

The Association between Attention Impairments and the Internet and Social Media Usage among Adolescents and Young Adults with Potential Consequences: A Review of Literature

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Abstract

In a 2022 report by the Pew Research Center, it was found that approximately 100% of young adults across eighteen countries reported using the Internet except Israel demonstrating the drastic influence. Given adolescents and young adults are the first generations born into this “connected” world this increase also has affected cognitive processes. This paper will focus on reviewing the current literature; specifically investigating the relationship between the cognitive process of attention and the Internet and social media usage. However, it is crucial to keep in mind that the Internet and social media are inventions humans have recently adapted to; thus, future investigations are essential to conduct. The overall cognitive and neurobiological process of attention will be put forward with its relationship with the Internet and social media usage. Since ADHD, attention span, media multitasking and Internet Use Disorder have been related to usage of social media and the internet, these topics will be explored (i.e. Firth et al., 2020; Ko et al., 2009; Wang et al., 2017). Proceeding by the consequences of the possible impairments in attention due to the Internet and social media usage. Even though the consequences will be in academic (i.e. grades, high detention rates), mental and social groups (i.e. depression and human interactions), emphasizing that the lines between these are not distinct but rather blurry because they all are the cause or the effect of each other. The paper will then proceed onto suggestions and future investigation, where the discussion of what further research should be done on this topic will be held. Then, the conclusion part will summarize the general ideas and findings and aim to give a possible explanation to the research question.

Keywords

Attention, Social Media, Internet, ADHD, Internet Use Disorder, Attention Span

1. Introduction

The discussion of “how a new technological innovation will affect human cognitive processes” did not start with the Internet and social media. When the press was invented, there were many concerns about how it would affect the cognitive process of memory because people would not need to write or memorise certain things from that time on (Lodge & Harrison, 2019). However, today, humans are in a much more significant transformation in their cognitive processes due to how rapid the new technologies are developing. This transformation, in some cases, can be observed as positive; however, in other cases, many impairments are recorded in cognitive processes associated with the Internet and social media. One of the leading topics in this research area is the cognitive process of “attention” and how it has been affected, especially in adolescents and young adults, due to being born into this “connected world”. A survey done in 2019 found that approximately 40 percent of US online users aged between 18 - 22 reported that they felt addicted to social media (Statista). Not just social media but a survey done in 2022 by the Pew Research Center found that most US teens have some access to digital devices, such as smartphones with 95%, a type of computer 90% and gaming consoles 80%. The study also showed an increase in daily teen internet users by 5%, going from 92% in 2014-15 to 97%.

1.1. Defining the Terms

In the presented paper, the reviewed literature aims to focus on the target group of adolescents and young adults, which the World Health Organization states to be people between the ages of 10 and 24. Since the topic investigated throughout the paper is the cognitive process of attention, the terms related to attention are frequently used. Attention span, as the American Psychological Association Dictionary defines it, is “the length of time an individual can concentrate on one specific task or other item of interest”. Relatedly is ADHD, meaning attention deficit hyperactivity disorder. APA states that ADHD is a “behavioral syndrome characterized by the persistent presence of six or more symptoms involving inattention, impulsivity or hyperactivity”. These symptoms may include difficulty maintaining concentration, impatience and difficulty being organised.

The concept of attention is not solemnly discussed by itself throughout the paper but with its relation to the usage of social media and the Internet among the focus group. For example, ADHD is looked into with its correlational nature with IUD, which is Internet Use Disorder. This general term is defined as “an excessive and uncontrolled use of Internet applications in terms of an online

behavioral addiction” (Dieris-Hirche et al., 2022). In this paper, addiction and dependency are two of the main concepts needed to be understood about the effects of social media. Addiction can be defined as “a state of psychological or physical dependence” on a certain thing (APA). Throughout the paper, that would be the Internet and social media. Some other terms used to concern these topics are multitasking and multimedia tasking. Multitasking is where one tries to perform more than one task simultaneously, and media multitasking is the “online” version of it where one is exposed to more than one media source. Lastly, “attention impairments” as a concept will target situations about attention that interfere with people’s daily lives and wellbeing, starting with ADHD and shortened attention spans.

1.2. Purpose

The purpose of this paper is to deeply understand the relationship between the cognitive process of attention and the Internet and social media and further look more into the consequences of attention impairments and over-usage of the Internet and social media on the target group of this research: adolescents and young adults. The new generation of adolescents and young adults are exposed to the Internet and social media before they can even recall; thus, the effect of this situation on specific mental and cognitive processes is undeniable, starting with the attention process. In addition to the effects, this situation’s overall social, academic and mental consequences were to be discussed. This paper also aims to connect them and present a structured source of information.

