Brain Train - Video Games and Reaction Times

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Table of contents

Timeline

Jan 10 - 18	Idea Generation and research
Jan 18 - 28	Research question and hypothesis
Jan 28 - Feb 1	Research and experiment plan
Feb 1 - Feb 3	Ethics & due care submission and approval
Feb 3 - 10	Experiment coordination and planning
Feb 8 - 9	Experiment rehearsal and testing
Feb 10	Experiment session #1 (class 1)
Feb 11	Experiment session #2 (class 2)
Feb 12	Experiment session #3 (class 3)
Feb 13 - 14	Data entry and analysis
Feb 14 - 15	Findings and conclusion
Feb 15 - 18	Write up findings
Feb 18 - 22	Presentation preparation and recording
Feb 22	In school presentation

Idea Generation

Things I am really interested in:

- Video games
- Music
- Martial arts
- Computers
- Parallel universes and the 4th dimension

Things I am really curious about:

- How different sounds / music affect mood?
- What makes music popular?
- Are video games good or bad for you?
- How do you make a good video game?
- What is the 4th dimension?

Things I could test:

- Do certain sounds make people feel different
- Can video games make you faster
- Can video games make you smarter

Things I could build

- 3d model in blender
- Videogame

Background Research

Videogames and the brain:

More than one billion people play video games every day and there are differing views about what video games do to the brain. Some people say they are good for the brain, others say they are not. Even though some have said video games cause violent behaviour, there has not been a complete answer as no one has found enough proof (Nichols, 2017).

What is known is that video games change the structure of the brain. Those changes have been found to be both positive and negative. Studies thus far have found that videogames have positive effects on attention and motor skills but they can also have negative effects due to the higher risk of developing an addiction (Paulaus, 2017).

More specifically studies have found video games improve capacity in the frontal lobe, which is important for attention (Marengo), and areas in the brain responsible for visual and spatial information and memory (Nichols, 2017). They also found that those that those that play fast video games have better selective attention, required for fast movements over slow game players (Paulaus, 2017).

Testing actions

Reaction time tests were first performed by Franciscus Cornelis Donders. He performed experiments using reaction time tasks in the early 1860s.

He did the following tests:

1. Simple reaction time test:
2. Choice response time task.
3. A go/no-go discrimination response time task.

https://www.ru.nl/donders/about-us/biography-donders/

Physical process of a reaction

What happens in the body during a reaction time test?

Many processes happen when we do a simple reaction time test. First, light waves from an image to into our eyes and hit our retina, rods and cones. Then the image is sent to the brain. The message is sent to the opposite side of the brain and toward the back of the brain to the occipital lobe which is the primary area in the brain that handles visual information.

After the visual information leaves the occipital lobe, it goes to the front of the brain which decides to react and that message is then sent to the motor part of the brain.

Motor messages from the brain are then sent down the spinal cord and then out to the muscles which move as a response to the stimulus. (Human Brain book). All of this happens in a quarter to half of a second! (Salk Institute, 2005)

I want to see if there are benefits to playing video games, like improved planning or coordination. Some people say it is really bad for you, while others say it is good. Research has found that playing video games causes changes in the brain (Palaus et al., 2017) Could those changes in the brain be positive?

I am also wondering if there are benefits to playing different types of video games. Some people play fast paced games and others play slow paced games. Research has found that those that play slower video games had better attention (Nichols, 2017), but there has been no tests to see if there is a difference in speed of fast video game players and slow video game players.

Scientific Question and Purpose

I would like to test the speed of reaction time between slow and fast video game players to see if people who play fast paced video games are faster than those that play slower video games. I would also like to compare those reaction times to the reaction times of non-video game players and see if those that play video games are faster than those that do not.

Hypothesis and Variables

Since video games have been found to change how the brain and nervous system work, and faster video games require faster movements and decisions making, I hypothesize that people who play fast paced video games will have faster reaction times than people who play slower video games and non video game players.

Manipulated variable (manipulated outside of the experiment):

- Types of video games played (Fast paced, Slow paced, No video games)

Dependent variable

- Reaction time

Controlled Variables

- Testing type (same Test)
- Testing method (on laptop)
- Testing process (followed same process for each testing session)
- Testing time of day (at lunch)
- Number of trials (5)
- Environment (at Westmount in classroom)

Experimental Design (Materials and Procedure)

Location: In the school in 3 different grade 5 classroom over lunch break

Participants: Students and teachers at Westmount Charter school

Procedure:

1. Collected informed consent forms
2. Participants were asked to state what type of video game they played the most. The three categories are:

   a. Fast paced games (Genres and examples below)

   - First person shooter games (eg. Fortnite)
   - Rhythm games (eg. Beatsaber)
   - Bullet hell (eg. Mega Man)
   - Sport games
   - Action / adventure (eg. Super Mario)

   b. Slower paced video games (genres and examples below)

   - Sandbox games (Minecraft)
   - Exploration based games (Zelda)
   - Puzzle games

   c. Do not play video games

3. Each participant was asked to do the online reaction time test at https://www.mathsisfun.com/games/reaction-time.html, one at a time and the results were recorded with their video game choice.
4. Results were collected and grouped into three groups: 1. Fast paced games, 2. Slower paced games, 3. Non video game player.
5. Group scores were tabulated in Ms Excel and averages were taken for each group and compared based on average. Bar chart and box and whisker charts used to show difference in average and range of results.

