The Effects of Video Game Play on Visual Attention

Luke McMahon

B.A. (HONOURS) PSYCHOLOGY

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Abstract

The Global Games Market Report estimates that, as of 2019 there are 2.2 billion people worldwide that engage in video game play creating a global market with a valuation of $135 billion (Batchelor, 2018). Much of the current literature focuses on the negative psychological and physiological effects of video game play whilst the body of literature surrounding potential cognitive benefits is still lacking despite an increase in recent years. This study's primary aim was to investigate if video game play has a positive effect on an individual's visual attention abilities. This study used a Multiple Object Tracking (MOT) task in order to measure participants visual attention abilities. The study used a sample of young adults aged 18 - 23 ($n = 40$). The participants were separated into two groups; video game players (VGPs) and non-video game players (NVGPs) in order to see if video game players would perform better. Statistical analysis found video game players ($M = 271.35$) to perform statistically significantly ($p < .001$) better than their non video game playing counterparts ($M = 240.30$). The magnitude of the effect size led to a large effect size (Cohen's $d = 1.34$). Gender differences in visual attention were also assessed, with no significant difference being found between males and females ($p = .53$). These results were found in a public setting with no effort being made to reduce outside stimuli. Future studies should attempt to replicate these findings within a laboratory setting.

Introduction

Attention is not considered to be a unitary function but in fact contains at least four varying domains (Sturm, Willmes, Orgass, & Hartje, 1997). These four domains of attention are divided into two groups, both of which represent the intensity of attention as well as the processes related to the conditions of the limited attention capacity which governs the information selection processes (Sturm, et al., 1997). The first group contains the “phasic alertness” and “vigilance” domains of attention. The second group contains the “selective attention”□ and “divided attention”□ domains which govern which information is selected for processing (Sturm, et al., 1997). Phasic alertness refers to the ability to enhance response readiness as a result of external cueing in which a warning stimulus precedes the intended target (Sturm, et al., 1997; Sturm, & Willmes, 2001). Phasic alertness capabilities are also dependent on reaction time and are tested in many cases using reaction time tasks (Meiran, & Chorev, 2005). In terms of the domain of attention, vigilance refers to an individual's ability to sustain attention on a task for a period of time in order to detect relevant stimuli (Oken, Salinsky, & Elsas, 2006; Davies, & Parasuraman, 1982). However due to vigilance being a term used in various contexts and definitions, in this context vigilance is most often referred to as sustained attention (Oken et al., 2006; Hancock, 1989). Selective attention is defined by the selective processes sensory information undergoes so that only selectively relevant information is processed as opposed to irrelevant environmental information (Driver, 2001; Harter, & Aine, 1984). Divided attention refers to the sharing of attentional capacities in order to focus on and process more than one relevant stimuli (Perry, & Hodges, 1999; Colflesh, & Conway, 2007). All of these processes intertwine in order to form attentional systems used in everyday life under the context of the five sense; sight, smell, touch, hearing and taste.

Visual attention has been a recurring topic in psychological research. Visual attention refers to the set of mechanisms by which relevant visual information is selected whilst irrelevant visual information is suppressed (Hubert-Wallander, Green, & Bavelier, 2011, Sturm et al., 1997). Visual attention encompasses many complex processes that determine performance on certain attentional tasks. Selective attention is essential due to the limited capacity of information that can be processed (Desimone, & Duncan, 1995). The limited capacity model of attention states that the amount of information an individuals' attentional capacity can process at any given moment in time is limited (Lee, & Faber, 2007; Kahneman, 1973; Dux, & Marois, 2009; Huang,& Pashler, 2005). This limited capacity is made up of two components; primary task capacity and spare capacity (Lee, & Faber, 2007; Kahneman, 1973). As this model of attention states, attention cannot be spread across an infinite amount of tasks but is limited to about 3 to 5 units of information (Cowan, 2001; Cowan, et al., 2005).Visual attention can also be measured in terms of attentional control (Dye, Green, & Bavelier, 2009) and also in terms of visual searching ability (Green, & Bavelier, 2003; Castel, Pratt, & Drummond, 2005). Attentional control, also referred to as executive control resolves conflict among responses by directing attention to stimuli relevant to the task whilst inhibiting the processing of potentially distracting stimuli (Dye, Green, & Bavelier, 2009; Fan, McCandliss, Sommer, Raz, & Posner, 2002). Visual searching ability refers to an individual's ability to effectively search a given visual environment in order to locate specific stimuli in the given visual field (Cheal, & Lyon, 1992; Castel, Pratt, & Drummond, 2005; Duncan, & Humphreys, 1992; Wolfe, 1994).

