



How Social Media Affects the Teenage Brain: A Narrative Review of Key Neurodevelopmental Processes

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Abstract

Social media has been rapidly changing over the past two decades, and more and more people are starting to use it in their daily lives to connect with others. Perhaps the group that utilises social media is adolescents, who are experiencing a period of rapid neural development. As such, these years of development are some of the most crucial and malleable periods for teens, making it no surprise that the growth of social media has become a prominent environmental risk to adolescent brain development. This review explored how social media affects three key functions within the brain during adolescence: social sensitivity, emotion regulation, and attention and memory. The literature suggests that when using social media, adolescents have a higher sensitivity towards feedback from others, and they also possess lower levels of cognitive control when looking at risky images online. Social media was also found to cause worse emotional regulation as well as increase risks for depression. Working and long-term memory are also impaired with overuse of social media, as well as the attention of adolescents, which has been shown to be shortened due to media usage. Finally, we discuss limitations of the current literature and suggest directions for future research.

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Social media is a form of online communication that allows for rapid connections between users, no matter their physical distance. It allows users to share their experiences and is now a fundamental part of many people's daily lives. Its fast growth over the last two decades has completely revolutionized global communication and has contributed to many great achievements. There are many different forms of social media, all of which fulfill different purposes. In 2017, in Canada, some of the most common apps included Facebook, YouTube, LinkedIn, X, Pinterest, Instagram, Snapchat, Tumblr, and Reddit, all social media networks (Gruzd et al., 2018). Social media usage has transformed at a rapid pace. There had been a rapid adoption of social media and technology in general over the past two decades, as proved by an American statistic which showed an increase from 7% in 2005 of adults using social media to 65% in 2015 (Perrin, 2015). At the start of this new age, the most popular platforms were simple apps such as MySpace and Friendster, but as time passed, other apps became more popular, marked by the increase in usage of Facebook and, later, Instagram (Perrin, 2015). The aspect that remained consistent between platforms was the ability to share one's experiences with both friends and strangers around the world. For teens and young adults, it was shown that 95% of them now use social media, making them the most active age group on social media (National Library of Medicine, 2023).

The adolescent stage is a very important part of one's life, as teens explore their identities, work towards independence, and build social relationships outside of their family unit. The brain will continue to grow and mature until around the age of 25 (Arain et al., 2013), so until then, many of the parts of the brain are not fully developed yet. Because of this, teens are extremely susceptible to the effects of different environmental factors (Arain et al., 2013). Functions of the brain, such as impulse control, are often weaker during adolescence due to the prefrontal cortex not being completely developed yet (Arain et al., 2013). The emotions and reward systems are also extra sensitive, as the limbic system is highly active during this period (Arain et al., 2013). Due to these factors, the teenage years are a time of high vulnerability and neuroadaptations.

Current research on social media's impact on the adolescent brain includes fewer reviews synthesizing findings across studies on the effects of social media on different brain functions. There is an increasing number of studies exploring social media usage in adolescents and its potential impacts on neural development (Pihno et al., 2024; Sherman et al., 2018); however, a review paper is needed to synthesize findings from diverse studies exploring multiple neural mechanisms. Understanding the effects of social media on the teenage brain is pivotal for making sure that social media does not have unexpected, detrimental impacts on teens. This review explores 3 crucial neural processes for teens that are impacted by social media: social sensitivity to feedback on social media, the impact social media has on emotion regulation, and the effects it has on attention and memory.

Social Sensitivity

The teenage years are the peak of the development of our social sensitivity. It is how adolescents react, notice, and emotionally process different information, and what their peers may think of them (Sommerville, 2013). This leads to teens worrying more about social status amongst each other, often affecting their behaviours and actions. They may make decisions that will help their social status rather than address other competing goals, such as their academic objectives (Capella et al., 2023). Their perception of each other's popularity will also influence the amount of risk they choose to take. For example, one study theorized that adolescents who wish to gain approval from other popular teens will take more risky acts (Capella et al., 2023). Teens are also more reactive to feedback from peers, including both rejection and acceptance. With the introduction of social media, we are now able to interact with others seamlessly and receive acceptance and rejection each time we open a social media app, which drastically differs from the way teens experienced acceptance and rejection from others before social media. Before social media, acceptance and rejection were almost purely done face-to-face, which made it less frequent than now, while also keeping it within a smaller circle of people. Feedback can be given via the "like" button that appears in most platforms, including Instagram, TikTok, and Twitter, or through comments or follower counts.