Observations

Overview of Participants

	Count	Average Response Time
Fast paced video game players	**22**	**0.33**
Slow paced video game players	**45**	**0.37**
Non video game players	**6**	**0.40**
Overall	**73**	**0.36**

Data Collected

Slow paced	Fast paced	Non video game players
0.495	0.266	0.332
0.278	0.268	0.586
0.278	0.285	0.447
0.288	0.289	0.385
0.302	0.29	0.318
0.307	0.302	0.319
0.307	0.317	
0.309	0.318	
0.314	0.329	
0.325	0.329	
0.326	0.333	
0.328	0.351	
0.337	0.384	

0.341	0.41	
0.345	0.437	
0.347	0.351	
0.352	0.341	
0.365	0.305	
0.367	0.451	
0.369	0.241	
0.37	0.292	
0.377	0.307	
0.379		
0.431		
0.449		
0.461		
0.483		
0.576		
0.592		
0.621		
0.403		
0.457		
0.278		
0.317		
0.337		
0.328		
0.362		

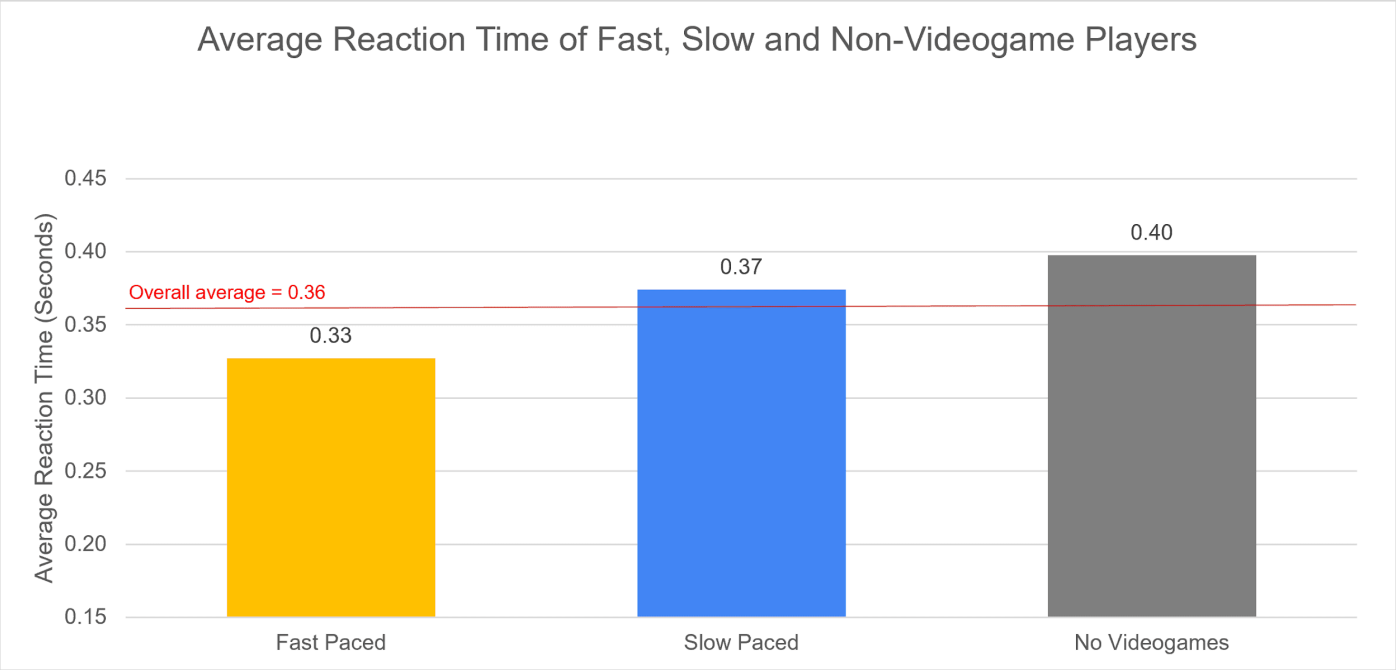
0.337		
0.334		
0.325		
0.421		
0.367		
0.466		
0.369		
0.322		

Results

Participants who play faster paced video games had faster overall reaction times (average: 0.33 seconds) than those that played slower paced video games (average:0.37 seconds).

