

Nathan Hallam

Eason

ENGL 101C

2nd December, 2020

Research Essay Outline

- Introduction
 - Topic - Video Games
 - Benefits of Video Games
 - On the human mind
 - Behaviour, attention, speech (social interaction)
 - Thesis - The increase in video game popularity among the young and old has led many studies to adopt video games for learning with a focus on enhancing cognition, memory, response times, multitasking, and treatment for people diagnosed with ADHD, ADD, and Dyslexia.
 - Background -
 - S1 - Cognition and Memory
 - S2 - Response Time and Task Switching (Multitasking)
 - S3 - Learning disability treatment
- Supporting Evidence #1
 - McDermott et al. [11],
 - in order to evaluate the way that playing action video games supports memory abilities, conducted an experiment using four tasks that virtual into separate memory processing areas.
 - In particular, they wanted to find out if the benefits from visual short-term memory extended to long-term memory.
 - The participants were 28 male AVGPs and 25 male NVGPs.

- In the Posner, letter identify task AVGPs had faster well-learned memories than NVGPs. In the proactive interference task, AVGPs were faster than NVGPs, because NVGPs slowed down when the interference increased.
- In the N-back task that requires multiple memories abilities, AVGPs were faster again. In the visual short-term memory task, which used a visuospatial short term memory task AVGPs were more precise than NVGPs.
- Blacker et al. (2013)
 - conducted a study to examine the visual short-term memory (VSTM) in action video game players.
 - Experiment 1, using colored stimuli, tested a general processing speed advantage between AVGPs and NVGPs, without being limited to the time to encode the memory items.
 - The participants were 121 Temple University undergraduates, 106 males, 15 females with mean age 21.6.
 - The results showed a VSTM advantage among AVGPs.
 - Experiment 2 using more challenging, complex shapes stimuli to increase the processing demand of the task, replicated the VSTM advantage among AVGPs independence of the encoding time.
 - The participants were 47 individuals from Experiment 1 and were divided into a group of 23 AVGPs and in a group of 24 NVGPs.
 - AVGPs keep their VSTM advantage and confirmed that the more complex shapes produced increased difficulty relative to the simplest.
- Baniqued et al. (2014),
 - in an effort to identify whether **playing casual video games** could **improve cognition** training, conducted this study by using active control groups, training tasks, and multiple tests.
 - The participants were 209 young adults aged 18-30, who had no major medical conditions and could be playing video games and board games for 3 hours or less per week for the last six months.
 - They belonged randomly to one of four groups: **working memory and reasoning games, adaptive working memory and reasoning games, active control casual games** and a no-contact control group.
 - Moreover, they had **training sessions two or three times per week**, where they played games for **20minutes for ten sessions**.
 - The cognitive assessment was grouped into five categories: **perceptual speed, reasoning/ fluid intelligence, working memory, episodic memory, and attentional control**.

- The results showed that **casual video games can improve cognition but transfer to untrained task was limited**. However, **working memory and attention improved**.
- West et. al. (2018)
 - conducted **three separate experiments** in order to **determine the impact of different learning strategies that different game genres demand on the episodic memory, in which hippocampus is involved and in caudate nucleus and involve memorizing a series of actions from a given starting point**.
 - **All the participants were brain-scanned with an MRI**.
 - **Their results suggest that experience-dependent changes in the hippocampus are dependent on the spontaneous navigation strategies that people employ**.
 - The participants who spontaneously encode the relationships between landmarks use spatial learning strategies, resulting in **experience-dependent growth in the hippocampus**. In contrast, **response learners** do not use the relationships between landmarks and they **show a reduction in grey matter in the hippocampus** when exposed to both the same gameplay demands and a similar number of environments as spatial learners
- Colzato et al.
 - investigated if and to **what extent video games could improve cognitive skills**.
 - The two groups consisted of 26 experienced video game players (VGPs) and 26 with little or no video games experience (NVGPs).
 - The results showed that **VGPs have faster reaction and were more accurate in working memory than NVGPs, but they have comparable stopping efficiency**.
- Clemenson et al. (2015)
 - investigated if virtual environmental enrichment through Video Games could improve Hippocampal-Associated memory.
 - They assume that the visually stimulating virtual environments of video games could influence the hippocampal behavior.
 - For participation in the study they needed 39 self-described video gamers and 29 self-described non-video gamers. The results from the experiment 1 showed that the video gamers who play 3D video games performed better on a demanding recognition memory task than video gamers who prefer easier 2D games.
 - In experiment 2, they trained players for 2 weeks on 3D video game Super Mario 3D World and the **results showed that they improved**

mnemonic discrimination ability. So the playing of video games is possible to provide meaning stimulation to the brain.