The reward circuit of the brain is crucial for the adolescent's processing of punishment and reward. The nucleus accumbens is a crucial part of the brain involved in social reward and punishment, as it is the hub of the reward system (Sherman et al., 2018). It's also been shown to be active during many social media activities, such as receiving positive comments or spreading information through different forms. The amygdala, where emotions are processed, is also active during reward and punishment. According to a recent study, the amygdala is

responsible for adolescents' sensitivity to feedback (likes) (Pihno et al., 2024). Other regions of the brain important for reward and punishment processing include the anterior cingulate cortex, which activates during negative feedback and is mostly responsible for processing social information. Finally, the ventromedial prefrontal cortex is important for higher-level valuation of social rewards as well as processing rejection. This is crucial since it helps people determine how meaningful the feedback may be to that individual.

Adolescents have higher social sensitivity than adults (da Silva Pinho et al., 2024). Their team utilized a reinforcement framework model using the platform Instagram, and tested it on adolescents aged 13-19 years old and adults aged 30-39. Their results suggested that the effort to post on the app for both groups was very similar; however, as they had hypothesized, the adolescents were 44% more sensitive to likes than the adults. Their research was furthered by using an online experiment where they uncovered that the younger groups had greater mood declines when they received the lower end of likes that were provided in the experiment. Using neuroimaging, they also discovered that social sensitivity from feedback caused activity in several different subcortical segments of the brain, with the amygdala exhibiting the most activation. This activation helps so that social media is affecting the brain, and that the social feedback is processed in the brain as an important experience, explaining why adolescents may develop greater social sensitivity with social media usage over time.

Another study by Sherman and colleagues (2018) found similar results surrounding adolescents' social sensitivity on social media. In their experiment, high school and college students were asked to scroll through a mock Instagram feed of both submitted posts and additional risky posts added by the researchers. It was shown that when given an option to like or skip every post they saw, participants from both groups were more likely to "like" posts with more likes (i.e., 23-45 likes) rather than the less popular posts (0-22 likes). These results were aligned with the study by da Silva Pinho and colleagues (2024), as both showed behavioural changes in adolescents when seeing or receiving more likes. These changes express a higher social sensitivity as adolescents started to put more emotional value on approval from their peers, making them more reactive to social feedback and their reputation with their peers. Sherman and colleagues uncovered neuroimaging results similar to those of da Silva Pinho and colleagues (2024), including activation in the amygdala, as activity in the nucleus accumbens (NAcc) was also increased when viewing more likes. These scans also showed how adolescents in high school had a lot less activation in the PFC compared to college students when viewing risky posts, suggesting they may display less inhibitory control than college-aged students.

In contrast, research done by Maza and colleagues (2024) observed conflicting findings to the prior two studies, as they did not find that social media affects teens the same way. While the other two studies showed that adolescents were normally more sensitive to different forms of feedback on social media, such as likes, Maza and colleagues (2024) found that social media does not affect all teens. They found out that there was no strong and consistent between-person and within-person connection between the time a teen spends on social media and the positive effects gained from it (Maza et al., 2024). Instead, they found that the mood state influenced by the use of social media that a teen was experiencing depended on the brain's sensitivity to peer popularity. Their work found that teens with a higher tracking of the popularity of their peers displayed alterations in their emotions to social media feedback, while others showed little to no change in their mood. They argued that social sensitivity in social

media is heavily varied from person to person and that the differences in the brain play a massive role in determining change.

Ultimately, current literature suggests that adolescents possess a heightened sensitivity towards social feedback and also lower cognitive control when viewing risky images on social media. The two studies by da Silva Pinho and colleagues (2024) and Sherman and colleagues (2018) supported the hypothesis that validation from peers is often a big influence on teens' mood and behaviour, such as displaying risk-taking behaviour for popularity among each other. However, Maza and colleagues (2024) argue that not every teen is influenced by this feedback, but rather certain neural sensitivities may make individuals more or less susceptible. In the future, more research may be needed to explore how the source of the feedback impacts responses, as well as additional work exploring how other interactions, such as comments rather than simply "likes", influence neural processing.

Emotion Regulation

During adolescence, teens have extremely sensitive emotional regulation and processing. Mood swings are more common; they are more sensitive to rewarding experiences and often have a greater level of negative emotions than older and younger people (Schweizer et al., 2020). Those teens with higher emotional dysregulation also have a higher chance of developing mental health conditions such as depression and anxiety. With the introduction of social media, emotional dysregulation has increased among teens, amplifying the effects it has on adolescents (Gioia et al., 2021). Social media, although it has its benefits, has introduced teens to a whole new set of problems, such as cyberbullying and the pressure they may face when trying to fit in with peers online. These experiences help contribute to emotional dysregulation by causing strong emotional responses, which may be hard for teens to manage.

Emotion regulation relies heavily on the anterior cingulate cortex (ACC), which is an important region of the brain for regulating our emotions (Perlman et al., 2010). The prefrontal cortex also plays a massive role in our emotional regulation and processing system by allowing for the comprehension of one's emotions while also helping people understand and express empathy (Cleveland Clinic, 2025). Finally, the hippocampus plays an important role in emotion regulation, helping regulate the responses towards stress.

