

Is there a link between Technology and ADD?

This paper or presentation is my own work. Any assistance I received in its preparation is acknowledged within the paper or presentation, in accordance with academic practice. If I used data, ideas, words, diagrams, pictures, or other information from any source, I have cited the sources fully and completely in footnotes and bibliography entries. This includes sources that I have quoted or paraphrased. Furthermore, I certify that this paper or presentation was prepared by me specifically for this class and has not been submitted, in whole or in part, to any other class in this University or elsewhere, or used for any purpose other than satisfying the requirements of this class, except that I am allowed to submit the paper or presentation to a professional publication, peer reviewed journal, or professional conference. In adding my name following the word 'Signature', I intend that this certification will have the same authority and authenticity as a document executed with my hand-written signature.

Table of Contents

OBJECTIVE	1
ARGUMENT	2
PROJECT PLAN	3
DIGGING DEEPER	5
EARLY CHILDHOOD VS. TECHNOLOGY	5
ADOLESCENCE VS. TECHNOLOGY	5
INTERNET ADDICTIONS	6
LEFT VERSUS RIGHT	8
JUST GOOGLE IT	9
REFLECTION	10
APPLICATION OF KNOWLEDGE	10
RISK FACTORS	10
WORK TO BE PERFORMED	11

Objective

For my capstone project I would like to tap into the intersection between technology and psychology. Being my two favorite subjects I have always had an immense curiosity about whether technology had an effect on the human brain. We live in an age where we own a plethora of different devices. An average person's home might consist of a television, computer, tablet, smartphone, and possibly a gaming system. There is no doubt that technology has become apart of not only our culture but in many other cultures in different countries around the world as well. As amazing and innovative technology is I hypothesize that it may have a negative effect on the human brain leaving children and adults with ADD/ADHD.

Multiple times a day the typical person will stop what they are doing to answer a phone call, reply to a text, check their email, etc. It's important to note that these regular device "check-ins" happen whether there is a notification/alert or not. I think its safe to say it has become habitual. My question now is where does all of this leave the brain? In addition, can technology leave individuals with cognitive impairments like ADD/ADHD?

I would like to begin by defining ADD/ADHD and giving some background on it for people unfamiliar with the term.

To quote the National Institute of Mental Health (NIMH):

"Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorders and can continue through adolescence and adulthood. Symptoms include

difficulty staying focused and paying attention, difficulty controlling behavior, and hyperactivity (over-activity)."

ADD is the same thing minus the symptom of hyperactivity. It is my assumption and expectation that technology has a major role to play with the prevalence of ADD/ADHD in our society today. It is also my assumption that the more and more technology becomes infused in our lives, the more common ADD/ADHD will be. I think this is an important topic to dig deeper into because of where the American education system stands today. Maybe the results and findings from the research I plan to conduct can shed some light on this issue.

There are two different methods of research I plan on taking. I would like to gather statistical data from longitudinal studies. I think by first gathering statistical data that can provide a framework for me and decide where to look next from there. The next method I will use is gathering relevant information from many different scholarly articles and journals.

Argument

I would like to prove that screen time from any kind of media such as television, videogames, computers, etc. have a negative effect on the brain and can cause cognitive problems leading to ADD/ADHD. My argument is that devices as such are extremely visually exciting or stimulating and when your brain is constantly being stimulated it becomes difficult for one to have that same kind of stimulation in environments without technology. The reason technology can be so stimulating is because a lot of your senses are being utilized all at once while

constantly the material is fragmented with new stimuli. To watch a television show one may use the senses sight and sound whilst a video game user may use the senses sight, sound, and touch. If you're wondering "*So what! We use the same senses sight and sound in a classroom as well!*" let me explain the difference. What makes it different is that the sight sense that you use while watching television or playing a video game is constantly being activated. Every fragment or scene in a show introduces new stimuli therefore makes it hard for you not to focus. If you try pausing and then playing a movie you will see how dynamic the visual stimuli can be. In addition to the visual stimuli comes the sound. For example, there are a multitude of different sounds in a video game. Character voices, theme songs, sound effects (clapping, screaming, laughter, gun shots), and background music. With the sight and sound stimuli being utilized together brings the emotional involvement. One may experience a plethora of emotions like happiness from a comedy movie, sadness from a romance movie, and panicky and anxious from a horror movie. Sometimes these emotions even lead to a reaction like laughing, crying, or screaming. With all these aspects tied together you can imagine how electrified the brain must get when dealing with the screen time of technology.