This paper will start with an introduction to the complex process of attention and will move into three concepts that will be discussed with their interactions with social media and Internet use: multitasking and media multitasking, attention span and social media, and ADHD and IUD. All of these will be discussed in depth by reviewing and synthesising current literature on them and will go deeper into how they play a role in impairing the attention process and how they interfere with each other. Emphasising that this topic is relatively new in the field of psychology and, thus, limited research is available, this paper will highlight the further steps that should be taken to proceed with the existing knowledge and open new doors. In conclusion, this paper aims to give a deep and structured understanding of the topic while attempting to give potential explanations and perspectives to the following research question:

What is the relationship between the cognitive process of attention and the Internet and social media usage?

1.3. Methodology

In the making process of this literature review paper, I used the Google Scholar database to find peer-reviewed articles related to my topic and what I aim to synthesise and put out as a whole. Some of the key terms that I used while researching for articles were “attention”, “social media and the Internet usage”, “attention and its effects on adolescents”, and “psychological effects of social

media and the Internet”. I have evaluated and chosen articles related to my topic and my specific intention to investigate attention with the Internet. I was mindful of choosing articles consisting of various methods, from experiments to surveys to literature reviews. Peer reviewed articles from 2007 to 2022 were reviewed. I then synthesised my knowledge and findings from the reviews into this paper, leaving space for further discussions on this significant topic.

2. Discussion

2.1. Attention

As defined in American Psychological Association’s dictionary, attention is “a state in which cognitive resources are focused on certain aspects of the environment rather than on others, and the central nervous system is in a state of readiness to respond to stimuli”. Humans have limited neural capability to break down and manage the excessive stimuli around them and thus have the cognitive ability to focus on a specific one or change their focus between multiple of them if necessary (Lodge & Harrison, 2019).

Attention can be voluntary or involuntary, depending on the situation, and it is in relation to many other cognitive processes, especially memory. Humans must focus on a particular thing to encode it into short-term memory. Thus, it remains vital for daily life from many different aspects.

Since much research on this topic is neuropsychology based, the mention of the neurobiology of the process of attention is vital. The attention process cannot be attributed to a single neural process and is a very complex sum of different functioning of different regions in the brain. The three regions primarily involved in attention are the parietal, temporal and frontal regions, combined with many association areas involved in high-ordered thinking processes (Lodge & Harrison, 2019). The neural systems of attention differ by being voluntary or involuntary; however, any damage or alteration to these networks may lead to severe attentional deficits According to the American Psychological Association, brain plasticity is “the ability of the nervous system to change in response to experience or environmental stimulation.” The neurons in the brain utilize connections and synapses to generate complex responses with various strengths from stimuli. stimuli or strengthen a response. For attention, the system involves a variety of neural pathways, so researchers have been unable to attribute the occurrence to a single reason. However, they can observe the changes and alterations through the brain’s plasticity. For example, even the most minor physical interactions, such as the contact interactions with a phone’s touch screen, have been observed to bring neurocognitive alterations due to neural changes in cortical regions associated with motor and sensory processes of the hand and thumb (Firth et al., 2019).

2.2. Media Multitasking, Multitasking and Attention

Many assume they can multitask by giving equal attention to the two or more

tasks they are working on. However, this has been proven wrong by science for a while now as Dr. Clifford Nass, a psychology professor in Stanford, stated in 2013. Scientists and researchers suggest that the quality of one's result that is put out and the depth of thought put into the task degenerate as the number of tasks one attends increases (Wallis, 2007). John Grafman, chief of Cognitive Neuroscience at the National Institute of Neurological Disorders and Stroke, goes deeper into the discussion of the frequent lack of depth of tasks being performed during multitasking will give "surface-level" results (2007). The phenomenon of multitasking has increased simultaneously as people engage with more tasks, they believe can be performed without giving their full attention. Multitasking can be conscious and voluntary. For example, working on two assignments simultaneously which may be due half an hour later. Additionally, multitasking can be performed "unconsciously," such as when people engage on social networking sites (Ophir et al., 2009). There is a tendency to multitask on social media sites and the Internet. This is where multitasking is starting to be referred to as "media multitasking", which happens when people are exposed to multiple sources of information and media stimuli while using the internet, computers, have made it more accessible and available in the current environment. Since people are exposed to many sites designed to capture their attention, it is easy for a person's attention to shift. For example, pop-up elements such as push notifications catch one's attention involuntarily (Lodge & Harrison, 2019). A person's sustained attention can interfere with a milli-second interaction between interlinked websites. This interference can cause a shortfall in attention even after the interaction ceases with the net.

