

# The Games We Play

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10/10/2003

## 1.1 Introduction

There is a faction of American society that is deeply concerned with the social and psychological ramifications of gaming. This conflict is singularly unique in that while the object of scrutiny is not a recent development, the modern technology being employed has only existed for the past 20 years and is being subject to a reactionary backlash. This paper intends to ameliorate these concerns by showing that research supports the contention that modern computer games improve the cognitive processes of attention.

“Recent surveys have shown that upward of 84% of American teens (roughly 90% of boys and 75% of girls) play video games regularly”[4]

Should video games be shown to be harmful and totally without positive benefits, several consequences follow: First, the pace of research on affects of video games must be quickened so that the problem may be more fully understood. Second, the entertainment industry shall be subject to regulation in order to insure minimal harm towards those subjected to games. Lastly, at risk individuals who have been exposed to damaging games should be offered treatment options.

The first step, increasing the pace and breadth of research, is necessary because the current research, while fairly complete in exploring the link between video games and aggression, is deeply lacking in other areas. In our research we have found comparatively little information dealing with other aspects of the mind, such as perception, learning, or even the long-term effects of video games. The last item is perhaps not surprising given the recency of video games, however it does point out the need for longitudinal studies.

The next step, regulation of the industry, would be a necessary but damaging requirement. The video game industry is a multimillion-dollar enterprise that

stands to lose if faced with such restrictions.

“The second most popular form of entertainment after television, video games have rapidly become the largest segment of the entertainment industry, taking in \$6.3 to \$8.8 billion in 1998...” [15]

One potential issue with regulation, for example, is the conundrum between the need for freedom of expression, such as the artwork and code that goes into the game, and the need to restrict it. Already, laws that directly inhibit freedom of expression in programming, such as the Digital Millennium Copyright Act, have raised the ire of programmers worldwide.

The last step, the creation of treatment options and publicizing the need, is necessary because parents do not always express due diligence and awareness of their children’s activities and needs, and thus may not be a reliable counter to the influence of video games.

“In a 1999 study, most parents were not able to name their child’s favorite game or named an incorrect game. In 70% of these incorrect matches, the child described their favorite game as violent.” [15]

If parents do not reliably function as the gatekeepers to bring children into our society, it may fall upon the society as a whole and the professional sector, ie doctors and psychologists, to make up the difference.

The above scenarios, however, are all contingent upon the idea that video games are damaging, which is a viewpoint that the authors of this paper diametrically oppose. Steve, Chris, and Paul each had a stance prior to creating this paper, and we still retain them.

Deprived of video games at an early age due to claims relating video games to negative effects on the brain, Steve had to live without them until the age of

11 at which point he got his first playstation. Steve came across a quote from a Nintendo executive:

“Computer games don’t affect kids - I mean, if Pacman affected us as kids, we’d all be running around in darkened rooms, munching magic pills and listening to repetitive electronic music.” (Kristian Wilson)

and it stuck in his mind. Distressed that his deprived childhood might be due to misinformation, Steve chose to participate in researching this paper, if only to put right what once was wrong. It is therefore his initial opinion that the paper’s thesis is correct.

Chris has been an avid fan of video games since he was a child, and he does not believe the negative rumors regarding video games. He chose to research this project so that he could substantiate his belief.

“Video games have never negatively influenced me or any other video game player that I have known, and I believe that all this controversy has just been created so senators will have something to pledge against in order to win votes, and video game haters will have something to (expletive deleted) about.” (Chris Doody)

It is therefore his initial opinion that the paper’s thesis is correct.

Paul believes that video games are a tool of artistic expression. They allow the programmer, designer, artist, sound technician, and other talented individuals to reach out and touch the heart and soul of an audience in a way that no other medium can; a way that allows the work and the audience to respond to each other rather than a passive one way relationship. While ideally he would attack the negative criticism against video games by attempting to debunk statements implying that video games instigate violence, due to the constraints of

this research project, he is instead settling on showing a positive benefit of video games in the area of attention. It is therefore his opinion that the paper's thesis is correct.

If our position holds, it serves as a partial defense against the cry for controlling violent video games, or even non-violent ones. This would help ensure that people can continue to enjoy games to the same or greater extent than they have in the past, rather than having the future of games cut off from them by those who feel they are a threat. This is a good thing for us, it is a good thing for adults, and it is a good thing for our children.

