
After game (5 min)	118.02±6.72	133.84±5.92	**0.0000

Data expressed as Mean±SD, $P<0.00001$=Highly significant. SD: Standard deviation

Table 4: Diastolic blood pressure in gamers and non-gamers

Diastolic blood pressure (mm of Hg)	Gamer Mean±SD	Non-gamer Mean±SD	*P* value
Before game (5 min)	75.5±5.81	75.12±5.65	0.741
During game	83.34±3.51	82.8±3.63	0.45
After game (5 min)	75.12±5.65	80.32±4.052	**0.0000

Data expressed as mean±SD, $P<0.00001$=Highly significant. SD: Standard deviation

Table 2 gives the preview of pulse rate, in both groups, non-gamers particularly showed highly significant ($P < 0.00001$) during gaming and after gaming, then gamers. Before gaming, too was significant ($P < 0.0001$) likely to be due to excitement or playing for the first time.

Tables 3 and 4 summarize the blood pressure, both systolic and diastolic. Non-gamers were found to be highly significant ($P < 0.00001$) during gaming and after gaming, then gamers, respectively.

Table 5 shows that respiratory rate before and after gaming which was not significant at all in both the groups.

Table 6 gives the (%) frequency of well-being in gamers and non-gamers, where the majority had a positive effect after playing games. The results are given in a tabulated form based on the questions answered by the students related to their gaming preferences.

The difference between the groups was not found to be statistically significant.

DISCUSSION

For centuries, medicine has been regarded as a gratifying and honorable career but comes with a lot of crisis which has an impact on health and well-being on medicos. The strongest predictor of well-being is academic stress. Every individual otherwise finds a way to relieve from stress, medicos are no option to this. It is found that they often play video games in their spare time. Our study based on the impact of video gaming on physiological responses and well-being in medical students had subgroups of 50 respondents who were self-identified as game players and provided gameplay data with their game choices and physiological responses such as pulse rate or heart rate, blood pressure was found to be more in gamers than non-gamers while respiratory rate remained unchanged. Moreover, we also found that gamers had an overall positive outlook, enhanced wellness, and the recovery phase drastically came back to normal or near to normal than the non-gamers.

The medical profession has its share of ups and lows which has a heavy toll on student's health and well-being. There is generally a shift to a more cynical and hedonistic orientation during medical school, as well as significant elevations and an increase in depression and anxiety.[5] Psychological well-being is about good psychological functioning. Medical student's well-being has often been swept aside. In 80s and early 90s, most of the research focused on the negative effects of entertainment games and violence, including both explicit and implicit manifestations, little research has been conducted on the positive effects of video gaming in medical students. Denot-Ledunois *et al.*, in 1998, reported the effects on an increase in breath duration in children[6] and an increase in cardiovascular reactivity and blood pressure (most often systolic blood pressure). While in our study, although there was change in pulse and blood pressure [Tables 3 and 4], but no significant difference was observed in respiratory rate for both gamers and non-gamers [Table 5]. The previous study by Miller and Ditto also reported a significant increase in heart rate, systolic, and diastolic blood pressure in 17 male adolescents during a racing simulation

Table 5: Respiratory rate in gamers and non-gamers

Respiratory rate (per min)	Gamer	Non-gamer	*P* value
Before game (5 min)	15.22±2.34	14.62±1.412	0.124
During game	15.58±2.16	15.08±1.33	0.168
After game (5 min)	15.4±2.57	14.92±1.61	0.152

Data expressed as mean±SD, *P* value – Not significant (NS). SD: Standard deviation