Project Plan

The timeline of this project will be demanding given the vast amount of data needed to be researched. *The following is a timeline on how I plan on dividing all the work that needs to be done:*

Week of Sept. 21 – Complete Peer Review

Week of Sept. 28 – Find 3 sources and complete 3 pages of draft

Week of Oct. 5 - Find 2 sources and complete 2 pages of draft

Week of Oct. 12 - Find 3 sources and complete 3 pages of draft

Week of Oct. 19 - Find 2 sources and complete 2 pages of draft

Week of Oct. 26 – Complete Peer Review 2

Week of Nov. 2 - Break

Week of Nov. 9 – Start editing draft (Pg. 1-3)

Week of Nov. 16 – Editing draft (Pg.4-6)

Week of Nov. 23 - Break

Week of Nov. 30 – Finish editing and turn in final (Pg.7-10)

Week of Dec. 7 – Prepare for presentation and project retrospective

My faculty advisor is Thomas Narock who is the instructor of this capstone course and has a lot of experience with research and technology. The following lists a summary of his qualifications and academic positions:

- Present2014

Assistant Professor

Marymount University

- 2013

Associate Research Scientist

University of Maryland, Baltimore County

- 2012-2001

Data Analyst

NASA/Goddard Space Flight Center

Digging deeper

Early Childhood vs. Technology

“It is widely known that the newborn brain continues to develop rapidly through the first few years of life and that considerable plasticity exists during this period. Considerable evidence also exists that environmental exposures, including types and degrees of stimulation, affect the number and the density of neuronal synapses. The types and intensity of visual and auditory experiences that children have early in life therefore may have profound influences on brain development.” (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004, p. 708) The National Longitudinal Survey of Youth was a representative longitudinal data set used on children between the ages of 1 and 3 for a research study conducted by the American Academy of Pediatrics. This study concluded that children (ages 1-3) exposed to television early on were associated with attention problems by the time they were age 7.

Adolescence vs. Technology

Another longitudinal study was conducted in New Zealand but this time on a larger scale. This study analyzed children starting at the age of 5 into their

adolescent years of age 15. Every two years starting at the age of 5 until the age of 11 the parent was required to give an estimate into how much television their child was watching. Then during the ages of 13 and 15 the researchers would obtain the results of a well-designed survey that had to be taken by the child, the parent, and a teacher. The survey was a measure of whether the child had an attention problem or not. The results later showed that the mean of hours of screen time during childhood had a correlation with attention problems during adolescence. The higher the mean number of hours, the higher the prevalence of attention problems. "One explanation targets brain development in early childhood. Because there is considerable brain plasticity during the first few years after birth, the rapid image and scene changes commonly found in television may overstimulate the child and adversely affect brain development. If this is true, we might expect very young children to be particularly vulnerable to these effects, whereas older children would be less affected. Another explanation is that life as portrayed on television with its fast-paced editing and attention-grabbing techniques makes reality seem boring by comparison. Hence, children who watch a lot of television may become less tolerant of slower-paced and more mundane tasks, such as school work." (Landhuis, Poulton, Welch, & Hancox, 2010, p. 535)

Internet Addictions

A research study on people with Internet addictions took a different approach in their method of research.