Humans have a limited capacity for stimuli absorption when processing and encoding information. Oversaturation of stimuli can be classified as damaging in many ways, starting with attention. High media multitasking levels are associated with reduced gray matter in the anterior cingulate cortex and other prefrontal areas, which are responsible for sustained attention and the ability to ignore external-distracting stimuli (Firth et al., 2020). The anterior cingulate cortex, also known as the cognition division, is implicated in a range of executive functions, such as attention allocation, error and novelty detection, and working memory modulation. Reduced grey matter in a brain region indicates cell deaths, irreversible brain damage, and a deficit in functioning (Mercadante et al., 2022). Adding these two pieces of information up gives clear reasoning for what happens in the brain when one performs media multitasking. If one cannot sustain concentration or ignore distracting stimuli persistently, it may lead to even worse consequences.

Attention is a cognitive process best examined with its relationships with other significant cognitive processes, such as memory. A study suggests that heavy media multitaskers were more likely to be distracted from external stimuli and form impertinent representations in their memories (Firth et al., 2020). One memory encoding initiate with attention meaning that one should focus on something for it to be encoded in their working memory first. In a person who

identifies as a “heavy media multitasker”, there is a high chance that they might be experiencing an attention deficit, and that causes the process of encoding a memory constantly get interrupted by distracting stimuli leading to memories not getting encoded as strongly, as they may in a “normal” individual.

2.3. Attention Span and Social Media

As defined by the American Psychological Association, attention span is “the length of time an individual can concentrate on one specific task or another item of interest”. Attention span can be conceptualized into two different areas, the attention span an individual has and the collective attention span, which can be defined as the amount of attention a topic is given on a population level. The latter has gotten shorter over time by observing the lengths of viral Twitter trend hashtags stayed trendy for (Firth et al., 2020).

Attention span can be trained, like many other cognitive functions. One may learn to concentrate and focus through practice. However, social media platforms such as Instagram and TikTok can have profound effects on attention span as well, as “scrolling” allows users to easily pass over stimuli. Social media content has optimized its ability to capture the viewer’s attention. For example, creating posts with very little to no text with a radiant background minimizes a viewer’s effort when viewing the post.

Paul G. Simeone, PhD, Vice President and Medical Director of Behavioral Health at Lee Health, says there are no clinical diagnostic criteria for social media addiction, but general addiction criteria can be adapted to people’s social media use. Like with many addictions, social media directly targets the reward system within the brain, triggering a release of dopamine (Macit et al., 2018). Dopamine is the same neurotransmitter released in sex, gambling, and eating, the release of dopamine drives addiction pathways. Scrolling through social media, getting likes, talking to people, seeing something pleasing to the eye, and ignoring and escaping the natural world all events that may trigger the brain’s reward system. This turns into an “easy” way to release dopamine and thus feels good; this is where it becomes an addiction.

In 2022, the social media platform with the most media attention was TikTok, an app where short videos differing from five seconds to two minutes in length are posted. As Sociologist Dr. Julie Albright stated in her interview with Forbes magazine about TikTok, “It is almost hypnotic, you will keep watching and watching”, in addition to referring to being in a “pleasurable dopamine state”. TikTok may be a creative content platform that embraces many adolescents and young adults’ talents. However, constantly being exposed to short videos may train one’s attention span to be shorter. WIRED reported that one study uncovered that 50% of TikTok users found videos longer than one minute stressful. Since TikTok uses the “random reinforcement” strategy, which can be adapted as the reinforced feeling of a good video’s potential of popping up any moment, which leads to scrolling more, exposure to short videos is inevitable once one is signed up to the platform.

