Influence Of Video Game On Executive Function And On Stress Reduction

The objective of this study was to examine the relationship between different type of action video game playing and the performance of executive functions. Also, this study is conduct to determine whether playing video games could reduce stress. Many people think that playing video games could lead to negative effects. The current study has found 100 acutely stress participants to play a video game. This research has proven that stress levels of participants who attend this experiment have declined over time. There is another survey conduct by taking 55 inexperienced video game players to play different type of game which include an action video game, a physics-based puzzle game, a real-time strategy game, and a fast-paced arcade game. This survey indicated a positive relationship between physics-based puzzle executive function of participants. It appears that video game play may have different effects on some executive functions with implications for real-world behaviour.

Keywords: Video game, Puzzle game, Executive function, Problem-solving, Stress

Video game is the general term of development that are going to implement. Puzzle game is the specific video game that wanted to develop. The game is aimed to develop in order to enhance different aspects of executive functions and to reduced stress without side effects. Puzzle game is a type of game that involve problem-solving skill.

Introduction

Video games are now the subject of the emerging interdisciplinary field of games studies. As it stands, the field is a mess of different ideas and methods, and there is hardly any core agreement between the theorists about what they are studying or how to study it. Video games are variously referred to as 'computer games', 'electronic games', and even 'digital entertainments.' (Tavinor, 2008)

Nicholas Esposito has stated that “a video game is a game which we play thanks to an audiovisual apparatus and which can be based on a story” (Esposito, 2005). A video game could be considered as an interactive application that interacts with players. Video game seems to has an increasing demand and higher market since people nowadays have to cope with difficulties every day so they may have found out some ways to release their stress as stated in the previous research that video game could help in stress reduction. But, most of the previous researcher have focused on the negative consequences of video games, such as increased aggressive behaviours which caused by violent video games. However, “according to mood management theory, heightened intervention potential should make video games particularly well-adept at repairing noxious moods.” as stated by Nicholas David Browman (Browman, 2010). This study is going to examine the effects of video game play on stress reduction.

Video game culture

Game culture is usually defined by the descriptions of gamers. It starts with the categories from

which the stereotype stems which include who plays video games, how they play, and what they play. Following these categories, the popular discourses provides a much more diverse game perspective. Games that are developed either in a positive or negative way could affect how the video games being researched. The power dynamics that attribute certain features could be seen by unpacking the discourse of video game culture. “Culture is a problem rather than a concept, we might assume that the category surfaces as an object of attention and scrutiny at those moments when culture matters because it condenses real material and experienced problems and contradictions. Any attempt to understand the concept must then look to its specific form and content at any moment.” (Grossberg, 2013)

Video games are played by everyone across the world. Video game can use as a communication tool between people, they can make new friends easily with the same interest. People play different genre of games that can help them to gain different experience which they cannot feel in the real life. Games help players think, force audiences to be active, socialize, and engage the body. Video game culture is thus often seen as something on the edges of, which nevertheless influences, popular culture. This has ideological and political ramifications as it allows for video games to be seen as a form of entertainment or the culture of other filed.

The young, old and academic group of people have begun to pay attention to the video game as the video game industry has rapidly grows into one of the most dominant forms of digital entertainment, moving from annoying puberty into a mature entertainment juggernaut. (Branston, 2007) (Rebecca Pleasant, Albert D. Ritzhaupt, 2014) claimed that content, overlapping goals, continuous problem solving, social interactions and gaming cultures are critical aspects of learning through games which relate to the growth of video game culture.

During the late of 1980s and 1990s, many of gaming stars were emerged and gaming slowly pushed into the mainstream with its first Hollywood movies. As getting more and more people being attracted to video game, the morality of content included more realistic and graphic violence in games. There were many bad cases happen before that make the video game sounds bad to most parents and academic people. For example, children follow the action of the violent game character. As the video game industry has undergone a dramatical change, it brings a lot of effects to the social life. It may influence one’s action and thinking.

The previous research has done to investigate the link between violent game and increased aggression, violence, and anti-social behaviour. The results indicated that violent crime has actually decreased dramatically as video game has become more popular.