Their method:

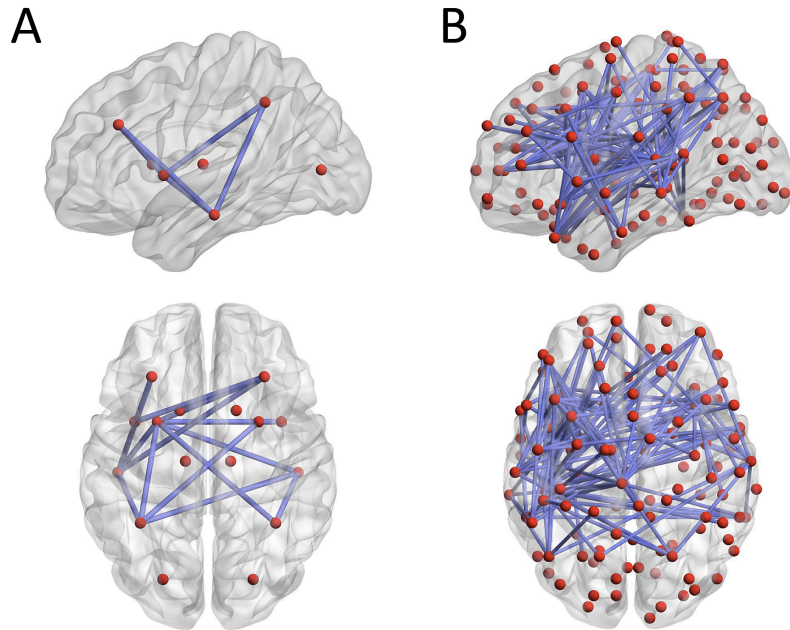
“Participants were 12 adolescents diagnosed with Internet addiction and 11 healthy comparison subjects. Resting-state functional magnetic resonance images were acquired, and group differences in brain functional connectivity were analyzed using the network-based statistic. We also analyzed network topology, testing for between-group differences in key graph-based network measures.” (Hong S-B, Zalesky A, Cocchi L, Fornito A, Choi E-J, Kim H-H, 2013)

I found this approach refreshing because it takes one step further into looking at any major differences in the brain with increased screen time. With the first two studies we learned that increased exposure to television leads to attention problems with children and adolescents. But the researchers never deemed to ask the question *why* or better yet *how is that so?* Analyzing an fMRI takes you inside the brain to look at the network structure within the brain, the same way a network engineer checks for connectivity in IT world of networking. This research method is significant because it answers questions like:

“How do individual brain areas interact with one another to enable cognitive function? How is cognition constrained by white matter pathways? How does the brain transition between functions like memory, attention, and movement? How do we control the interactions between different neural circuits in our brains?” (Bassett, pg.3)

The study later concluded that the participants whom were diagnosed with Internet addictions had decreased functional connectivity within the brain specifically, the prefrontal and parietal cortexes. Although the study does not have a direct link with attention problems I thought it would be useful to add this data

because there is a link with decreased cognitive functions. The following figure helps to have a better understanding of the issue.



(Hong S-B, Zalesky A, Cocchi L, Fornito A, Choi E-J, Kim H-H, 2013)

It is important to note the red dots represent nodes while the purple lines represent the links to other nodes. Here you can see on the left the decreased connectivity with Internet addicts versus high connectivity on the right with non-Internet addicts.

Left versus Right

In Seoul, there is a doctor by the name of Byun Gi-won. Dr. Byun Gi-won runs the Balance Brain Center in South Korea. He makes claims that people who overuse their smartphones are hampering the balance of their brains. Smartphone use is known to use more of the left side of the brain, which leaves the right side underdeveloped. The right side of the brain is directly correlated with attention,

memory, and concentration so lack of development can result in attention issues, which he calls a “digital dementia”. “South Korean experts have found that those who rely more on technology suffer a deterioration in cognitive abilities more commonly seen in patients who have suffered a head injury or psychiatric illness.” (DailyMail, 2013) Research also showed that 14% of young adults (18-39) made complaints about their memory being poor. It is important to note that poor memory is associated with ADD/ADHD.