Due to the constant requirement placed upon attention systems in everyday life, research has been conducted in order to evaluate if attention abilities can be trained. Factors such as age (Verhaeghen, & Cerella, 2002) and illness have been shown to have a deteriorating effect on visual attention performance. Illnesses such as bipolarism and strokes have been correlated with deficits in visual attention abilities (Kurtz, & Gerraty, 2009; Mazer et al., 2003). Previous research has examined the plasticity of visual attention abilities, with results showing that appropriate cognitive training interventions can be used in order to improve performance (Ball, et al., 2002; Buiza, Soldatos, Petsatodis, Geven, Etxaniz, & Tscheligi, 2009). This finding has been used in attempts to remediate the deterioration of visual attention in elderly populations (Verhaeghen, & Cerella, 2002; Ball, et al., 2002; Buiza, et al., 2009). In order to first assess visual attention performance, tasks have been developed that place specific demands upon the systems in question. One of the most commonly used task to study visual attention is Multiple Object Tracking tasks (Pylyshyn, & Storm, 1988; Cavanagh, & Alvarez, 2005). The development of the Multiple object tracking paradigm has led to the finding that individuals can track multiple objects moving independently of each other suggesting that individuals have the ability to track more than one object simultaneously (Howe, Horowitz, Morocz, Wolfe, & Livingstone, 2009; Sears, & Pylyshyn, 2000). The Multiple Object Tracking task has become a common way to assess and measure an individual's performance on a visual attention demanding task (VanMarle, & Scholl, 2003; Hauser, Dye, Boutla, Green, & Bavelier, 2007; Alvarez, & Franconeri, 2007; Xu, & Chun, 2009; Dye, & Bavelier, 2010).

In recent years, the field of video games and the effects they have on psychological and physiological functions has been increasing. Much of the literature on video games look at negative behavioural effects video games may have, especially on aggression (Anderson, & Bushman, 2001). Due to video games often containing violent and aggressive characteristics, much of the research surrounding video games has attempted to see if there are any negative consequences associated with video game play. The most prominent of these negative consequences being studied is the influence on aggression and aggressive behaviours. Although existing literature seems to suggest that video game violence exposure increases aggressive behaviour, there remains need for further additional research (Dill, & Dill, 1998). This research area is especially important as violent video games have always made up a large portion of the market (Braun, & Giroux,1989; Buchman, & Funk, 1996) and as of 2018 the video game market has a valuation of $135 billion worldwide (Batchelor, 2018). However, violent video games are only one of many genres that video games come in to make up such an enormous market (Connolly, Palmer, Barton & Kirwan, 2016). Inconsistencies and empirical issues regarding the association established between video game play and violent or aggressive tendencies has faced scrutiny within the literature (Dill, & Dill, 1998; Ferguson, 2007; Barlett, Anderson, & Swing, 2009).

Although the research began looking to the negative effects of video game play more recent studies have shown the possible effect that video game participation may have on remediating the effects of cognitive ageing, especially in older adults (Belchior, et al, 2013) as well as the effect of prosocial game play on increasing prosocial outcomes (Greitemeyer, & Mügge, 2014). Video game participation has also been shown to improve cognitive functioning and maintenance of self-concept in elderly populations leading to a better quality of life (Torres, 2011). A common characteristic of ageing is the decreased performance of cognitive control. Cognitive control refers to neural processes being configured for performance on specific tasks in a goal directed manner (Anguera, et al., 2013; Botvinick, Braver, Barch, Carter, & Cohen, 2001). Training cognitive control in elderly populations through tasks that require multitasking results in improved performance on multitasking ability with this improved performance extending to untrained cognitive control abilities (Anguera, et al., 2013). Although limited, video game studies achieved benefits in general cognitive functioning (Stanmore, Stubbs, Vancampfort, de Bruin, & Firth, 2017) with these improvements being generalisable to other tasks (Dye, Green, & Bavelier, 2009). Previous studies present findings that video gamers outperform non video gamers on tasks involving attention in clustered scenes (Green, & Bavelier, 2006). Other studies demonstrate video gamers to suffer less cost in dividend attention, suggesting video gamers are better at detecting items in the periphery of their vision (Green, & Bavelier, 2006).