○ Nouchi et. al. (2013)

- conducted a double-blind randomized controlled trial using a popular brain training game (Brain Age) and a popular puzzle game (Tetris), in order to determine if **playing video games would improve cognitive functions and the beneficial effects of video games on cognitive functions would differ according to the types of video games.**
- 32 participants took part in the study and were randomly assigned to either of two game groups (Brain Age, Tetris).
- The participants were asked to perform each video game training (Brain Age or Tetris) over 4 weeks with at least 5 training days each week.
- On each training day, participants performed the video game for about 15 minutes.
- **The measures of cognitive functions were conducted before and after training.**
- On the first day of training (pre), all participants were tested on a series of neuropsychological and behavioral tests. After 4 weeks of training (post), all participants were re-examined to assess their performance on some neuropsychological and behavioral tests.
- According to the results of the study, **brain age game improved executive functions, working memory, and processing speed while Tetris improved attention and visual-spatial ability**

○ Boot et al. (2011)

- conducted a research examining the **effects of video-games playing on cognitive abilities, including memory** between expert players and no-gamers.
- In the survey participated 11 expert video games players, who played seven or more hours per week for the past two years and 10 non-video games players, who played video games one hour per week or less.
- The result of the research showed that **experts had better basic cognitive skills** and in particular they could **detect better changes to items stored in visual short-term memory** and they **performed more accurately in visual short- term memory tests**

○ Ballesteros et al. (2014)

- investigated the effects of **20 1-h non action video games training sessions** with games selected from the Lumosity, a web-based cognitive training platform, on a series of **age-declined cognitive functions and subjective wellbeing.**
- Forty healthy older volunteers participated in the study.

- randomly separated either to experimental group or the control group.
 - All the participants, before and after the intervention, underwent neuropsychological tests.
 - experimental group incurred 20 1-h training sessions over 10-12 weeks on 10 video games from Lumosity (speed match, memory matrix, rotation matrix, face memory, memory match, money comb, lost in migration, space junk, raindrops, chalkboard).
 - Assessment measured: processing, speed, attention, executive control, spatial working memory, episodic memory and subjective wellbeing
 - The results showed that the experimental group **enhancement** compared to the control group **in controlled processing, attention, immediate and delayed recall memory**
- "Video game therapy is an option for the management of chronic traumatic brain injury patients to ameliorate balance and **attention deficits.**"
- Expert video game players often outperform non-players on measures of basic attention and performance.
 - Such differences might result from exposure to video games or they might reflect other group differences between those people who do or do not play video games.
 - Recent research has suggested a causal relationship between playing action video games and improvements in a variety of visual and attentional skills
- Expert gamers and non-gamers differed on a number of basic cognitive skills: experts could track objects moving at greater speeds, better detected changes to objects stored in visual short-term memory, switched more quickly from one task to another, and mentally rotated objects more efficiently.
- Strikingly, extensive video game practice did not substantially enhance performance for non-gamers on most cognitive tasks, although they did improve somewhat in mental rotation performance.
- Supporting Evidence #2
 - Dobrowolski et. al. (2014)
 - conducted a study to **determine the role of video game genre in cognitive enhancement.** In order to do so, they designed a study comparing the cognitive functioning of **first-person shooter (FPS) and real-time strategy (RTS) players (action games).**
 - According to their results, **action video games of different genres may not have an equivalent enhancing effect on the shifting aspect of executive functions and visual attention.**
 - **Real-time strategy players showed superior performance to non-video game players on task switching and at Multiple Object Tracking**

(MOT), and also showed a trend level advantage over first-person shooter players on overall MOT performance.