One study conducted by Zhang et al. (2022) found that different social media activities result in worse emotional regulation and higher depressive symptoms. The study was done by researching using fMRI with 79 adolescents aged 11-14 who completed a monetary incentive delay task. These researchers discovered that the adolescents who had spent more time on social media displayed more activity in the left anterior insula and the right dorsolateral prefrontal cortex, sections of the brain that are necessary for emotion regulation, leading the researchers to believe that social media increases teens' sensitivity to negative stimuli, disrupting their natural emotion regulation. Through an fMRI analysis, the authors stated that the connection between social media and poor emotional regulation could be caused by maladaptations of social media, where many teens are using it to help cope with stress in the short term.

The idea that long-term addiction-like social media use disturbs emotional regulation and processing in teens has been supported by multiple studies (for a review, see De et al., 2025). Pulling from many different studies, the authors suggest that the algorithms behind many social

media apps, such as Instagram, stimulate the brain too much, which, over a long period of time, could lead to addiction. This usage changes the volume of grey matter in brain regions important for emotion regulation (e.g., amygdala, prefrontal cortex, putamen, and orbital-frontal cortex), leading to more impulsive habits (De et al. 2025). This included increased grey volume in the bilateral putamen and decreased volume in the orbital-frontal cortex. It also led to changes in the PFC, which was associated with increased sensitivity of the brain to the different stimuli of social media and reduced repressive control, leading to a weakened emotional regulation system (De et al. 2025). Therefore, these findings show that addiction-like use of social media greatly changes the structure and function of the brain, leading to lower regulation of a teen's emotions.

Ultimately, the current research suggests that there is a consistent negative effect of social media on emotion regulation in teens, as well as a connection to increased symptoms of depression. As shown in the studies discussed above, Zhang et al. (2022) uncovered that the usage of social media not only increased the brain's sensitivity to negative stimuli but also disrupted the emotion regulation pathways. De et al. (2025) also discussed how the addictive usage of social media can change the formation of the brain and cause more impulsive behaviours in teens; similarly, Achterburg et al. (2016) also concluded that social media usage, more specifically when a teen observes another's feedback, can also lead to lower emotion regulation. These studies suggest a consensus that social media leads to a noticeable decrease in emotion regulation and an increase in depressive symptoms in teens. Future studies should consider what stages of puberty each participant is at and how hormone changes may also play a role in emotion regulation, and include experiments more reflective of real-life scenarios to better assess how social media usage impacts emotion regulation in the real world.

Attention and Memory

Attention is another important function of the brain, as it allows individuals to focus on different things while also being alert to their surroundings. Attention and concentration are the reasons why people are able to drown out unimportant noises when working or pick the correct type of cereal on the shelf, even though there is a sea of different brands. Memory, the ability of the brain to store and remember information, is also very tightly connected with our attention. Although there are many types of memories, the main subsections are short-term memory, which holds small amounts of information for a short duration of time; long-term memory, which stores information from past experiences; and working memory, which also incorporates attention to assist in handling tasks. Attention and memory are deeply connected, as attention controls what one remembers, while also allowing us to recall information (Lindsay, 2020).

Attention is mainly controlled by the frontal lobe, which allows the brain to filter out unneeded information. The reticular activating system also assists in this function by allowing the body to stay awake and alert (Ackerman, 1992). As for memory, the hippocampus, located in the brain's temporal lobe, is crucial for allowing the engraving of information into the mind. It helps convert short-term memories into long-term memories, allowing for the ability to recall information for a longer period of time (Ackerman, 1992). The cerebral cortex also assists with memory by storing visual memory as well as being involved in our usage of working memory while completing tasks, along with the PFC (Ackerman, 1992).

Recent studies have uncovered that social media has started to destroy many

adolescents' ability to concentrate and focus. In many cases, it has been shown that multitasking and the different forms of fast-form media have shortened the attention spans of adolescents (Ali et al., 2024). Petro et al. (2025) also pointed out that overuse of social media leads to a greater lack of attention among teens. Similarly, West et al. (2023) demonstrated that many adolescents had a hard time focusing on tasks in school due to the distractions of social media. They studied 36 teens in Australia and collected data with three main methods, which included rich picture mapping and talking to the teens both in groups and individually. They reported that the use of social media while the students were studying encouraged worse concentration and multitasking, which caused many to ask peers for help, leading to worse performance in school. Ali et al. (2024) also discovered that the severe overuse of social media could cause adolescents with attention deficit disorder (ADHD) to worsen their attention span. They found out that during the teenage years' developmental stages, the prefrontal cortex, which is extremely prone to change, could have its growth disturbed, leading to further attention problems (Ali et al., 2024). West et al. (2023) also mentioned how teens often choose to scroll through social media rather than getting a good night's rest. This often leads to lower cognitive performance, including attention, the day after.

