

Psychology of Social Media and the Brain Behind It

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ABSTRACT

In today's world, social media is a very important part of our everyday lives. Almost 50% of the world's population uses social media, spending around 3.5 hours daily. In comparison, only 40% have flush toilets or proper water-related sanitation, and 18% use cars. The impact of social media on personal and interpersonal well-being has been thoroughly studied during the past few decades. However, the association between social media use, cognitive functioning, and underlying brain mechanisms has only recently begun to attract the attention of researchers. The aim of this review is to provide a comprehensive overview of the most recent and relevant research about psychological and neuroscientific determinants of social media use. We seek to introduce the most prominent concepts in this field and to make this review accessible to both experienced researchers and newcomers. We first explore some of the reasons why people use social media in such large numbers and so often. While the primary use of social media is to communicate with others, important motives also include seeking information, passing time, entertainment, and relaxation, as well as gaining knowledge about others and even spying without compromising one's own anonymity. Next, we focus on findings from neuroscience and cognitive psychology to describe neural systems and cognitive functions that underlie social media use. We give special attention to the prime users of such technologies – children and adolescents – and some fundamental cognitive concepts like mentalizing, task switching, and attention capacities. Since research shows that various types of social media use differentially affect the brain and cognitive functioning, at the end we consider the possible harms and benefits of social networking. Even though the available studies are still scarce and the results we have are conflicting, one thing is very clear – the use of social media changes cognitive systems and the supporting brain networks.

Key words: social media, cognitive functions, brain, children and adolescents, media multitasking

Introduction

We live in a world in which social media is a prominent part of our lives. According to Cambridge Dictionary¹ social media is a set of websites and apps that allow users to communicate and share information. Whether we use it ourselves or follow our friends, family or a celebrity, we cannot escape the social media presence in today's world. More than 3.8 billion people use social media² which is almost 50% of the world's population. Not only do people use social media in such large numbers, but they also spend much of their time using it. An average user spends 3.7 hours per day using social media and messaging apps. Facebook alone has more than 2.5 billion monthly active users, which means that Facebook can reach more than half of all 18 to 34 year old adults. A vast number of people use other social media sites as well. Instagram has 1 billion active monthly users³, TikTok has 800 million, Reddit has 430 million, and Pinterest has 322 million monthly

active users. Williams⁴ calls the age we live in the "Age of Attention" which brings an abundance of information and challenges of self-regulation.

As these numbers vividly illustrate, social media is an integral part of our everyday lives. While the impact of social media on personal and interpersonal wellbeing has been thoroughly studied during past few decades⁵⁻⁸, its association to cognitive components and underlying brain mechanisms has only recently begun to attract the attention of researchers. The aim of this review is to provide a comprehensive overview of the most recent and relevant research about psychological and neuroscientific determinants of social media use. We seek to introduce the most prominent concepts in this field and to make this review accessible to both experienced researchers and newcomers. First, we will explore some of the reasons why people use social media in such large numbers and so often. Next,

we will describe studies about cognitive functioning and supporting neural systems of social media use, focusing on findings from neuroscience and cognitive psychology. Finally, since research shows that various types of social media use differentially affect the brain and cognitive functioning, we will consider both – possible harms and benefits of social networking.

The Appeal of Using Social Media

While half of the human population use social media, only 40% have flush toilets or proper water-related sanitation⁹ and 18% use cars¹⁰. However, social media is much more accessible worldwide, and the cost is far less than the cost of, for example, owning a car. Nevertheless, these numbers put social media usage into perspective. What is it that makes social media so appealing?

Social media is not an entirely new concept. Prior to social media, people used radio, television, and newspaper to broadcast information, and telephone to communicate with others¹¹. First social media site appeared more than 20 years ago in 1999 in Korea under the name *Cyworld* and within several years gained a massive audience. It is interesting that this social media site was built on cultural principles in Korea. The platform operated on reciprocity, meaning that friends needed to interact with each other equally. Many professionals think that this is the reason for its success in Korea, but also the reason why this site did not spread to other parts of the world, where platforms like Facebook are much more popular¹¹. Facebook creates a specific environment on social media by enriching social life while at the same time ignoring the physical distance. There are more than 70 translations available and about 75% of the users are outside of the U.S., where Facebook was first released in 2003, originally as FaceMash¹².