Video game became a hit online in the 2000s, with persistent online worlds like World of Warcraft attracting millions of players to leave the real world for extended stays in fictional realms. It brings a culture to world, which is cosplay. Cosplay was first popularized in Japan in relation to anime. It soon bled over into video game, and cosplay is not only happening in Japan but the West as well. People enjoy playing dress up like the characters in video game or anime to express their passion for gaming and unleash their creative and role-playing sides. It even contributes to a new occupation which is the professional cosplayers. This group of people earn money by publishing their cosplay related merchandise and receiving lucrative fees for appearing at conventions or fair.

Video game also contribute a lot to video-sharing platform such as YouTube indirectly. Gamers sharing their gameplay videos and gaming experiences that attracted majority of viewers and

post it through YouTube to earn money. This action drives the growth of economy.

Video game history

Everything has its own history to remind new generation of previous mistakes made in order to avoid it, and testify the growth of the particular fields. Same goes to the video game.

Video game have appeared since the early 1970s. Nutting Associates introduced the first commercial arcade video game, Computer Space in 1971. In 1972, Atari introduced Pong, an arcade ping-pong game. Atari was formed by Nolan Bushnell, the man who developed Computer Space. He left Nutting Associates to found Atari, which then produced Pong, the first truly successful commercial arcade video game. (Mark J. P. Wolf, Bernard Perron, 2003)

On the same year, Magnavox offered a prototype for the first multiplayer, multiprogram video game system that could be played on a television, also known as the “Brown Box” which are developed by Engineer Ralph Baer and his colleagues. The Odyssey was very limited that it could only produce very simple graphics, and required that custom plastic overlays be taped over the television screen. It does not achived commercial success due to the poor marketing. In 1975, Atari introduced a home version of its popular arcade game, Pong. The original home version of Pong was sold exclusively through Sears, and even carried the Sears logo. Pong was a phenomenal success, opening the door to the future of home video games. (Kent, 2010)

Although the Fairchild Channel F, released in 1976, was the first truly removable game system, Atari once again had the first such system to achieve commercial success. Introduced in 1977 as the Atari Video Computer System (VCS), featured interchangeable game cartridges that were retailed separately, allowing a multitude of games to be played using the same hardware.

In the past few years, Systems like the Atari 2600, its descendant, the 5200, Coleco's ColecoVision and Mattel's IntelliVision helped to generate interest in home video games. But it began to wane due to the lagged of the home product quality that are far behind arcade standards. But in 1985, a small Japanese company, Nintendo introduced the Nintendo Entertainment System (NES), whose popularity and commercial success surpassed any previous game console.

Nintendo's strategy has paid off, and the NES triggered a recovery in the home video game market that continues to thrive and expand even now. Home video game systems are no longer looked upon as inferior imitations of arcade machines. New games that would have been impractical to create for commercial systems, such as Legend of Zelda, were developed for the home markets. These games enticed many people who had not thought about buying a home video game system before to purchase the NES.

Video games are no longer a novelty. Nintendo continued to develop and introduce new game consoles. Other companies, such as Sega and Sony, created their own home video game systems.

Video game genre

Video games are often classified into genres, which purport to define games in term of having a

common style or set of characteristics, for example as defined in terms of perspective, gameplay, interaction, and objective. Many video games could be considered to be more than on genre. For instance, a tennis game could be considered as a sports game as well as a simulation game. In scholarly writing on video game genre, most taxonomies either focus exclusively on interactive genres, or recognize the multiple nature of interactive, narrative, thematic, social and/or even material genres. (Arsenault, 2009) Multiple genre of video game includes action, adventure, educational, puzzle, rhythm, Role-Playing (RPG), simulation, sports, and strategy.

Action games are typified by fast-paced events and movement which often have to be performed reflexively. It is a complete challenge by fighting with enemies, and use a character to represent yourself and jump into the action. Examples of action games are Pong and Space Invaders.

Adventure games are often set in fantasy or adventure worlds, connected rooms or screens, involving an objective which is more complex than simply catching, shooting, capturing, or escaping, although completion of the objective may involve several or all of these. (Wolf, 2001) The game generally starts with a back story of a character, and some missions needed to be figured out. This type of game is usually combined with a role-playing element and allow the character to initiate dialogue. Examples are The Walking Dead, and The Longest Journey.