2.4. The Relationship between ADHD and IUD

Attention Deficit Hyperactivity Disorder is among the most common neurodevelopmental disorders. The Centers for Disease Control and Prevention states that children diagnosed with ADHD may display difficulties with paying attention, managing impulsive behaviors or being highly active. ADHD is the most common and severe attention impairment type in psychology and studies showed that it goes hand in hand with Internet Use Disorder, known colloquially as Internet addiction. The problem of “internet addiction” was first mentioned by Kimberly Young in 1998 but hasn’t yet got its place in the DSM-5. A 2-year long cross-sectional study done by [Ko et al. \(2009\)](#) was designed to evaluate the predictive values of psychiatric symptoms for Internet addiction and found that adolescents with ADHD were the most likely group to be addicted to the Internet. In a comprehensive literature review done by [Wang et al. \(2017\)](#), it was found that the symptoms of ADHD were also more severe than the control groups, and inattention was the most frequently occurring symptom among all participants. In the cases of young adults, meaning university, the situation remained the same. [Yen et al. \(2007\)](#) examined a sample of over 2500 college students and found that the symptoms of ADHD were correlated with IUD.

A great number of findings on the association between them were neurological. Structural changes and deficits in activations and function were found in the regions of the brain associated with attention, attention control, reward systems and motivation in people diagnosed with Internet addiction ([Firth et al., 2020](#)). Individuals with IUDs had a higher likelihood of being diagnosed with ADHD than control groups of healthy people, as Firth et al. further states. Once again, inattention was the highest-scored criterion among all diagnoses. People diagnosed with ADHD have deficits mainly in higher-level cognitive functions, frequently mentioned as “executive functions”. These functions are associated with the late-developing fronto-striato-parietal and front-cerebellar networks ([Hart et al., 2013](#)). This indicates that the abnormal brain activities in the subjects with ADHD lead to impaired inhibition which causes a significant lack of self-control and prevents themselves from activities, especially rewarding ones ([Wang et al., 2017](#)). Thus, the nature of ADHD shows extreme vulnerability to internet addiction.

In addition to social media, online video gaming may serve as a stressor for the deficits observed following similar patterns. A critical, provocative treatment study was conducted by [Han et al. \(2009\)](#), where 62 drug-naive children were treated with methylphenidate, a drug used to treat ADHD that stimulates the sympathetic and central nervous systems and is heavily used in the treatment of attention deficit disorders. It has been found that not only ADHD symptoms, but the internet usage durations and Internet addiction test scores were lowered. The characteristics of online video games serve adolescents with ADHD in numerous ways. The structure of online games as them working on the incentive to

“pass to the next level”, and the rapidly changing screens and constant simulations serve to both the minimal demand and a constantly activated reward pathway (Weiss et al., 2011).

Despite these findings, the current literature is unable to determine if internet use is a causal factor for ADHD, or if people with ADHD are more excessive to internet use.

3. Consequences

The concerning use of the Internet and social media could excessively interfere with daily activities, potentially harming adolescents’ mental health and quality of life. Those with high use of the internet may display less physical activities, academic engagements and interpersonal relationships with peers and family (Baya et al., 2022). The over usage of the Internet and attention impairments have been observed to show a bi-directional pattern which causes an exponential increase in their effect levels when the consequences have been recorded. As the hours spent online lengthens, the time spent on other activities, such as playing sports, making music, studying, and socializing decreases. ADHD may be worsened by minimal exposure to these activities, and this comes with consequences, as expected because they hold a significant place in developing leading cognitive and social skills. For more of a structural analysis, this paper divides the consequences of internet usage and attention impairments into three categories: academic, mental and social.

3.1. Academic Consequences

For one’s academics, internet usage has positive and negative side effects. While the Internet provides unlimited sources of information and ways to complete an academic task, the high accessibility to the internet makes it easier to drift away from its academic purpose and serve other purposes, such as impairing-over-using. Data collected from 85 university students in Bangladesh showed that 42.5% of the students “strongly agree” and 21.25% of “agree” to answer the statement “Internet addiction affects negatively on the academic achievement of students” (Fatema et al., 2020). Asdaque et al. (2010) found that academic achievement is highly affected by the time spent on the media; if students spend more time studying, their cumulative grade point averages are better.

In addition, specific cases of ADHD are also associated with poor grades, increased rates of detention, and relatively low graduation rates compared to undiagnosed individuals (Loe & Feldman, 2007). With the burden of being diagnosed with ADHD, individuals may be more likely to develop a sense of inferiority, especially in academic tasks where constant usage of high-order cognitive functions such as judging and organizing is necessary. An “unsuccessful” academic life can come off as a failure, and ADHD patients may compensate for the failure they face in real life with the virtual world’s constantly rewarding nature (Wang et al., 2017).