Although the research is limited into the relationship between video games and visual attention, there is evidence that suggests a relationship exists between the two. However action-video-game playing has been shown to have the capability to alter a range of visual skills (Green, & Bavelier, 2003). The definition of an action video game is very ambiguous. One accepted definition is a physically challenging video game that requires reaction time as a crucial component. Other definitions involve the use of violence within a video game in order to classify it as an action video game, although no finite definition has been agreed upon (Karimpur, & Hamburger, 2015). This study used various tasks such as an enumeration task and the Flanker compatibility task in order to measure attentional resources available during tasks at various difficulties. This study found video game players to have an enhanced attentional capacity over non video gamers, performing on tasks with significantly greater accuracy than non-video gamers (Green, & Bavelier, 2003). Greater performance by video gamers on an enumeration task has also been demonstrated in another study (Green, & Bavelier, 2006). The enhancing effect of video game play on attentional skills has been shown to have an effect on players of all ages but previous literature has shown the generalisability of these effects in young adults populations across attention demanding tasks (Dye et al., 2009).

As stated previously video game players perform better on attention tasks that are set in clustered scenes (Green, & Bavelier, 2006). The ability to search a visual field and efficiently attend to the relevant stimulus is a critical component of visual attention. Video game players have been found to use the same techniques to search a visual environment as non-video game players but do so at greater speeds (Castel et al., 2005). The training of visual search ability has led to findings showing the immediate positive effect on driving ability (Roenker, Cissell, Ball, Wadley, & Edwards, 2003). Video game players have also been found to have faster reaction times and overall better performance on tasks involving attentional control (Dye et al., 2009; Green, & Bavelier, 2012; Boot, Kramer, Simons, Fabiani, & Gratton, 2008). Previous studies have also used multiple object tracking tasks to measure visual attention ability differences between video gamers and non-video gamers (Green, & Bavelier, 2006; Oei, Patterson, 2013).

Visual attention is essential to observing the world around us. The visual attention improvements seen in previous research regarding video games has been demonstrated to also result in improvements on other visual attention demanding tasks. According to reports from the Global Games Market Report, as of 2019 there are approximately 2.2 billion people worldwide that engage in video game play. As visual attention deteriorates performance on everyday tasks requiring visual search, for example driving, are hindered. Visual attention deficits can also result in a smaller field of view. Much of the current literature has taken a focus on older populations due to the attentional deficits commonly associated with growing older (Ballesteros, et al., 2014; Hall, Chavarria, Maneeratana, Chaney, & Bernhardt, 2012). Studies have shown that the average gamer is 35 years old and 48% of all gamers are women (Karimpur, & Hamburger, 2015; Duggan, 2015). A gap in the literature exists in these positive cognitive effects of video games in young adult populations, both male and female. The literature surrounding gender differences in visual attention abilities is extremely limited and as such this study aims to investigate any potential gender differences as a previous study has found no difference to be present (Skogsberg, et al., 2015). Due to the sheer size of the video game-play population as well as the lack of literature in the area surrounding young adult populations, possible effects of video games should be investigated.

The literature presented in the above discussion provides a basis for the study of the cognitive effects of video game play. The benefits to an individual's attentional capacity merit further investigation. The research questions for the present study are as follows; Is there a positive relationship between participation in video game play and visual attentional abilities?; Is there a gender difference in male and female visual attention abilities? Tasks have been developed by researchers in order to measure an individual’s visual attention ability. This study will have two hypotheses. The first hypothesis for this study is that video game players will perform better on a visual attention demanding task than their non video game playing counterparts. The second hypothesis for this study is that there will be no difference in visual attention abilities between males and females. The aim of this study is to test these hypotheses within a young adult population. For the purposes of this study a video game player (or VGP) will be defined as an individual who self-reports engaging in at least 5 hours of video game play per week on average. A non-video game player (or NVGP) is defined as an individuals who self-reports engaging in little or no game play per week. Gender differences in visual attention scores will also be investigated in order to examine if the results are in line with the limited literature focusing on gender differences in a visual attention context.

Methods

Participants

This study used a sample of young adults. The sample size was 40 with an age range of 18 - 23. The sample consisted of both males (N = 23) and females (N = 17). Convenience sampling was used to gather participants for this study. Participants were approached on the college campus as well as the immediate surrounding area. Participants were provided with an information sheet detailing the study and an informed consent form was provided prior to the study commencing. The only inclusion criteria required for this sample was that participants were aged between 18 - 23. No incentive was used in order to encourage participants.