Educational games are designed to teach, and in which the main objective involves the learning of a lesson. It was structured like games, with such elements as scoring, timed performances, or incentives given for correct answers rather than being structured as a straightforward set of lessons. Games make learning fun. That is the reason people prefer game instead of studying. Many parents and teachers claimed that video games may affect studying of children, but there are some great educational games that can help with the learning process. Most of the educational game related to math and science. Example of educational game is Carmen Sandiego series.

Puzzle game often require the player to solve puzzles or problems and can involve the exercise of logic, memory, pattern matching, and reaction time. It also involves solving enigmas, navigation, learning how to use different tools, and the manipulating or reconfiguring of objects. The most popular example is Tetris.

Rhythm game requires players to keep time with a musical rhythm. Playres need to undertake some action in response to some stimulus. It may employ a variety of controllers beyond usual video game hardware. It was then defined as a music and dance games often involving a unique controller similar to a guitar or dance pad. (Luther Elliott, Andrew Golub, Geoffrey Ream, Eloise Dunlap, 2012) This grouping of games is differentiated by the timed elements usually synched to music somehow. Example of rhythm game involves OSU! and Dance Dance Revolution.

Role-playing game also known as (RPG), often characterised in terms of providing the player with flexibility in terms of character development, and problem resolution. Players could create or take on a character represented by various statistics such as race, gender, and clothes style. It was evolving from pen-and-paper games like Dungeons and Dragons. Example of RPG include Final Fantasy.

Simulation games are games which attempt to simulate realistic situation in order to accurately re-create an experience. These games can range from realistic simulations used by institutions, such as those used to train astronauts, tank drivers, or airline pilots, to simplified game-like approximations of them used mainly for entertainment. (Wolf, 2001) The popular game under this category is The Sims series where the players could create and control the characters that they created followed their preferences. This genre of game will be popular because people could try everything they dare not to do in the real life inside the game.

Sports games usually involving an interactive motion controller. It is the game that simulate the sporting experience which include sports such as football, basketball, golf, boxing, ice hockey, and tennis. The main objective of sports game is to emphasis the experience of playing the sport. Examples of sport game are Pro Evolution Soccer, and Championship Manager.

Strategy games most often involve tactical movement of troops and/or players. It attempts to capture a sense of realism for the players to experience. This genre of games emphasizing the use of strategy as opposed to fast action or the use of quick reflexes. Examples of strategy game are Monopoly, and Chess.

Study of video game genre could bring the understanding of which genre of game is benefits for people, and what type of development tools or game engine are suitable for developing that genre of game.

Influence of video game on stress reduction

What is stress? Why people suffer with stress? How it can solve by using video game? Stress is defined as any external perturbation to an organism’s optimal homeostasis (Dow, 2014). Stress is the way your body response to any demand or threat. Stress could help people to meet challenges, for instance it helps you to focus on presentation at work. But stress could cause significant damage to health, mood, and productivity when it reaches certain level that one cannot endure. There are multiple causes stress which include situational circumstances such as death of a spouse, a job or even weather conditions, which can lead seasonal affective disorder syndrome (SADS). Generally, people will find social support, or a coping activity that help them to improve their mood such as shopping, movies, exercise, and recreational activities.

Stress can cause serious diseases such as cardiovascular disease, digestive problems, autoimmune diseases, depression and anxiety, it can even cause disability and death. Thus, it is important to examine if there is any relation between video game and stress reduction. Recent research has found out that the growing use of Casual video games (CVGs) may be directly related to their ability to assist in decreasing stress and improving mood without the potential negative side effects of other choices. (Carmen V. Russonlello, Kevin O'Brien, J.M. Parks, 2009)

In a research done by (Carmen V. Russonlello, Kevin O'Brien, J.M. Parks, 2009), its purpose is to examine that whether casual video games could improve mood and/or decrease stress in players using valid and reliable psychological and physiological measures. Specifically, this study has been tested by playing three popular casual video games which are Bejeweled 2 (BJW 2), Bookworm Adventures (BWA) and Peggle (PGL). It shows a positive relationship between video game and stress reduction. In the experiment, the casual video games could

alter the autonomic and central nervous systems consistent with stress relief and mood improvement as playing casual video games would result in decreases in left frontal alpha power, increases in right frontal alpha power and overall alpha symmetry when compared to controls. Decreases in left alpha power improve mood and decrease avoidance/withdrawal behaviours. Moreover, increases in right alpha power improve mood and increase approach/engage behaviours.