In their exploratory research study, Whiting and Williams¹³ found that people primarily use social media to communicate with others. They use social media to get information and educate themselves on various topics of interest, but also as an excellent pastime activity that is both convenient and accessible at any time. Social media users highlight that it provides entertainment and relaxation, topics on which they can start conversations with their friends and family, and as a bonus, it is a place to share information about themselves and their opinions on different issues. Some participants stated that they like being anonymous on social media, so they can criticize others without consequences or "spy on people". An interesting finding regarding the use of social media to get informed and gather information comes from a study by Van Erkel and Van Aelst¹⁴. They found that using Facebook to gain political knowledge is not effective, and in fact, results in decline of such knowledge. This is not due to personalized one-sided posts, but rather to information overload, which interferes with the user's ability to process and store information. This was especially pronounced for participants who used both social media and other media

types, such as newspapers and television, to gain political knowledge. When it comes to fostering contacts with others, a study of adolescents found that social media use can benefit interpersonal relationships when used in moderate amounts¹⁵, that is, if people use social media when face-to-face interaction is not possible. However, excessive use can lead to stress, over-stimulation, and mistrust, and many people struggle to control their social media use.

Meshi et al.¹⁶ found that people use social media to fulfil two basic evolutionary needs: to connect with others and to manage their own reputation. Many scientists believe that the ability to form and preserve strong social connections set *Homo sapiens* apart from other human species like Neanderthals or *Homo floresiensis* that went extinct¹⁷. Managing one's reputation by leaving a good impression puts a person higher in the social hierarchy, and this can provide status and power. More interaction with others enhances psychological wellbeing by preventing negative feelings of loneliness or rejection, but also provides more access to potential partners and thus ensures more possibilities for reproduction¹⁶. Since social interactions are so beneficial to our survival and progress, they can be a powerful motivational force. That is another possible explanation to why social media is so popular from an evolutionary point. It even has the word *social* in its name.

When discussing social media use, it is crucial to consider both the motivations of consumers and creators. On the revenue side, we can ask how social media platforms generate revenue from their users, given that they are almost all free of charge. The answer lies in the attention economy: social media users are a commodity, and their attention is the product that is being sold to advertisers⁴. Consumers do not have to buy anything; all they have to do is give their attention to social media posts. In turn, social media owners and creators have a product that can be sold: the views and attention of their users. Unfortunately, social media often addresses and exploits our fears and insecurities, making us desperate for the cure that we believe can only be provided by further social media use. Considering the motive behind the creation of social media, our role in the attention economy, the evolutionary role it can play, and the void it seems to fill, we can understand the crucial need to examine the broad influence of media on our everyday lives.

Social media platforms no longer display content to users in chronological order. Instead, they use algorithms that consider factors such as the strength of a user's interactions with other users, the amount of watch time, likes, and comments a post has received. The exact components of these algorithms are not publicly known, but they are based on the same principles that people use when deciding whether or not to like a post. For example, a post with many likes is more likely to be liked by other users, regardless of its content¹⁸. In fact, studies show that due to this virtual social life, many users find themselves captivated by the good feeling of receiving likes, comments, and messages on social media, constantly looking for more¹⁹.

It seems that this kind of behaviour has a biological background that resembles addiction – it has been related to reward motivated behaviour and the need for perpetual activation of the dopamine reward system²⁰, leading to a compulsion to excessively use social media²¹. Although algorithms determine the type of content users engage with, studies have found that they are poorly understood by the public. Even young, highly educated users have difficulty understanding and discussing algorithms, and some may not even be aware of the term or what it represents²². This area of research is crucial nowadays, as algorithm changes are making it increasingly difficult for posts to be seen. Content creators are not the only group affected by the algorithm. Everyday social media users may feel even more confused and frustrated by the decrease in likes, reach, and comments they receive on their posts. Since they use social media for fun, they may not be aware of what algorithms are or how they change, or that the engagement they receive from their followers is not a reflection of whether their followers like them, but rather of whether they have even seen their posts. With the higher rejection sensitivity among the 18–29 year old population²³ and the importance that social media status plays in lives of young people, this is an understudied area that requires more attention from the research community.

The Intertwine between Social Media, Cognitive Functioning and the Brain

In order to engage with the world of social media, people use three fundamental cognitive concepts¹⁶: self-referential thinking, mentalizing, and receiving a reward. First of all, people need to be aware of what they would like to post, and in order to do so, they need to think about their own thoughts and feelings, which is followed by the activation of the medial prefrontal cortex and precuneus (part of the posterior cingulate cortex). Studies have directly linked the activation of these brain regions to sharing and receiving shared information²⁴. Since people use social media to receive a reward in the form of likes, comments, shares, etc., they adapt their behaviour to maximize the potential for getting a reward. The release of dopamine (neurotransmitter which reinforces feelings of pleasure by connecting sensations of pleasure to certain behaviors) in the reward circuit prompts the user to seek reward based on gratification that comes after receiving it^{25,26}. The biggest reward comes from posting opinions and behaviours aligned with the user's followers. If the user wishes to receive many likes, he needs to think about what his followers would like to see in their feed. In other words, he needs to *mentalize* or think about the feelings and opinions of other people²⁷. When he receives likes and comments, he may also think about the motivation behind the received feedback, and in turn, he may comment on other people's posts based on the assumption he made about the way they would receive his feedback. Not only receiving but also giving likes and comments trigger the reward system since users can see it as a form of prosocial be-