■ **FPS players held a trend level advantage of lower switch costs but did not outperform NVGP's.**

○ Green et. al. (2014)

■ investigated the effect of **action video game experience on task-switching.**

■ Task switching, or set-shifting, is an executive function that involves the **ability to unconsciously shift attention between one task and another.**

■ They have done so by demonstrating that the action video game players (AVGPs) switch cost advantage generalizes to:

- Vocal responses in addition to traditional manual responses
- Tasks that are more cognitive rather than perceptual in nature
- Goal switches as well as motor switches. They conducted four separate experiments.

■ According to their results:

- The AVGPs show exactly the same advantage when using a vocal method of response.
- Twitch-cost advantage was strong in a task that was more cognitive in nature.
- the AVGPs advantage was also roughly equivalent in a condition where the switch was required a goal shift and, in a condition, where the switch involved only a change in the motor response set.
- Training on an action game did indeed result in reductions in switch-cost that were greater than training on a control game.

○ Action video game players, as expected, outperformed non-video-game players on all tasks.

○ However, surprisingly, this was true only for participants with intermediate levels of media multitasking, suggesting that playing action video games does not protect against the deleterious effect of heavy media multitasking.

○ Playing action video games and multitasking are themselves methods of training the brain that can lead to improved performance but also to overdependence on media activity.

○ Action video games require concentration on pursuing a single goal (or switching between different goals) with many sub-goals that require constant prediction and updating in the presence of distractors.

○ As such, action video games can be considered analogous to real world multitasking.

○ In general, the more exposure to video games, the faster and more reliable was the switching between tasks.

- Overall, the evidence from several studies indicated that there was a large and consistent effect of video games on aspects of orienting, particularly in blocking irrelevant information, and a much smaller effect on task switching and the executive network
- Supporting Evidence #3
 - Franceschini et. al. (2017)
 - tested **reading skills** and **phonological working memory**, **visuo-spatial attention**, **auditory**, **visual** and **audio-visual stimuli localization**, and **cross-sensory attentional shifting**
 - **two matched groups** of **English-speaking children with dyslexia** before and **after** they played **Action Video Games** or **non-action video games**.
 - Participants were **tested 3 to 5 days** before starting the **treatment** and **re-tested** between **one and three days** after its end.
 - They have observed **an improvement in word reading** and **phonological decoding speed**, **without any cost in accuracy**.
 - **Action Video Games** training **improves reading skills** without a **direct targeting of phonological, orthographic or grapheme-to-phoneme decoding**.
 - Antzaka et. al. (2017)
 - studies showing that **Action Video Game-AVG** training **improves** not only **certain attentional components** but also **reading fluency in children with dyslexia**, tried to identify the shared attentional components of Action Video Game playing and reading.
 - Two tasks of global and partial report were used to measure VA span together with a Single letter identification control task.
 - According to their findings a **larger Visual Attention (VA) span was observed in AVG players compared to non-players**.
 - Franceschini et. al. (2013)
 - tested reading, phonological, and attentional skills in two matched groups of children with dyslexia before and after they played action or nonaction video games for nine sessions of 80 minutes per day.
 - they tested the hypothesis that since video game training has been proven to increase attention abilities, attentional action video game (AVG) training should produce learning that transfers well beyond the task domain, so they investigated the effects of video games on children with dyslexia.
 - According to their results only playing action video games improve children's reading speed, without any cost in accuracy, more than 1 year of spontaneous reading development and more than or equal to highly demanding traditional reading treatments.