Measures/Materials

The apparatus used to complete this study was a browser enabled laptop running the multiple object tracking task, a desk or table that allows the laptop to be placed at arm's length as well as a pen and paper in order to record the participants' scores after each block of trials.

Design

This study had a between subjects design. In order to test the hypothesis participants would complete a multiple object tracking task. The dependent variable in this study is performance on the multiple object tracking task which is measured in the accuracy percentages provided by the task. The independent variable is the participants' video game playing habits, whether they engage in little or no video game play or at least 5 hours per week.

Procedure

During recruitment before the participation begins, potential participants are asked if they are aged between 18 - 23. If the individuals meet the age criteria they were asked if they would like to participate in the study. An information sheet will be provided for the potential participant to read in order to understand the study (see Appendix A). Potential participants were encouraged to ask the researcher as many questions as they wanted in order to ensure they understand the study and what participation would entail. A consent form was then provided and the participant was asked to provide their age (see Appendix B). As a part of the informed consent process, participants were assured that they were allowed to withdraw from the study at any point during participation without penalty, however once data had been collected it could not be withdrawn after participation as the data was stored anonymously. In order to begin the experiment portion of the study, participants were asked to self-report on their video game playing habits. This allows participants to be placed in their corresponding groups for statistical analysis on the basis that they engage in little or no video game play each week or at least 5 hours of video game play a week. Once the participants have provided the required information, the task portion of the study was ready to begin. Participation took place in a public area with outside environmental stimuli present. The participants were seated in front of the researchers laptop which was placed at a comfortable height and at arm's length away from the participant. The computer based multiple object tracking task was then run on the laptop in front of the participant. The task must be adjusted to match the screen size and brightness of the room. The same laptop was used with each participant so the screen size was set at 15 inches, but participation took place at different times and in different rooms so the brightness had to be adjusted in each case accordingly. Once the multiple object tracking task has been loaded up, graphics will be presented on the screen which describes the procedure of the task in step by step detail. Before the testing phase of the task the participant will be given a practice block which consists of 5 simplified trials in order to allow the participants to familiarise themselves with the task. Once the practice block is completed the participants will be prompted to press the spacebar in order to begin the first block of trials. The participants instructions are as follows; Once the participants presses the spacebar a grey circle appears in the centre of the screen. Within the grey circle there are blue sad faces and yellow happy faces bouncing around within the limits of the circle. As soon as the task begins the participants are to track the blue sad faces positions as all the faces move in random directions. The amount of blue sad faces and faces present on the screen in total is random however there will always be more yellow happy faces than blue sad faces. After an allotted amount of time the blue sad faces will transform into yellow smiley faces, identical to the ones already being presented as distractors. The participants must remember which sad faces turned into smiley faces and must continue to track them. The movement of the faces will cease and a single face will show a question mark. The participants must respond with 'B' if that face was once a blue sad face and transferred into a yellow happy face or 'Y' if the face was always a yellow smiley face. Once the answer has been provided, the participants will be prompted to press the spacebar in order to engage the next trial and repeat the same steps.The participants will complete 15 trials in each of the three blocks. The percentage accuracy will be stated after each block of 15 trials and must be recorded by the researcher each time. The procedure requires around 15 minutes with each participant in order to collect the initial information, become familiar with and perform the task.

Results

Table 1

Frequencies for the current sample of video-game players (VGP) and non-video-game players (NVGP) on each demographic variable (N = 40)

Variable	Mean	Std. Dev	Frequency	Valid Percentage
Gender				
Male			23	57.5
Female			17	42.5
Age	20.25	1.56		
18			6	15
19			5	12.5
20			16	40
21			6	15
23			7	17.5
Group				
NVGP			20	50
VGP			20	50

Frequencies for categorical data are presented in Table 1. Just over half of the participants were male (57.5%). The mean age for the sample was 20.25. There were an equal number of participants in both groups.

Table 2
Results of t-test and group statistics for visual attention scores by group

	Group						95% CI for Mean Difference		
	NVGP			VGP					
	M	SD	n	M	SD	n		t	df
Total Visual Attention Score	240.30	29.06	20	271.35	17.40	20	-46.38, -15.72	-4.10*	38

* p < .05.