Just Google it

We now live in a world where if one has a question the next step is to Google the answer. “With all the emails, tweets, chats, and status updates continually vying for brain space, young people these days are slave to what’s been called *continuous partial attention*.” (Henig & Henig, 2012) As the term suggests it is when one continuously only devotes their attention partially to what they are doing. This concept relates to Google based on the mental fact that the user knows the information being researched can always be accessed at a later time. Therefore your attention and focus while reading becomes tainted because you are only partially paying attention to what you need out of the information being presented to you. This habit can affect your memory of the knowledge being learned because you’re not gaining a deep understanding of the material. “In 2011 a team of psychologists led by Betsy Sparrow of Columbia gave 60 undergrads a bunch of trivia (on the order of “an ostrich’s eye is bigger than its brain”) and asked them to type all forty factoids into a computer. Half were told that the file containing these facts would be accessible later; half were told the file would be erased. On a subsequent test of

memory, the ones who thought everything would be erased remembered much more. When they believed their document would be saved, Sparrow found, they didn't bother remembering it; they figured they could always find it (or, as it's called outside the lab, Google it) when they needed to." (Henig & Henig, 2012) It becomes obvious that the correlation of continuous partial attention and Google results in a superficial level of understanding and can affect critical thinking and retrieval of memory.

Reflection

Application of Knowledge

Before my transfer to Marymount I took a great deal of psychology courses. This has helped me to break down the research in a way that is understandable by people who do not have any background knowledge. It has also helped me in understanding and analyzing the research. Having prior knowledge about the different lobes of the brain and their corresponding functions. Also having background knowledge on how the brain is chemically made up and how it operates as a network was very beneficial.

Risk Factors

I don't believe there are any risk factors that could negatively impact my project. All of the research studies I've been following up on have been carefully selected. Doctors and Neuroscientists have conducted all of the research I introduced in this paper so the data is extremely reliable.

Work to be Performed

My project consists of a multitude of different works performed by others that are qualified to conduct extensive research on the topic. My intended role in this project is to build upon what I've analyzed from the many different studies I've researched. Some of the studies I mentioned were conducted more than a decade ago while some are more recent. My goal is to give a timeline of these events to paint a picture of how things have developed scientifically.

References

- Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early Television Exposure and Subsequent Attentional Problems in Children. *Pediatrics*. doi:10.1542/peds.113.4.708
- 'Digital dementia' on the rise as young people increasingly rely on technology instead of their brain | Daily Mail Online. (n.d.). Retrieved from <http://www.dailymail.co.uk/health/article-2347563/Digital-dementia-rise-young-people-increasingly-rely-technology-instead-brain.html>
- Henig, R. M., & Henig, S. (2012). *Twentysomething: Why do young adults seem stuck?* New York: Hudson Street Press.
- Landhuis, C. E., Poulton, R., Welch, D., & Hancox, R. J. (2010). Does Childhood Television Viewing Lead to Attention Problems in Adolescence? Results From a Prospective Longitudinal Study.
- Hong S-B, Zalesky A, Cocchi L, Fornito A, Choi E-J, Kim H-H, et al. (2013) Decreased Functional Brain Connectivity in Adolescents with Internet Addiction. *PLoS ONE* 8(2): e57831. doi:10.1371/journal.pone.0057831
- Bassett, D., & Lynall, M. (2013). Network Methods to Characterize Brain Structure and Function. 3-3.
- Misner, I. (2014, November 26). The Danger of Continuous Partial Attention. Retrieved from <http://www.entrepreneur.com/article/240254>

Seigher/ CovenantEyes, L. (2014, October 2). iForget: A Look At Digital Dementia & Excessive Screen Time. Retrieved from

<http://www.covenanteyes.com/2014/10/02/iforget-new-digital-dementia/>

Sigman/ Alex Segre / Alamy, A. (2013). The Impact Of Screen Media On Children: A Eurovision For Parliament.

Swing, E. L., Gentile, D. A., Anderson, C. A., & Walsh, D. A. (2010). Television and Video Game Exposure and the Development of Attention Problems. *Pediatrics*. doi:10.1542/peds.2009-1508