3.2. Mental Consequences

Individuals using the Internet and social media pathologically may experience negative returns on their mental health. As mentioned above, with academic challenges being only one, many factors are related to overusing the Internet and attention impairments that directly affect one's mental health. Returning to the study done by Ko et al. (2009), among the most significant predictors of Internet addiction, it was also found that social phobia and depression played a great role coming right after ADHD. A study with a sample of 1038 adolescents clearly stated that excessive and maladaptive internet use had been recorded more frequently in individuals with previous mental health problems (Baya et al., 2022). A similar pattern was also found if the individual's psychological needs aren't fulfilled in offline settings such as their friend group or family. It has also been found that as the time spent on social networks increases, the depression scores of individuals increase (Balouch et al., 2019). While the internet serves as an escape mechanism to neglect mental health issues and reward oneself with overstimulation and exposure, the internet can be the reason for that mental health issues too. Specific to this paper, it would be worsening the symptoms of a serious psychiatric disorder such as ADHD.

3.3. Social Consequences

Humans are frequently described as "social beings" with various social needs. The internet and social media create an alternative world for one to satisfy those needs less effortfully. The initial problem is that virtual socialisation limits face-to-face communication with family and friends. Mythily et al. (2008) state that this lessened face-to-face communication may lead to social isolation and depression. Connecting to attention, higher levels of media multitasking and exposure to various content are associated with lower levels of socioemotional functioning (Cardoso-Leite et al., 2021). The lack of real-life social interaction and its effect on the individual has been demonstrated multiple times. Creating a "new world" that satisfies the expectations of the natural world may lead to not being able to differentiate between them and losing the ability to self-control. The ability to self-control is impaired in individuals with ADHD, and the internet has a more desirable nature for any kind of attention impairment diagnosis; people with attention deficits have been more prone to experience these consequences.

4. Future Investigations

The discussion of the Internet's and social media's effects on adolescents and young adults is a new topic in psychology and science in general. Thus, this causes a lack of long-term research that can give a deeper insight into this topic and its relation to the process of attention. While the future investigation paths hold a vital place and will be further mentioned, some footnotes exist. The attention network in the brain and the cognitive process are both known for their

complexities, and it is expected that current and close-future studies cannot give direct causal relationships. However, as the field of psychology and technology develops and cooperates and is given the right opportunities, researchers can expect great findings in the future.

There is an urgent need to define and medicalise Internet Use Disorder exists in order to proceed with its treatments. Needed funds and time should be spared on the research related to Internet addiction, especially among adolescents, because it is not only affecting an individual life, but it is affecting a whole future generation of adults.

As mentioned, there is a lack of research that can give causal relationships about this topic due to its newness; thus, a specific research design that is suggested to be held in future investigations is observing any occurrence of drastic changes between the brains of this generation when they become elders and the elders right now who do not strictly count as “completely adapted” to the online world. These types of cross-sectional studies in the future can give a great comparison between the long-term effects since the focus group of this paper will be the first generation that these changes will be observable. In addition to this, looking at the number of people that have been diagnosed with ADHD in the future and observing if there has been a significant increase can again reveal a finding about the strong correlation that has already been stated through many pieces of literature today.

Finishing off with suggestions about future policies that need to be taken to lessen the effects of the consequences, policies’ primary aim should be to protect adolescents from overusing the internet while encouraging the obtaining of life skills in real-life settings. Schools should emphasise Internet and social media usage and the developmental disorders that affect children and youth greatly, such as attention deficit disorders. This would help to raise a mindful generation.

5. Conclusion

This literature review aims to synthesise current existing research, studies and literature on how the Internet and social media usage affects the cognitive process of attention among adolescents and young adults. The increase in digital media consumption among children and youth has been a leading concern in the last couple of decades and raised many questions concerning its impact on cognitive functions, socialisation, academic life and mental health. By collecting and elaborating on current knowledge on the specific cognitive task attention and its impairment due to the excessive uses of the Internet and social media, this paper aims to draw attention to a problem that exists today and only will increase in aptitude exponentially in the near future. By investigating this topic from multiple perspectives and emphasising future investigations, it has been clearly shown that there are still blanks to fill in relating to all aspects. Attention is one of the most critical executive functions, and impairments can be both caused by a va-

riety of factors and cause a variety of consequences. While trying to structure and combine existing information, in conclusion, the paper aimed to emphasise the importance and urgency of the relationship between attention and the Internet for future generations of humankind.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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