“The video game offers an opportunity to master the intricacies of a complex, multi-cued, rule-governed environment, which young children presumably find intrinsically motivating” [6]

## 1.2 Literature Review

The first step of our search was to look up our topic using the list of databases provided by Chris Cox from the Gordon Library. We first searched for the keywords “video game” and “violent computer game” on Psychinfo. The former yielded several useful results however the latter did not. The search was continued through the ScienceDirect and SocialSciIndex databases and then other internet search engines, such as Google.com, Search.com, and Ask.com. The keywords used on these databases included: “games affect cognition”, “video games attention”, “video games”, “video games perception”, “video game cognitive processes”, “are cognitive processes negatively affected by video games?”, “do video games positively affect cognitive processes?”, and “do video games negatively affect cognitive processes?”. The combination of these search engines with these keywords yielded over 300 possible results, which does not include google's unrealistically high estimate of 1,450,000 returned pages. For example,

a large number of these web based resources were written on May 8th or 9th and were rewrites of an article that ran on AP Newswire that itself is a summary and quote of the research by Green and Bavelier[8]. Unfortunately due to the aforementioned problem and others, these web based search engines returned results that we deemed unreliable or non-useful and thus were not considered when drawing our conclusions. After sieving the massive number of possible candidate documents for inclusion into the paper, we settled upon 20 valid articles or experiments upon which to focus our scrutiny. Further study showed that some of these articles definitively answered our thesis question and thus provided sufficient data to reach a conclusion.

The journal documents we chose tended to be detailed, well thought out and well executed. For example, “The difference between playing games with and without the computer: a preliminary view.” [5] This article enumerates through the exacting details involved in the experiment: the participant selection and breakdown thereof, the materials and descriptions of the games played, the procedures and results which includes graphs, and the breakdown of the outcome. Another experiment we examined was built upon minimizing the flaws of earlier ones that came before.

Most of the group’s research results were available either in physical form from WPI subscribed journals such as Nature and Human Communication Research, or in electronic form from online journal databases. Regardless of the nature of the articles we found, the works cited by each tended to closely overlap each other. From this, it was concluded that the documents on the subject matter selected by the group were valid and reliable.

### 1.3 Results and Evaluation

The main experiments that support our thesis are covered in Green & Bavelier [8], Antonietti[5], and Blumberg[6]. Green & Bavelier performed four tests: two that measure attention resources, one that measures attention over space, and one that measures attention over time. Antonietti performed one test that compared the subject's performance on a board game and its computer counterpart, and Blumberg also performed one test that sought to determine how adept video gamers think.

The first test by Green and Bavelier uses the flanker compatibility effect to determine the attentional resources of gamers (video game players) and non-gamers (non video game players). According to their paper, this effect causes us to easily be distracted (distractor effect) by irrelevant stimuli when performing a task where we have visual processing to spare. In other words, as the difficulty of the task increases, the visual processing resources that we can spare decreases, and our performance on the task increases because of less distraction. It is remarkably counterintuitive, and furthermore, it showed that the distractor effect is more prevalent with gamers showing that they possess greater visual processing resources.

The second test by the two involved flashing an image containing squares for a brief period of time, and then requiring the participants to count them.

“The number of items that can be subitized gives an estimate of the number of items that can be attended at once” [8]

As expected, the gamers performed better, attending to an average of 4.9 items versus the 3.3 that non-gamers could handle.[8]

The third test was designed to eliminate spatial orientation of the stimuli as a variable. Reasoning that perhaps higher performance by gamers is constrained

to the viewing field normally used in playing computer games, they tested the subjects ability to locate a target among distractors within the visual field for games, at the border of said visual field, and well outside the visual field for games. Their data shows that the improved performance of video game players is not localized to one area of the visual field and is in fact improved all over.

The last test performed was to determine whether gamers performed better than their peers with a temporal task that tests how quickly stimuli can be processed in time. They used the attentional blink task which involves subjecting the subject to two discrete stimuli in rapid succession to determine how far apart they must be in time before they can be identified as separate. Again, video gamers performed better than the non-gamers.

These four tests were performed on a group of gamers and non-gamers to yield these results, and then they were performed again on two groups of non-gamers who were allowed to practice games, one hour per day, for ten days. A control group played a game that, in theory, would not enhance visual attention skills: Tetris. The other group played attentionally demanding Medal of Honor. As expected, those who played Medal of Honor had improved attentional capabilities across the board compared to those who played Tetris.

Antonietti tested the general performance of those who played a computer version of a game named Pegopolis with the performance of those who played the corresponding non-computer version. The test subjects were a uniformly distribute, albeit college level, group who had never played the game before. These subjects were broken down into two groups: half played two trials of the board game before doing two trials of the computer version, and the other half did the reverse. The subject's duration of play, comments on strategy, and intelligence were checked after they performed the trial.

“No significant difference emerged in the scores computed separately

for each trial and those computed by summing the scores, respectively, in the two real and in the two virtual trials. Analyses revealed that general intelligence levels were not significantly different in [...] video game players and nonplayers.” [5]

In short, according to Antonietti’s analysis, there are no statistically significant differences in playing the game on the computer or on the board.

Blumberg tested 114 schoolchildren to determine how gamers think compared to non-gamers. Each participant was allowed 10 minutes to play Sonic the Hedgehog 2 after which they were asked a series of questions:

1. What were you thinking about as you were playing the game?
2. Suppose you were going to tell someone else who has never played the game before how to play it. Are there any special secrets or rules that you would tell them about?
3. Is there anything you would pay attention to?