“Mood can be defined as a temporal state that is susceptible to environmental influence and potentially under an individual’s control, or management. The logic of mood management theory explains how these dimensions of mood control can produce optimal post-consumption mood states.” (Nicholas D.Bowman, Ron Tamborini, 2012) An affective-dependent theory of stimulus arrangement often referred to as mood management theory, explains individual's motivation to eliminate harmful emotional states where possible, and to make media choices based on such motivations. The result of this selective exposure to media fare is mood repair; that is, the emotional state clearly shifts from a detrimental state to an optimal state. (Browman, 2010) “Mood Management Theory (MMT) is based on the assumption of human natural hedonism. Individuals attempt to arrange stimuli in their environment to increase pleasurable mood states and decrease or eliminate noxious mood states such as sadness, boredom, or stress.” (Serrone, 2012)

Video games offer a highly engaging, interactive experiences, therefore increase the tendency for video-games to become effective mood management tools. Excitatory potential has the propensity to adjust the intensity of a mood state by increasing or decreased sympathetic nervous system arousal. In general, mood states that are characterized by high sympathetic arousal such as stress or depression are most likely to be maintained by consuming or interacting with media messages that are high in excitatory potential. When applied to video-games, individuals who are depressed would benefit most from playing nonviolent, self-paced problem-solving games such as tetris or cut the rope, because these games have low excitatory potential. (Serrone, 2012)

The previous study employed a design to acutely stress 100 participants before assigning them randomly to play a mildly violent game either competitively or cooperatively with a female confederate. Results indicated stress levels declined over time at equal levels during both competitive and cooperative game play. Participants in the competitive condition held a slightly less positive impression of the confederate following game play, although players held a generally positive impression of the confederate overall. (Amanda Roy, Christopher J.Ferguson, 2016)

“Stress is a fact of life.” (Johnson, 2006) People are dealing with a lot of job or work every day which may lead to stress occurrence. Therefore, people have to improve the ability to handle stress. According to the findings above, video game could play an important role in coping with stress.

Influence of video game on executive function

What is executive function? Why investigate executive functions in video games? What is the impact of video game contribute to executive function? (Mezzacappa, 2017) defined executive function as a pragmatic construct that encompasses the processes and skills required of an

individual to anticipate, plan, initiate, monitor, modify, and terminate goal-directed, that is, voluntary–purposeful, behaviour. The executive functions are a set of processes that all have to do with managing oneself and one's resources to achieve a goal. Executive function skills serve to manage one’s cognitive processing aimed at achieving one goal. (Jocelyn Parong, Richard E. Mayer, Logan Fiorella, Andrew MacNamera, Bruce D. Homer, Jan L Plass, 2017) It is an umbrella term for the neurologically-based skills involving control complex cognitive processes such as working memory, attention and planning. Executive function skills control and manage other cognitive processes. They are particularly involved in the processing of complex task situations such as those requiring participants to execute different tasks simultaneously or sequentially with rapid switches between them. (Tilo Strobach, Peter A. Frensch, Torsten Schubert, 2012)

Previous researches have focused on the negative consequences of violent video game. It affects the opinion of most parents towards video game directly, so most of them do not encourage their children to play video game but this action may have an adverse effect. Everyone will have a feeling of wanted to do something if a person does not allow you to do so. It may influence the relationship between parents and children. Therefore, the goal of this study is to examine the potential of using video games as vehicles for improving cognitive skills in adolescence, particularly the cognitive development of executive function skills, such as being able to make good decision and have a good memory.