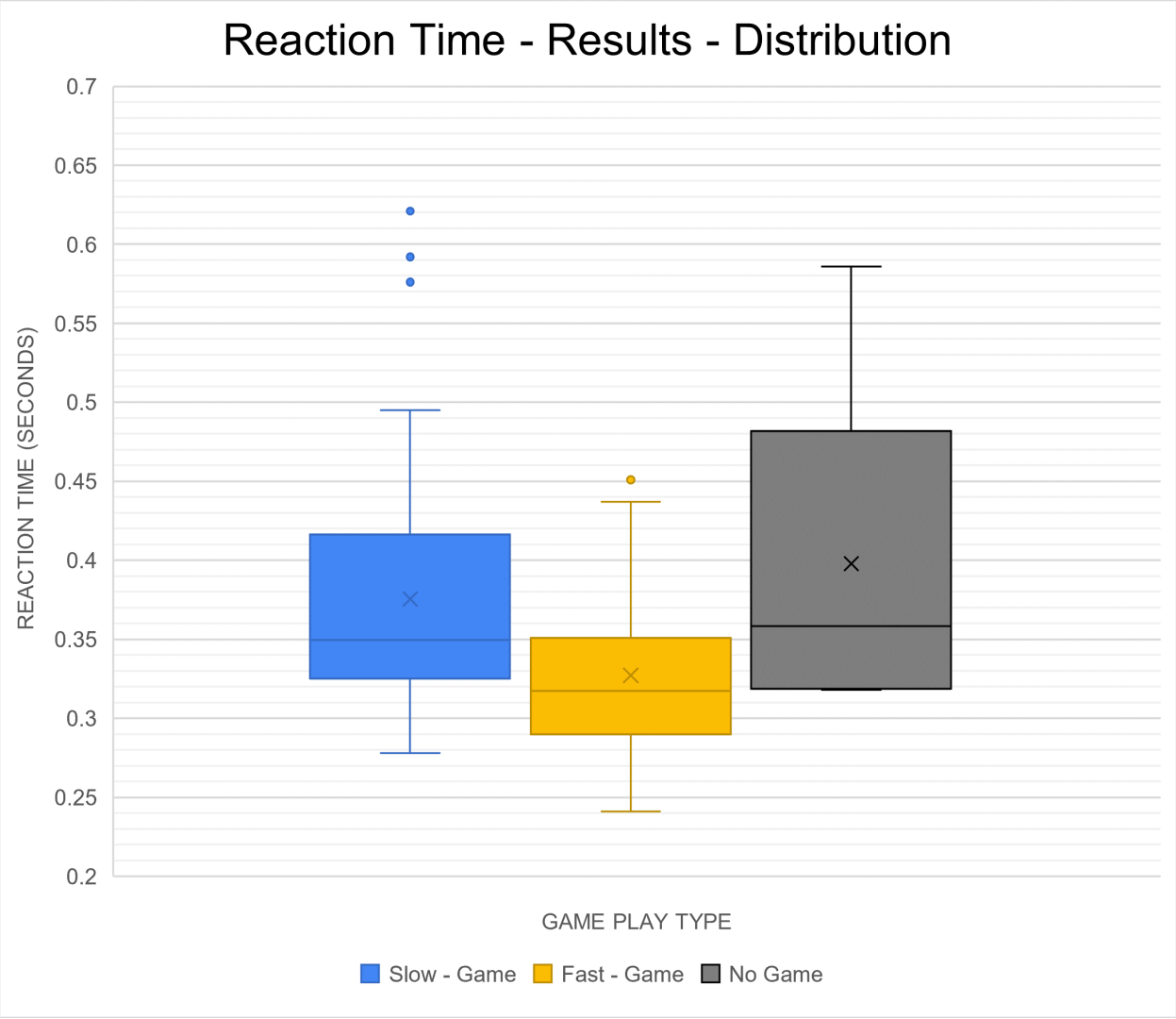
Those that played fast and slow video games had faster reaction times than those who didn't play video games at all (average: 0.40 seconds).

Chart 1 - Average reaction times for each game play group



There was a range of reaction times for each group, but overall, the fast paced video game group had a faster range of reaction times than the slow paced video game players and the non-video game players.

Chart 2 - Overview of the range of results for each game play group



Conclusions

My hypothesis was that people who play fast-paced video games would have a faster reaction time than those who play slower videogames and those that don't play videogames at all.

Based on the results of my test, my hypothesis is correct.

Applications

Playing faster paced video games may help a person improve hand/eye coordination and faster response times. This could be useful in training all sorts of areas such as:

- Simulation training
- Musical training

Shows that video games may be beneficial so parents can RELAX already!

Improvements

While the study showed us that there is a difference between the different groups, it did not tell us why. Further experimentation is needed to show direct cause and effect related to whether playing faster video games improves overall reaction times.

Further Questions

Additional areas to study would be the speed of choice reaction time for the different types of game players to see if that differs as well.

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