Table 6: Percentage frequency of well-being in gamers and non-gamers

Statements	Gamers (*n*=50)	Non-gamers (*n*=50)
I have been feeling optimistic about the future	84 (42)	60 (30)
I have been feeling useful	80 (40)	4 (2)
I have been feeling relaxed	84 (42)	64 (32)
I have been feeling interested in other people	70 (35)	60 (30)
I have had energy to spare	90 (45)	40 (20)
I have been dealing with problems well	80 (40)	42 (21)
I have been thinking clearly	84 (42)	40 (20)
I have been feeling good about myself	92 (46)	30 (15)
I have been feeling close to other people	72 (36)	30 (15)
I have been feeling confident	80 (40)	30 (15)
I have been able to make up my own mind about things	80 (40)	34 (17)
I have been feeling loved	76 (38)	32 (16)
I have been interested in new things	80 (40)	40 (20)
I have been feeling cheerful	80 (40)	30 (15)

video game and compared their resting state and exercise testing measurements.[7] Recent research has suggested that a moderate amount of video game playing could have a potentially positive effect on young people's well-being. Moreover, we could also see that gamers had a positive way of thinking [Table 6] and wellness than non-gamers. People experience high levels of well-being when they feel pleasant emotions, engage in interesting activities, and are satisfied with their life.[8] Probable reason could be due to neurotransmitter and dopamine. Playing video game has been shown to trigger dopamine release in the brain, which is closely associated with reward seeking, addiction, and learning. Some studies have come to the conclusion that young people are already engaging in video games to regulate their emotions and forget their worries. The present study also had a significant influence on problem-solving skills, logical thinking, and hand-eye coordination by three different games; limbo, angry birds, and piano tiles 2, very few gamers had poor hand-eye coordination. One study, with the world of warcraft players, was correlational, making it impossible to discern whether playing the game improved problem solving or people with better skills in the first place were drawn toward this type of open-ended role-playing game.[9] More recently, another study examined the causal effect of playing games on virtual surgical endoscopy skills with a relatively more scientifically rigorous research design.[10] Several studies, especially in the United States, use of computer games as a tool in teaching. However, many studies argued that computer games pose disadvantages to student's academic performance. While several studies have documented negative influence between computer game uses, the promise of video games in the future will make a great stir in the field of education. Indeed, problem-solving seems central to all genres of video games (including those with violent content). Most people think of video games as entertainment. There is a growing interest about video games as a means to educate and train people.[11] It is interesting to note that the earliest applications of video games in health occurred because someone clever made an innovative interface, so the typically sedentary games could be used to motivate patients and engage adolescent and adult patients in physical therapy and activity. Play is, therefore, often conceptualized as a means of stress management which has a key role in helping patients manage aversive or shameful aspects of their illness through playing video games.[12] In fact, when it comes to education, medical curricula designers also should consider including video games as teaching tools, be it surgical or medical, so students will not be stressed because of their academic demand and competition rather, they will have the motivation and healthy well-being. Griffith argued that although there are educational, social, and therapeutic benefits to video games play, but in excess leads to addiction, playing 24 × 7/week and in some cases to a gambling problem.[13] Thus, technological gadgets and its applications like video gaming though necessary seem to have influenced our health and lifestyle in a negative direction due to overuse but keeping in mind the positive effects also. These problems and awareness need to be addressed timely.[14] There have been various hypotheses proposed and tried to explain the relation between video gaming, heart activity, and well-being but still the relation is uncertain.

The strength of this study is that although our sample is representative of medical students. Here, we unraveled indirect observations which can help to assess the role of video gaming related to physiological responses and well-being alone, making it a positive impact on medical students. On the other hand, this study has limitations. Indulging for long hours may have a negative impact on health and well-being. Being a cross-sectional study and data may not be have been sufficient enough to allow the final conclusions. Therefore, cohort studies are needed in the future to further understand the long-term effects of video gaming. Furthermore, studies need to examine the influence of video gaming on pulse, blood pressure, respiratory rate, and well-being in larger and other professionals too, and in still much younger age groups.

CONCLUSION

The present study concluded that there is a difference in physiological responses in gamers and non-gamers and quick retrieval in gamers. Whole process of gaming is based on individual attitudes of the player, experiences, skills, and memories. Many studies opined on the negative effects of games. In our study, gamers had better well-being. It allows medical students to learn and apply theoretical knowledge in a clinical setting. Hence, more games should be tailored for medical students. Thus, video games can be the next-generation tools for mental training, cognitive development, and fun too.

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