An independent samples t-test was conducted to compare visual attention abilities between video game players and non video game players. There was a significant difference in scores, with video game players (*M* = 271.35, *SD* = 17.4) scoring significantly higher than non video game players (*M* = 240.30, *SD* = 29.06), *t*(38) = -4.1, *p* < .001, two-tailed. The magnitude of the differences in the means (mean difference = -31.05, 95% CI: -46.38 to -15.72) was very large (Cohen's *d* = 1.34).

Table 3
Results of t-test and group statistics for visual attention scores by gender

	Group						95% CI for Mean Difference		
	Male			Female					
	M	SD	n	M	SD	n		t	df
Total Visual Attention Score	258.30	29.35	23	252.47	27.56	17	-12.69, 24.36	.64	38

An independent samples t-test was conducted to compare visual attention abilities between males and females. There was no significant difference in scores, with males (*M* = 258.30, *SD* = 29.35) and females (*M* = 252.47, *SD* = 27.56) scores not differing to a statistically significant degree, *t*(38) = .64, *p = .53*, two-tailed. The magnitude of the differences in the means (mean difference = 5.83, 95% CI: -12.69 to 24.36) was small (Cohen's *d* = .20).

Discussion

Interpreting Results

The current study aimed to examine the relationship between video game play and visual attention abilities. The primary aim of this study was to investigate if video game players would perform at a greater capacity on a visual attention demanding multiple object tracking task than their non video game playing counterparts. The results of the multiple object tracking task were recorded and entered into SPSS for statistical analysis in order to determine if there was a statistically significant variance in scores between video game players and non-video game players. This study used a young adult population (18 - 23) in order to fill an existing gap in the literature in regards to the positive cognitive effects of video game play. Positive remediating effects are often studied in older populations due to their potential practical implication of remediating the negative effects of old age on attention abilities (Ackerman, Kanfer, & Calderwood, 2010; Hughes, Flatt, Butters, Chang, & Ganguli, 2014; Stanmore, et al., 2017).

In order to examine the relationship between video game play and visual attention an independent sample t-test was run to compare the overall results of the VGP group and the NVGP group. Statistical analysis showed that video game players (M = 271.35) performed at a statistically significant higher accuracy ($p < .001$) than their non video game playing counterparts (M = 240.30). This result indicates that video game players have a greater capacity for visual attention demanding tasks than non-video game players. This finding supports recent research which suggests that video game play, whether avid or short term, improves performance on visual attention tasks (Kefalis, Kontostavlou, & Drigas, 2020; Wilms, Petersen, & Vangkilde, 2013). The video game playing group also had a much smaller standard deviation (SD = 17.40) than the non-video game playing group (SD = 29.06) indicating that video game players not only score higher on average but also score at a more consistent level than non-video game players. This finding may be a result of individual differences in visual attention abilities being a more prevalent factor in participants who do not engage in video game play. This finding suggests that video game play could help facilitate the growth of an individual's visual attention capacity (Bediou et al., 2018). The effect size for this study (d = 1.34) was seen to exceed the requirement for a large effect size (d = .80) (Cohen, 2013). This large effect size indicates how great the difference in visual attention abilities is present and further supports the finding that video game players perform at a significantly greater capacity on the given visual attention task. Previous research has also found medium (d = .59) to large (d = .77, .99) effect sizes in attention based tasks used in video game based interventions (Belchior, et al, 2013). However, studies have also found no significant differences between VGP and NVGP groups on attention based tasks, suggesting that the modification of visual attention as a result of video game play is limited (Murphy, & Spencer, 2009; Roque, & Boot, 2018). This finding supports the hypothesis for this study that video game players would perform better on a visual attention demanding task than non-video game players. An improved ability to sustain attention over multiple objects has been found in previous research regarding the positive cognitive effects of video game play (Hubert-Wallander, et al., 2011).

Due to gender being collected as part of the demographics for this study, statistical analysis was run in order to examine any potential gender differences in visual attention abilities. There was no statistically significant difference (p = .53) found between genders with males (M = 258.30) scoring slightly higher than females (M = 252.47). A small effect size (d = .20) was also found further suggestive that no gender difference is present. A previous study did not find a difference between male and female visual attention abilities (Skogsberg, et al., 2015), however this finding may be due to the lack of research into comparing genders on visual attention tasks. Another study suggests that behavioural studies cannot fully capture any possible gender differences and that neural measures may be required in order to effectively study these differences (Feng, et al., 2011). However due to the lack of research in this area of study it is difficult to attempt to try and explain the relationship between visual attention and gender although the result of this study supports the hypothesis that no gender difference would be found in visual attention ability. Much of the literature surrounding gender and visual attention is set in a more social context referring often to the differences in attention targets as opposed to actual visual attention capacities (Amon, 2015).