haviour^{16,27}. Indeed, providing a positive feedback to others on social media has been associated with activation in brain regions implicated in reward and receiving positive feedback from others, like the striatum and ventral tegmental area²⁸. Interestingly, Westbrook et al.²⁹ found that greater social media use was associated with lower dopamine synthesis capacity in bilateral putamen.

Mentalizing has been proven to be an essential attribute of individuals who have a high capacity to influence others. It was also found that those individuals have increased activity in the temporoparietal junction, a region that is a part of the mentalizing brain network^{30,31}. Newer research suggests that mentalizing is positively associated with the number of dyadic relationships (conversations between two people) a person has on social media, but not with the number of communities (group conversations) or the overall size of their online network³². Research in this area is scarce, and it would be highly beneficial to have more information on not only the association between mentalizing abilities and network size, but also the possible effects that mentalizing has on the success of media influencers and content creators on social media platforms.

Today, social media is an inseparable part of education and entertainment, socializing and traveling, business and marketing, and the majority of workplaces. It has an extraordinary power to capture our attention since the constant expansion of available information guides our divided attention across multiple media sources. The first study, which explored the interaction between social media use and cognitive functions, was conducted in 2009. In this cross-sectional study, Ophir et al.³³ investigated the impact of media multitasking (that is, interacting with multiple digital media inputs simultaneously) on cognitive capacities. Multi-tasking is especially apparent in social media use, and it has been found that switches occur as frequently as every 19 seconds with heightened arousal leading to every switch³⁴. Ophir et al.³³ compared individuals who frequently engage in media multitasking to those who do not on different cognitive task-switching tests (i.e. attention to environmental stimuli and working memory, manipulation of stimuli, controlling responses to stimuli). They wanted to examine whether and how frequent media multitaskers process information compared to individuals who do not frequently multitask on social media. Contrary to their expectations, researchers found that individuals who frequently engage in media multitasking are actually more susceptible to interference from irrelevant stimuli, which led to their worst performance on task-switching tests. It seems that media multitasking increases the sensitivity to distraction and reduces the ability to filter out irrelevant information important for success in such tasks^{33,35}. Moisa et al.³⁶ in their functional imaging study showed that adolescents and young adults who engage in frequent media multitasking exhibit greater activity in right prefrontal regions (right frontal pole and anterior cingulate cortex), which are involved in attentional and inhibitory control. These brain regions are usually activated in response to distractor stimuli. Since they per-

formed worse on attentional tasks compared to infrequent social media users, authors believe that this increased activation suggests that frequent media multitaskers require a greater cognitive effort to maintain focus when confronted with distracting stimuli^{36,37}. The problem of media multitasking is widespread, with 38% of students reporting that they are distracted while doing homework³⁸. Despite the fact that 64% of students believe they should focus more and learn how to cope with distractions, only a small majority put strategies, such as silencing their phone, into practice. However, some studies did not find any adverse effect of media multitasking on attention, while other suggested that media multitasking could be linked to increased performance in some aspects of cognition^{39–41}. Overall, it is clear that multitasking can have negative consequences and social media is becoming a major source of distraction. It would be highly beneficial to conduct further research on multitasking on social media, and to develop programs that help users cope with distractions. These programs would be especially helpful if implemented as part of teaching curriculums, as they could reach students of all ages who struggle with media multitasking the most.

The effects of frequent social media use on cognitive functioning are relatively unexplored in the prime users of such technologies – children and adolescents. Considering the results of studies on adverse effects of frequent media multitasking on attentional capacities, extensive social media multitasking in childhood and adolescence could have adverse effects on the developing brain. One longitudinal study has found that frequent use of social media predicts development of attentional deficits in early adolescents⁴². An EEG study showed that Internet use reduces attentional capacity in late adolescents (average age 19.79 ± 1.47), including the underlying changes in brain processing; specifically, N2 amplitudes and alpha activity which reflect attentional processing⁴³. Studies have found that individuals with attention dysregulation struggle to control their social media use. For example, Ra et al.⁴⁴ found that high-frequency use of digital media is associated with increased odds of ADHD symptoms over a 24-month period in mid-adolescence.