There are millions of video games, with different themes and goals. Action Video Games (AVG) are a video game genre that emphasizes physical challenges that include hand–eye coordination and decision making with a limited reaction-time. The AVG genre includes diverse subgenres such as fighting games, maze games, multiplayer battle arena games, pinball games, platform games or first-person shooter games, which are widely considered the most important action video games. Executive function in children can be improved by action video games training. Action video game training for 50 hours over 8 weeks significantly improved executive function in typically developing children compared to those training with non-action video game. (F.Algabbani, 2016)

Task switching is one of the executive functions that being examined in this study. Task switching is a measure of mental ?exibility, including the sequential execution of two or more activities with rapid switches between them. Action video game training may transfer to predictable task switching paradigms via an enhancement to working memory updating by more ef?ciently using articulatory rehearsal. Hypothetically, working memory updating could be important in action video games as players are required to update their working memory in terms of the mission objectives, items collected. Therefore, it is plausible that working memory updating is improved rather than mental ?exibility in action video game training. (C. Shawn Green, Michael A. Sugarman, Katherine Medford, Elizabeth Klobusicky, Daphne Bavelier, 2012)

Video game play can have a negative effect on affect and behaviour, but its relationship with cognition has been mixed. The previous study about the effects of active video game play on decision making, problem solving, and risk-taking have been examined. It appears that active video game play may have positive effects on some executive functions with implications for real-world behaviour. (Melissa T. Buelow, Bradley M. Okdie, Ashley B. Cooper, 2015) The other research done by (Richard E. Mayer, Jocelyn Parong, Kaitlin Bainbridge, 2019) promising evidence that o?-the-shelf games in the action video game genre can serve to help students develop perceptual attention skills under ideal conditions of long-term exposure.

However, (Adam C. Oei, Michael D. Patterson, 2014) had done a research to investigate whether action or non-action video games enhance executive function. Fifty-?ve inexperienced video game players played one of four different games: an action video game (Modern Combat), a physics-based puzzle game (Cut the Rope), a real-time strategy game (Starfront Collision), and a fast-paced arcade game (Fruit Ninja) for 20 h. Three pre and post training tests of executive function were administered: a random task switching, a ?anker, and a response inhibition task (Go/No-go). Only the group that trained on the physics-based puzzle game signi?cantly improved in all three tasks relative to the pre-test. These results suggest that playing a complex puzzle game that demands strategizing, reframing, and planning improves several aspects of executive function.

Based on the researches above, both puzzle and action video game could improve the executive function. The future study may be how to develop a video game which is most efficient in enhancing executive function among adolescence.

Literature review

Video game is interactive digital entertainment that one “play” via a computer, a game console such as the Xbox or PlayStation or a phone or tablet. Once talking about video game, most of the parents and teachers will first thinking about the negative effects of it due to the news or previous research about the violent game. To reduce the negative impression of people towards video game, this study is conducted to investigate the relationship of video games with stress reduction and executive functions.

According to research done by (F.Algabbani, 2016), and (C. Shawn Green, Michael A. Sugarman, Katherine Medford, Elizabeth Klobusicky, Daphne Bavelier, 2012), it shows a positive relationship between executive function and action video game. However, (Adam C. Oei, Michael D. Patterson, 2014) found out that puzzle video game can improved several aspects of executive function. He assigned fifty-five inexperienced players to four genres of games for 20 hours, but only those playing the physical puzzle video game improved their executive functions as tested by using a random task switching, a ?anker, and a response inhibition task.

In the research done by (Carmen V. Russonlello, Kevin O'Brien, J.M. Parks, 2009), and (Amanda Roy, Christopher J.Ferguson, 2016),action video game could lead to stress reduction without any side effects. It is applicable for everyone especially those who suffer from depression, seasonal affective disorder syndrome (SADS) and post-traumatic stress disorder (PTSD). These researches may benefit a lot of people especially college students, working people, and veterans.

Proper utilization of these researches to develop a game with combination characteristics that could both reduce stress and improved executive functions can bring video game industry to another level of evolution. It could also contribute to working opportunities of that particular country due to the development process of that video game.

If I were to conduct this study, I think the best way to do so would be by both quantitative and qualitative methods. I would choose to use survey research to observed the behaviours of participants and timing that they started to change. By using this method, I would be able to

know the minimum time consume of video game play used to reduced stress and improve executive functions. The participants of survey would be chosen from 17 to 25 years old. 300 of samples are needed in this survey to conduct a relevant research.

Conclusion

The present study conducted is aimed to execute the relationship between video games with stress reduction and executive functions. This is because most of the previous researches stated about the negative consequences of video games. Therefore, this study wanted to prove that playing video game could also enhance our skills. Some researches have found out that action, casual, and puzzle video game could reduce stress and improved different aspects of executive functions effectively. These genres of game could be developed as learning and mental health recovery tool.