Strengths and Weaknesses

This study's limitations consist of both confounding variables and methodological issues. The first limitation of this study is the small sample size. This study had a sample of only 40 young adults. The sample size was limited to 40 due to time restraints and future studies would be advised to use a larger sample. However the small sample size did not compromise the magnitude of the effect size, pertaining to an appropriate methodology being used for this study. Another limitation of this study is relating to the methodological issue that the task portion of this study did not take place in a laboratory setting. As participants were recruited in and around the college campus the task was completed in a public area. Due to the multiple object tracking task requiring constant mental effort to maintain attention on the given task, the outside environment acted as a confounding variable. This is due to the distracting nature irrelevant external stimuli on an individual performing an objective task involving cognition, concentration and attention (Button, Behm, Holmes, & Mackinnon, 2004; Castaneda, & Gray, 2007; Dalton, & Behm, 2007; Hartley, & Williams, 1977). This limitation has been researched to show that external environmental or sensory stimuli, especially background noise, can have a negative effect on performance on a cognitive functioning task. The impact this confounding variable has is determined by certain factors; the intensity and duration of the stimuli (Dalton, & Behm, 2007; Jerison, 1959), an individual’s cognitive control (Hancock, & Szalma, 2008), and also individual differences in the interpretation of the stimuli (Smith, 1985). Due to this study not taking place in a laboratory setting, each participant was accompanied by various levels of external stimuli. The third issue surrounding the methodology of this study was that the task being used would occasionally glitch. This glitch made it so that the participants were not given the option to give an answer for a trial. However this issue was rare and would not have a large effect on the study to be considered a confounding variable.

A major, unavoidable, limitation of this study was the differences in motivation each participant had whilst undergoing the task. Participants often noted being bored by the task and as a results felt less motivated to try to the best of their ability. Participants also mentioned that once they knew they got a trial wrong, they were less inclined to continue trying as hard. This limitation relates directly to the participants own motivation and was not a methodological flaw of the study. Previous literature has found motivation to be a determining factor in an individual's performance on a cognitive task (Botvinick, & Braver, 2015; Kanfer, & Ackerman, 1989; Revelle, 1989). Low motivation has been shown to result in lower levels of performance in both low and high ability individuals (Vroom, 1964). Although the level of impact has had on the study is unknown, the literature shows that individual differences would be more pronounced if task motivation is high (Kanfer, & Ackerman, 1989). This limitation is expected in an experimental design. However, although this limitation is a result of an experimental design, this design is also a strength of the study. A characteristic of experimental design is that it can allow for causation to be inferred. Inferring causation means that the results can be duplicated. By adding or removing steps in the experimental process, future research can attempt to further support the results to help understand the validity of the findings. As previously stated the other strength of this study is the effectiveness of the methodology used. This is evident in the large effect size which was found using a relatively small sample size.

Future Research

A look at the current literature surrounding video games returns a body of literature consisting mostly of studies aiming to relate video games to negative outcomes, especially aggression (Griffiths, 1999; Kühn, et al., 2019; Sherry, 2001). However, the findings of the current study merit further study into the potential positive effects of video game play on higher order cognitive processes such as attention and perception. The findings of this study could have clinical relevance for remediating cognitive deficits. The clinical relevance of these findings could be of most importance as an intervention aimed to help preserve, recover or enhance cognitive functions that decline with age (Toril, Reales, & Ballesteros, 2014). As the population of older people continues to grow worldwide, these cognitive deficits only increase in prevalence (Torres, 2011). The enhancing effect has been shown to be effective for all ages (Dye et al., 2009). Future research should aim to further support the positive cognitive benefits of video game play. Efforts should also be made in order to develop effective interventions to remediate cognitive deficits and also develop appropriate methods of training that enhance cognitive functions using video games.