- Attentional skills also improved during action video game training.
- Ochi et al. (2017)
 - conducted a pilot study and they developed a neurofeedback game for attention training in adults.
 - The participants were 17 adults separated into two groups of high risk and normal based on their initial assessment of ADHD symptoms.
 - The game used a BCI system to detect the attention levels of players from their brain activity measured by a dry electrode played at the forehead in the right prefrontal lobe area.
 - When the player had a low attention level the background of the game slowly dimmed to black and left the field of view only in the center of the screen.
 - This strategy helps the player to focus on a small area of the game and regain his/her attention.
 - Their finding suggests that neurofeedback training could be effective as an alternative treatment for ADHD, because the attention level, the time retained at elevated levels and the time user used to refocus has improved for the high risk group
- AVG training improves not only the basic letter-to-speech sound integration—indexed by increased pseudoword reading efficiency—but also lexical recognition, measured by the word text reading as recently suggested by Vidyasagar and Pammer
- the improvement in word text reading speed obtained after 12 hr of AVG training was higher than the improvement expected in a dyslexic child without treatment for one year.
- Moreover, the AVG speed reading improvements were bigger than those obtained by the highly demanding traditional phonological and orthographic treatments and equal to the letter-to-speech integration training
- Opposing Point - Video Games and Violence
 - Boys play more than girls
 - No significant difference in aggression was found between people who played for more than 30 minutes a day and people who played for less than 30 minutes a day.
 - A significant difference in prosocial behaviour was found in heavy players and moderate players.
 - Heavy players showed less prosocial behaviour than those of moderate play
 - Boys have a higher preference for violent games than girls
 - Children with lower intelligence had a higher preference in violent games
 - In the study, boys who had a preference for violent video games had a higher tendency of violence than those who did not prefer violent video games.

- Children who liked to play violent video games also spent more time on playing those games.
- Boys have a higher preference in violent video games than girls
- Study shows that video games' themes often revolve around aggression and many video games contain aggressive behaviour. Thus, a great deal of video games correspond to the masculine gender stereotype, making them less appealing for girls.
- Intelligence was not a moderating factor in the relationship between aggressive video game playing and aggression.
- Sum Up Conclusion
 - Playing non violent video games can improve memory, and cognition, especially for games that focus on improving memory and cognition.
 - Violent video games, specifically Real Time Strategy and other sub-genres with simultaneous tasks can improve multitasking if played in moderation.
 - Violent video games can improve reading speed with no cost to accuracy.
 - Children that play violent video games are found to have a lower intelligence, but intelligence does not factor aggressiveness after playing violent games.
 - Children that play violent video games are not prosocial in nature.
 - Boys are more likely to play video games as the nature of video games are more masculine focused, correlating to the gender stereotypes.
 - Violent video games can be used as a fast method to help treat dyslexia.
- So What Conclusion
 - Play video games in moderation

Works Cited

- "Aging Research - Geriatrics and Gerontology; New Geriatrics and Gerontology Findings from Claremont Graduate University Outlined (the Effects of Video Game Training on the Cognitive Functioning of Older Adults: A Community-Based Randomized Controlled Trial)." *Electronics Newsweekly*, Jun 18, 2019, pp. 3526. *ProQuest*, <https://search.proquest.com/docview/2242806884?accountid=33851>.
- Boot, Walter R et al. "The effects of video game playing on attention, memory, and executive control." *Acta psychologica* vol. 129,3 (2008): 387-98. doi:10.1016/j.actpsy.2008.09.005
- Cardoso-Leite, Pedro et al. "Technology consumption and cognitive control: Contrasting action video game experience with media multitasking." *Attention, perception & psychophysics* vol. 78,1 (2016): 218-41. doi:10.3758/s13414-015-0988-0 <https://pubmed.ncbi.nlm.nih.gov/26474982/>
- Franceschini, Sandro et al. "Action video games make dyslexic children read better." *Current biology : CB* vol. 23,6 (2013): 462-6. doi:10.1016/j.cub.2013.01.044
- Kefalis, Chrysovalantis, et al. "The Effects of Video Games in Memory and Attention." *International Journal of Engineering Pedagogy*, vol. 10, no. 1, Jan. 2020, pp. 51–61. *EBSCOhost*, doi:10.3991/ijep.v10i1.11290.
- Rothbart, Mary K, and Michael I Posner. "The developing brain in a multitasking world." *Developmental review : DR* vol. 35 (2015): 42-63. doi:10.1016/j.dr.2014.12.006
- Wiegman, Oene, and Schie Emil G M van. "Video Game Playing and its Relations with Aggressive and Prosocial Behaviour." *The British Journal of Social Psychology*, vol. 37, 1998, pp. 367-78. *ProQuest*,

[https://search.proquest.com/docview/219186411?accountid=33851.](https://search.proquest.com/docview/219186411?accountid=33851)