



How Social Media Affects Brain Function

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As of 2024, 5.17 billion people worldwide use social media, constituting 63.82% of the world's population (Singh, 2024). The statistics are even more astounding when separated by age. Approximately 93% of teens use social media, making up nearly 37 million people in the United States alone (Chaddock, 2024). The most common forms of social media used are apps such as TikTok, Instagram, Facebook, and Twitter. Although social media has several benefits, such as connecting people, it can also be harmful, especially to a teenager's mental health. Due to its widespread use, understanding the relationship between social media and mental health is crucial. Social media usage can negatively affect attention-deficit/hyperactivity disorder (ADHD) symptoms and attention span, can increase anxiety and depressive symptoms, and can increase the levels of insomnia, which are all significant concerns in the United States. Understanding the relationship between social media and mental health is necessary today.

Attention-Deficit/Hyperactivity Disorder (ADHD)

ADHD is a prevalent disorder with increasing rates of diagnosis (Abdelnour et al., 2022). Common symptoms include fidgeting, difficulty concentrating, impulsivity, and trouble staying on task. Investigators have begun to explore what might be causing the increased prevalence of ADHD. A team led by Dr. Ra hypothesized that there is a correlation between the growing use of social media and increased rates of ADHD. Ra et al. (2018) conducted an observational study examining the frequency of growing social media use and the rate of ADHD symptoms. The investigators utilized self-reporting surveys to quantify the frequency of social media use. They evaluated ADHD symptoms using mental disorder testing at baseline and every six months for

up to 24 months. At 12 months and 24 months, participants were asked how often they had accessed social media in the past week and were grouped into low, medium, and high-use categories. The results demonstrated that students with low-frequency media use had a mean rate of ADHD symptoms of 4.6% compared with a 9.5% incidence of ADHD symptoms for medium-frequency students. Students with high-frequency use had the highest rate of symptoms at a mean rate of 10.5%. This study observed that an increased frequency of social media use correlated with increased rates of ADHD symptoms (Ra et al., 2018). This observational study was limited because subjects self-reported their symptoms of ADHD, leading to the possibility of under- or over-reporting symptoms. The study also had geographic limitations because it only included students from schools in one region. The correlation between digital media use and ADHD symptoms is hypothesis-generating, but further research is needed to determine whether the association between higher frequency use of digital media and symptoms of ADHD is random.

Slightly different from the study led by Dr Ra, another group conducted a study to investigate the correlation between intense social media use and addictive social media use to the degree of ADHD (Boer et al., 2019). The study looked at the direction of the relationship between ADHD symptoms and both social media use (SMU) intensity and SMU problems among adolescents. SMU problems are defined as “addiction-like behaviors.” Meanwhile, SMU intensity is the frequency of social media use. The study used the Social Media Disorder scale to measure SMU problems and the first three waves of the Digital Youth Project, a longitudinal study based on online behaviors and mental health. The results of this study showed that children with high averages of social media use intensity and social media use problems also had a high average rate of issues such as attention deficits, impulsivity, and hyperactivity. The

study also showed that children who had an increase in ADHD symptoms did not report an increase in social media use intensity or increased social media use problems. The findings suggested that SMU intensity, the frequency of use, does not increase ADHD symptoms, but SMU problems do. The results indicate that the study could not define a set causal relationship between SMU intensity, SMU problems, and ADHD symptoms, as their results conflicted with one another. The study was able to point out that addiction-like behaviors caused by SMU are what lead to an increase in ADHD symptoms, and the frequency of social media use does not lead to an increase. The findings also indicated that the relation was unidirectional because there was no observation of the reverse pattern. Some limitations of this study include the fact that the potential relationship between daily fluctuations in ADHD symptoms and social media behaviors could not be observed due to long time intervals. A final limitation is that time-varying covariates were not included in the study, but could have contributed to the associations. For example, age may have impacted the relationship. This is because SMU intensity usually increases with age during adolescence. Further research should use more waves of the Digital Youth-project, instead of just the first three, and shorter time intervals to help confirm the conclusions of this study.

ADHD can cause difficulty with concentration and a lack of attention span. There have been hypotheses that social media can also contribute to a decreased attention span (Mahalingham et al., 2022). Mahalingham and his colleagues conducted a study observing the connection between time spent on social media and both attention span and psychological distress. It used an app on participants' phones to measure usage data and a depression/anxiety stress scale to measure psychological distress. A task was administered to measure attention span. The results of this study showed that participants with lower levels of

attention control showed a positive relationship between psychological distress and social media use. There was no relationship between participants with average or high attention control. A possible implication of this study is that excessive social media use might have negative consequences on attention control. Some limitations of this study are associated with using objective indicators of social media consumption. Further research may benefit from including usage data found from computers and other devices.