Recent literature also shows that more multitasking on social media amongst teens often has worse long-term and working memory than those who multitask less (Uncapher et al., 2017). Prolonged periods of constantly changing from different pieces of work and social media may make remembering information a lot more challenging. Those who rely heavily on multitasking on social media displayed less volume in the grey matter in the anterior cingulate cortex, which is important for memory processes and also focus (Loh & Kanai, 2014). These findings come together to point towards the fact that social media, specifically multitasking on social media, can damage adolescents' memories and also affect their brain structures as they grow.

Ultimately, current literature suggests a mix of findings when it comes to how digital media can affect memory, and a clearer negative effect on attention. As shown in the studies above, Uncapher et al. 2017 found that social media could negatively affect working and long-term memory. Although not all forms of social media are harmful, the important part is how it's used and self-control. The main consensus is that overuse of social media can harm attention and memory, impacting adolescents' school performance and their overall health. More research is still needed regarding the differences in effects according to gender and possibly other factors that contribute to attention difficulties in teens.

Discussion

Based on the current research surrounding how social media affects the adolescent brain, it has been found to lead to increased sensitivity when exposed to social feedback from others, such as rejections and likes on social media. Social media can reshape the brain, which will then lead to changes in their emotions and their behaviours. The increased activity in the amygdala also makes teens more socially and emotionally sensitive, which the increased activity in the nucleus accumbens may motivate more risky behaviours online. Social media has also been found to cause long-lasting structural changes in the emotion regulation sector, which lead to dysregulation and higher reactivity to negative stimuli. For memory and attention, recent studies have shown that multitasking while using social media is connected with worsening

adolescents' concentration and possibly harming their working memory, leading to worse academic performance in school. In comparison, other sources argue that the effects of social media are not set in stone and that they vary depending on demographic factors and the form of social media. Ultimately, most research concludes that social media has a significant impact on the adolescent brain.

Social media will remain in most adolescents' lives, making a ban on social media for children extremely unrealistic. Instead, we should take smaller, but still effective strategies to combat the possibility of it harming adolescents. Much of this responsibility will fall on parents, who are often not well-informed about the impacts of social media. They should be given psychoeducation to understand the neurological effects that social media has on the developing brain. This should also be accompanied by education of the youth by pushing for more information to be given at schools to help them become aware of the effects of social media. Moreover, while banning social media is nearly impossible, setting time limits may be a great alternative for those under 18 to help mitigate the possible effects on their attention, emotional regulation, and social sensitivity. The government should also consider regulating artificial intelligence (AI) use in technology, particularly the algorithms of social media platforms. A study conducted by De et al. (2025) found that AI algorithms were designed to capture their users' attention by stimulating the brain's reward systems, which can lead to the development of addictive behaviors. It may be impossible to remove AI completely from the algorithms, but governments should try to make them less addictive to protect the youth.

Many limitations are also present in the current research. One great constraint of the research surrounding social media is the failure to specify which types of social media are associated with the neural impacts discussed. For example, Uncapher et al. (2017) only discussed multitasking on social media and discussed it very generically, rather than specifying. This poses a problem, as a platform such as Facebook, which is often used for connecting with others, will most likely have a different effect on the brain when compared to an app such as TikTok, which contains a lot of short-form content that may particularly impact attention and memory. This makes it very difficult to help isolate the impacts that different apps or functions of an app may have on different adolescents. Moreover, many studies could not be generalized due to the sample sizes and the lack of diversity in those samples. Many studies use low numbers of adolescents, which may not be representative of the greater population, and may overlook different cultural and individual differences. Not every culture uses social media the same way, and using adolescent participants from two vastly different countries may lead to different conclusions when studying the effects of social media. Finally, there is also a lack of long-term studies that look at the impact of social media on the brain over time, as many studies remain short-term. Longitudinal work is needed to help researchers determine if the existing effects are only associated with the developmental stage or if they carry into adulthood.

There are many important areas that future research should focus on. More research on the effects of social media on both biological genders should be conducted in greater detail. Currently, we can see this with the findings of Soares et al. (2021), who found that some social media benefited the working memory of only male participants, but not female ones. A more direct investigation will help understand the social or neurological reasons behind this gender difference. Due to research pointing towards how social media may be very addictive, it may be beneficial for researchers to start researching social media and its effects using the same methods used for gambling and other addictive activities. This might help lead to more discoveries that might have been missed in the past. Many study designs should also be



improved to be more ecologically valid, as they can often stray away from what social media looks and feels like, due to many of the tasks feeling very fake during the experiment. Instead of simulations, studies could have participants actually go on their phones and browse the different social media platforms to make sure that the results match with real-life scenarios. In conclusion, although social media will continue to become more and more integrated with people's lives, usage amongst adolescents should always be controlled to prevent any damage it may lead to the brain.

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