Conclusion

This study's primary aim was to investigate if video game players have better visual attention abilities than non-video game players. This study found video game players to perform statistically significantly better than non-video game players. The result of this study further supports the findings of the current literature that video game play can enhance aspects of cognitive functioning. However, this study did use a relatively small sample and did not take place in a laboratory setting meaning that each participant was subject to unique distractors in the environment. Future research should aim to duplicate these findings after the limitations have been accounted for. The future findings should aim to use the resource of video games in order to promote the under studied positive outcomes of video game play.

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Tables

Table 1

Frequencies for the current sample of video-game players (VGP) and non-video-game players (NVGP) on each demographic variable (N = 40)

Variable	Mean	Std. Dev	Frequency	Valid Percentage
Gender				
Male			23	57.5
Female			17	42.5
Age	20.25	1.56		
18			6	15
19			5	12.5
20			16	40
21			6	15
23			7	17.5
Group				
NVGP			20	50
VGP			20	50

Table 2

Results of t-test and group statistics for visual attention scores by group

	Group						95% CI for Mean Difference	t	df
	NVGP			VGP					
	M	SD	n	M	SD	n			
Total Visual Attention Score	240.30	29.06	20	271.35	17.40	20	-46.38, -15.72	-4.10*	38

* p < .05.

Table 3

Results of t-test and group statistics for visual attention scores by gender

	Group						95% CI for Mean Difference	t	df
	Male			Female					
	M	SD	n	M	SD	n			
Total Visual Attention Score	258.30	29.35	23	252.47	27.56	17	-12.69, 24.36	.64	38

Appendices

Appendix A

Information Sheet Regarding the Study of The Effects of Video Game Play on Visual Attention Ability

This study is being completed for the purpose of the completion of an undergraduate thesis as the National College of Ireland.

This study is being conducted in order to examine if there is an effect on video game play on an individual's visual attention abilities. For example, in the context of this study how well an individual can track multiple moving objects in a field / on a screen.

Individuals who volunteer to participate must be eligible. For the purposes of this study eligibility means individuals are aged between 18 - 23 and partake in little or no video game play or at least 5 hours of video game play each week. Participants will also be asked to state their gender.

In order to measure the visual attention abilities, participants will be asked to perform a multiple object tracking task on the researchers laptop. The multiple object tracking task will take approximately 10 minutes to complete.

Any individuals who participate retain the right to withdraw from the study at any time during participation if they wish to do so.

There are no risks involved with participation in this study.

Any questions regarding the study may be asked of the researcher at any time.

Contact Details
Researcher: Luke McMahon
Email: x17400032@student.ncirl.ie
Phone Number: 0831555824

Supervisor: Fearghal O'Brien
Email: Fearghal.OBrien@ncirl.ie

Appendix B

Informed Consent Sheet Regarding the Study of The Effects of Video Game Play on Visual Attention Ability

This research is being conducted by Luke McMahon, a final year student at the National College of Ireland.

This study has been examined and approved by the Departmental Ethics Committee at the National College of Ireland. It is the responsibility of the research to adhere to ethical principles and not the committee's.

I have been informed of the nature of this study and understood the information sheet provided. I therefore agree to participate in a study for *The effects of video game play on visual attention ability* and allow my information to be used for the purposes of said study. I have also been informed of my right to withdraw from the study at any point should I wish to do so and have been made aware that all data collected for the study will be treated as confidential. I understand that once my participation has ended, that I cannot withdraw my data as it will be unidentifiable.

□ Please tick this box if you have read, and agree with all of the above information.

□ Please tick this box to indicate that tour ae providing informed consent to participate in this study.

Age: ____

Researcher: ____

Appendix C

Debriefing Sheet Regarding the Study of The Effects of Video Game Play on Visual Attention Ability

The study in which you participated in has been conducted with the intent to measure individuals visual attention abilities in order to examine if there is a difference in ability between video game players and non video game players. In order to examine this relationship, the data collected from participants will be used for statistical analysis. Any data that has been collected will be stored confidentially and can not be withdrawn after participation as the data will be unidentifiable. Contact details for the researcher will be noted on this sheet if any further information is desired by participants.

This research is being conducted as the basis for a final year thesis at the National College of Ireland. Your participation is greatly appreciated for both the use as a final year thesis and also in hopes to help grow our knowledge in the area regarding the positive effects that video game play may have on individuals.

Thank you very much for your participation.

Contact Details
Researcher: Luke McMahon
Email: x17400032@student.ncirl.ie
Phone Number: 0831555824

Supervisor: Fearghal O'Brien
Email: Fearghal.OBrien@ncirl.ie