Depression and Anxiety

Another potential concern with social media use is its association with depression. Depression is categorized as losing interest or pleasure in activities as well as having a low mood for extended periods (*Depression*, n.d.). A study was conducted by Aalbers et al. (2019) to observe the relationship between passive social media use (PSMU) and depression symptoms. PSMU is defined as scrolling through posts such as news feeds or photos. This study used a questionnaire several times a day over a two-week period to measure PSMU, depression symptoms, loneliness, and stress. The results showed that PSMU only directly correlated with active social media use (ASMU). It illustrated that engaging in PSMU did not predict loneliness, stress, or depression symptoms. However, underlying fatigue and loneliness predicted PSMU, so it is possible that these symptoms may have caused participants to use social media. PSMU occurred simultaneously with loss of interest, problems with concentration, fatigue, and loneliness. This finding may conflict with previous results, making it harder to fully understand the impact of social media on mental health. Also, participants who spent more time on PSMU had a higher average level of feeling depressed, lonely, hopeless, and inferior. In conclusion, the study was unable to answer whether PSMU leads to depression or if depression

leads to PSMU (Aalbers et al., 2019). Also, in this study, emotions were self-reported, which may affect accuracy. Further research should aim to more accurately evaluate the direction of the association between PSMU and depression symptoms. One way this could be conducted is through a longitudinal study. The study could have two groups: one that uses social media and one that does not. Periodically, the depression levels of the two groups would be measured to help provide a definitive answer to whether depression causes PSMU or if PSMU causes depression.

Procrastination caused by social media use is another factor that can increase depression symptoms (Rogowska & Cincio, 2024). A study by Rogowska and Cincio (2024) aimed to study TikTok's role in the relationship between depression and procrastination. The study was conducted using a modified version of the Bergen Facebook Addiction Scale to measure Problematic TikTok Use (PTTU). The study used a Patient Health Questionnaire (PHQ-9) to measure symptoms of depression. Finally, to measure procrastination, the study used the Pure Procrastination Scale. The study found that procrastination had a positive relation to both PTTU and depression. Furthermore, PTTU was also shown to have a positive correlation with depression. In other words, the results suggest that procrastination could lead to an increase in TikTok use as well as an increase in depression symptoms. The results of this study indicated that PTTU partially brings about the relationship between procrastination and depression. However, this study has several limitations, including the fact that the survey used to conduct this study was only distributed in one country, making it less representative of all TikTok users. Another limitation is that this study included participants between the ages of 18 and 35 who were predominantly university students. Consequently, we cannot generalize the

results to other age groups, such as adolescents. Further research should be done to broaden the scope of the study and confirm its results.

Another possible negative effect of social media is that it may increase anxiety symptoms (Anto et al., 2023). Anxiety is characterized by feeling excessive fear and uneasiness for extended periods (*Anxiety*, 2023). A study by Anto et al. (2023) was conducted to observe how social media impacts students' anxiety levels. Undergraduate students were interviewed on subjects such as the students' social media use, opinions about social media, as well as students' views on the impact social media has on their anxiety. The results of this study had eight second-order themes: comparison, fear of missing out, procrastination, stress, negative experiences, social connections, escapism, and positive experiences. The study found that 3 of those themes decreased anxiety levels, while five themes increased anxiety. The ones that decreased anxiety were social connections, escapism, and positive experiences. Meanwhile, the ones that increased anxiety were comparison, fear of missing out, procrastination, stress, and negative experiences. The study found that social media caused a decrease in anxiety through positive experiences, allowing users to be more connected socially and providing them with an outlet to decompress. However, it caused an increase in anxiety through aspects such as stress, comparison, negative experiences, procrastination, and the fear of missing out. In summary, this indicates that social media can be seen as beneficial in certain aspects; however, the benefit may be outweighed as it does cause an increase in anxiety symptoms.

Overall, social media impacts the anxiety levels of students and is an important factor in mental health (Anto et al., 2023). Some limitations of this study include the possibility that the findings could have been affected by monomethod bias, which occurs when a single method is used to collect data. There may also have been interviewer bias, as two groups of researchers

conducted all subsequent interviews after the pilot interview. Another limitation is that most participants were students from a British Asian ethnic background studying in London, and most were male. A final limitation of this study is that the participants may have experienced anchoring and availability bias throughout the study. Further research should use a wider demographic and include participants from more universities. Further research should also be conducted on other mental health symptoms, such as depression.

Insomnia

A final concern with social media use is that it is associated with insomnia and sleep disturbance (Levenson et al., 2016). Insomnia is a disorder that can affect falling and staying asleep (*Insomnia - Symptoms and Causes*, 2024). A study by Levenson et al. (2016) assessed social media use and sleep in young adults. The study aimed to determine the relationship between sleep disturbance and social media use. To conduct this study, social media volume and frequency were tested through self-reported minutes. Social media volume is defined as the total number of minutes the participant spends on social media per day on average for non-work-related reasons. Meanwhile, social media frequency refers to the number of times a participant accesses a social media platform weekly. Sleep disturbance was measured through the Patient-Reported Outcomes Measurement Information System (PROMIS). The study also used items adapted from the Pew Internet Research Questionnaire. The results of this study showed that participants in the highest quartile of social media volume per day had an adjusted odds ratio of 1.95 for sleep disturbance compared to those in the lowest quartile for sleep disturbance. When compared to participants in the lowest quartile of social media use frequency per week, participants in the highest quartile had an adjusted odds ratio of 2.92. Overall,

participants who used social media more frequently and in higher volumes had a greater likelihood of experiencing sleep disturbances (Levenson et al., 2016). However, due to the study's design, it was unable to determine whether higher social media use causes sleep disturbance or if sleep disturbance leads to higher social media use. This means that the study's results show a correlation between sleep disturbance and higher social media use. However, they were unable to find a definitive answer about the direction of the relationship. Another limitation is that the study was conducted using participants between the ages of 19 and 32, so the conclusions of this study are only applicable to this age range. Further research should focus on assessing the direction of the association across different age groups. Also, to establish a cause-and-effect relationship, further research could study two cohorts of people: those who use social media before sleep and those who do not.