(Taken from [6])

The student’s responses were then recorded and categorized as goal oriented, strategy-based, game-oriented, and evaluative comments. Analysis found that there was a significant difference between gamers and non-gamers in strategy responses to question #3. Namely, gamers were more likely to give comments about where to focus attention.

Neuroscientists have also investigated claims about video games, and state that playing video games leads to

“striatal dopamine release increase [...] and that the correlation between dopamine release and performance level was significant. Dopaminergic neurotransmission is probably related to learning, reinforcement behavior, attention, and sensorimotor integration.” [15]

Essentially, playing video games has a real, measurable effect on a neurochemical that is related to attention.

Do these results support the hypothesis? For the most part, the results do support the hypothesis. Although Antonietti's study provides a dissenting view that the computer aspect of the game does not affect performance, it must be pointed out that his study was fairly short term, involving only two computer trials. Furthermore, it should be noted that the game chosen was not one that showcased the computer's ability to tax attention, a deficit noted by Antonietti himself. The other two studies were focused on testing attention and eliminating most other variables, and they show a broad range of increased attentional capabilities from faster processing to a greater attentional capacity, to a greater ability to strategize the allocation of attention. In fact, none of the studies we have read through, with the possible exception of Antonietti's, appears to contradict these findings. It is therefore reasonable to say that our hypothesis is true and is supported by credible, peer-reviewed research.

The lack of any research to the contrary is somewhat heartening, but also fairly troubling. The one sided support for our thesis may be an indication that the state of research in video games has not matured to the point where a serious analysis of video games and attention can be made. Perhaps what is needed is for the subject to be tackled by people biased against video games who will work to find any inconsistency in the established studies that favor games. Such efforts would, of course, be required to be reproducible so that the bias of the researchers does not translate into bias in the experiment. One area that can be explored this way is whether this increased attentional abilities come at a cost. Can we really get improved attentional capabilities at the cost of playing video games, or is there another trade off involved? Do other cognitive processes decay in ability as attention improves? These are questions that demand an answer.

## 1.4 Conclusions

It appears from the available evidence that attention is significantly improved by modern video games, as was postulated earlier. Attention capacity, response time, spatial response, and meta-level processing (i.e., strategizing about attention) were all improved in those who play video games. This result is important because it provides some measure of protection against the view that video games are bad for children, and it also provides an indication of where video games may help people.

There are many types of people who may wish to improve their attentional capabilities, and video games may be the answer. On one extreme, there are people who need to push the envelope on what the human mind can do. These are the racecar drivers, military personnel, jet and commercial aviation pilots. These are the people with jobs for which a distraction could be fatal. Even driving a normal car may be fatal, and

“Action video gamers tend to be more attune to their surroundings while performing tasks like driving down a residential street, where they may be more likely to pick out a child running after a ball than a non-video gamer.”[13]

On the other extreme, there are people whose attentional capabilities are severely diminished, such as those with ADHD or schizophrenia. These people may greatly benefit from games that help them develop their attention capabilities, perhaps even to the level of normal functioning people. After all,

“...10 days of training on an action game is sufficient to increase the capacity of visual attention, its spatial distribution and its temporal resolution.” [8]

For this reason, the authors are glad that their original opinions have held

true. We believe our original hypothesis turned out to be correct because it is fundamentally the intuitive view on the subject for those of us who are gamers. Certainly, no gamer wishes to think games bad for them, and in this case, the facts support the opinion. Despite reading the unrelated research on aggression that supports denying video games to children until they reach maturity, Steve still believes that his lack of a console in his early years was a bad thing. In this, his opinion is as much a function of the facts as it is his own biased views. Chris's opinions are, if anything, stronger because now he has the research to partially support his stance on video games. Finally, Paul is just glad his potential as a game developer will not be terribly hindered by ethical qualms, however he is slightly troubled by the unrelated studies on aggression. In this, his opinion is not as strong as it once was.

## **1.5 Authorship**

### **Steven Chizinski**

Steven Chizinski was responsible for almost half of the research as well as most of the work on the literature review. He was the second person on the team after Paul, and he was present at the first get together where he and Paul went over the assignment and fleshed out the framework for the focus of the research. When the day is over, he enjoys drinking a hot cup of cocoa while time traveling and watching special interest groups bicker.

### **Chris Doody**

Chris Doody did some research, created the bibliography, and seeded Steven with some initial information to use to write the literature review. He attended all but the first get together making him a reliable member of the team. On his

off time, he enjoys taking trips to never-never land where the video game critics never grow up.

## **Paul Ingemi**

Paul Ingemi coordinated the team. He set up a wiki for online collaboration `<http://users.wpi.edu/~pingemi/wiki/>` which allows team members to collectively modify a hierarchical document. He set up the group get-togethers in the campus center, set up the division of labor, performed some of the research, and collated the results. Furthermore, he also wrote the introduction, results and evaluation, conclusion, and the authorship page. Lastly, he converted all of the documents for inclusion into this paper into one voice and one  $\text{\LaTeX}$  document. When the sun goes down, Paul changes from super project organizer man back into a normal student.

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