While Levenson et al. (2016) evaluated the effects of social media use on sleep disturbance, the study was unable to determine the direction of the association and could not differentiate causal effects on individuals who use social media before sleep. Therefore, further research must be conducted to clarify the relationship between sleep quality and social media use. The work done by Abdalqader et al. (2018) aimed to measure the prevalence of insomnia and determine the association between social media use and insomnia. A questionnaire used in the study evaluated social media in terms of frequency, time spent, time of day spent accessing social media, and the type of social media used. Another section of the questionnaire included 16 self-rated questions about insomnia and other sleep disorders. The questions were taken from the Behavioral Health Virtual Resource in 2018. The results of this study showed that the more frequently someone accesses social media, the more likely they are to suffer from insomnia, with the prevalence of insomnia among participants being 69%. There was a

statistically significant association between the frequency of social media use and insomnia. The more frequently a person uses social media, the more likely they are to experience insomnia. Also, this study found that the time of day a person accesses social media is significant. The use of electronics in bed before sleeping showed an association with insomnia. Overall, this study found that insomnia is highly prevalent among university students and has a significant association with social media, particularly in terms of frequency of use and time of day (Abdalqader et al., 2018). Although the study does not specifically mention its limitations, it utilized a questionnaire, which allows for the possibility of recall bias. Another limitation of this study was that it was conducted with students at a private university, which provided a partial representation of all social media users. Further research should be conducted in a way that avoids using questionnaires to minimize the threat of recall bias, instead uses diagnostic materials to monitor participants, and includes a larger demographic of social media users.

Moreover, people who have higher in-bed use of mobile device-based electronic social media are more likely to suffer from insomnia, anxiety, and short sleep duration on weeknights (Bhat et al., 2018). This data is shown in an observational study conducted by Bhat et al. (2018) that studied the extent to which using social media in bed is associated with insomnia, daytime sleepiness, mood, and sleep duration. The study was conducted using an online questionnaire and found that almost 70% of participants used social media in bed, with higher levels of use observed in younger and middle-aged participants compared to the elderly. Participants who had higher in-bed social media use were more likely to experience insomnia, anxiety, and short sleep duration on weeknights. However, they did not have depression or daytime sleepiness. The study also found that low in-bed use of social media only increased the possibility of short sleep duration on weeknights. The findings suggest that using social media in bed is associated

with both mood and sleep dysfunction in adults. Even though several studies have pointed out similar associations, the various studies all use different instruments, methodologies, and criteria, making it difficult to conclude whether specific relationships and associations are consistent across the several different studies. Further research should be conducted with stricter controls, using the same methodologies, instruments, and criteria to further support the drawn conclusions.

Finally, automatic TikTok use, which is characterized as mindless, habitual use of the app, is positively related to pre-sleep cognitive arousal and positively associated with daytime fatigue (Wang & Scherr, 2021). Wang and Scherr (2021) conducted a study to observe the association between TikTok and daytime fatigue, focusing on pre-sleep cognitive arousal. The researchers used the Fatigue Assessment Scale to measure daily fatigue and the Pre-sleep Arousal Scale to measure arousal experiences while trying to sleep. The Brief Measurement of Sensation Seeking Scale was used to measure sensation seeking. The study found that automatic TikTok use, characterized as mindless and habitual, was positively related to daytime fatigue and pre-sleep cognitive arousal. Another finding is that pre-sleep cognitive arousal was positively related to both sensation-seeking and daytime fatigue. This helped to conclude that media consumption might hinder people from obtaining good quality sleep. However, this study had several limitations, including its reliance on self-reported data. Also, the research design of this study hindered the ability to make causal inferences or rule out alternative models. Another limitation is that the study did not include participants who are TikTok users in China, people under the age of 18, or over 40, preventing the results from being generalizable. A final limitation is that the study did not investigate specific content features and how those features

affected pre-sleep cognitive arousal. Further research should distinguish between the different features and the different types of content, and have a wider range of participants.

Altogether, these various studies clearly illustrate that social media has several negative implications. Social media can increase ADHD symptoms, anxiety levels, depression symptoms, and cause sleep disturbances. However, one significant limitation with the majority of the studies conducted is that they are self-reported, undermining their accuracy. Although social media has a negative impact on mental health, people are not deterred from using it on a daily basis. Unlimited social media use as it exists today will continue to increase the frequency and severity of mental health issues people tackle. Our society must start taking action to decrease mental health diagnoses, either by limiting social media use or teaching responsible social media usage techniques.

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