Adolescence is the age when relationships and interactions with friends become a primary focus and an important determinant of identity, happiness and personal well-being. Since the real-world interaction has been shifted into the online social environment, the question is how these virtual interactions relate to the way individuals process and use information gained through social media to explain and predict the behaviors of others – ability referred to as the *social cognition* (Kilford et al., 2016). Emerging research shows that online social interactions are similar to the real world interactions. Studies indicate that online social network closely resembles individual's real-world social network^{5,45} and both have been related to structural differences in the brain. While amygdala volume positively correlates with the size and complexity of one's offline social network⁴⁶, the number of Facebook

friends positively correlates with the grey matter density in the left middle temporal gyrus, right entorhinal cortex, and right superior temporal sulcus^{47,48}. It was also found that participants with more extensive online social networks have a greater bilateral temporoparietal junction connectivity during social exclusion⁴⁹, the brain area previously connected to the mentalizing process. Given the addictive nature of the immediate feedback and adolescents' tendency to make social comparisons, frequent social media use can have adverse effects on adolescent, especially those suffering from low self-esteem, depression or anxiety³⁵. Achterberg et al.⁵⁰ conducted a longitudinal study of adolescents to investigate the relationship between social media use, mental well-being, and structural brain development. They found that social media use frequency was stable across adolescence. In terms of structural brain development, a weak difference was found between high and low social media users. High-frequency social media use was associated with higher baseline cortical thickness in the lateral prefrontal cortex (LPFC) and medial prefrontal cortex (MPFC). Adolescents who engaged in high-frequency social media use also showed accelerated cortical thinning across adolescence, particularly in the LPFC and temporoparietal junction (TPJ). The authors theorize that adolescents with higher baseline cortical thickness in the LPFC and MPFC may be more drawn to frequent social media use, but that social media also acts as an environmental factor that shapes the brain and the thickness/surface area of several structures. The study did not find an association between mental well-being and social media use⁵⁰.

Although the available research is still limited and the findings are conflicting, particularly in the areas of attention, multitasking, and well-being, one thing is clear: social media use changes cognitive systems and the supporting brain networks. More research is needed to understand the long-term effects of social media use on cognitive development and mental health, and to resolve the conflicting findings that have been reported to date.

The “Social” in Social Media and its Cognitive Counterpart

People who decide to post and comment often experience a spiral of silence⁵¹. Spiral of silence theory was first mentioned by Noelle-Neumann⁵², explaining that people have a "quasi-statistical organ" which determines what can be said without being socially sanctioned. This means that people will tend to stay silent if they think others will not agree. What happens when the majority does not share their opinion due to misalignment between their own views and social media ones, even though social media is not a true average of the population's opinions? Banisch et al.⁵¹ found that people who have opinions that correspond to the perceived majority view become more willing to share their views and vice versa. In this way, if a minority is seen as a minority, it becomes quieter and quieter. However, the same phenomena can affect the majority

if a minority acts as a cohesive group and creates an illusion of a dominant force.

Social media is a perfect ground for a spiral of silence, especially when minorities get so loud that the majority becomes quiet. Hampton et al.⁵³ found that people are more willing to share their opinions in person than on social media and that social media users will more likely share their opinions online if they think that their opinion is in alignment with the opinion of their followers. They also found that people who regularly check their social media are less likely to share their opinion both on social media and in face-to-face interaction in comparison to people who do not frequently use social media. What we see on social media is an opportunity for marginalized views to live an impression as a dominant standpoint and completely change what people are willing to share with others⁵¹. Ehlebracht⁵⁴ argues that social media becomes a filter of our own reality. Previously mentioned algorithms play a huge role in how opinions are formed since they determine which content will be seen by others. Some go so far as to say that even history is constructed by the media⁵⁵. In the past, only the things that have been written down became history, while now, only those events that are presented through media vividly and visually become history.

Since users perceive likes as a social reward, they are more prone to align their behaviour to get the maximum reward, which implies that others perceive them positively. Therefore, by using mentalization or, in other words, thinking about what others think and feel¹⁶, people adjust their behaviour and opinions so they would be approved by society. Cascio et al.⁵⁶ asked participants to rate games on how likely they would be to recommend that game to a friend based on a description of a game given to them. Next, they were put in an fMRI scanner while being reminded of their own rating and a rating that they thought was an average rating of their peers. However, ratings shown to them have been randomly made smaller, the same, or higher than the participant's rating. After receiving this information, they had an opportunity to change their initial rating. Results showed that participants changed their rating significantly more often when peer rating differed from their own compared to when the ratings did not differ⁵⁶. People, especially adolescents and young adults, are prone to change how they act if they believe that their behaviour is not aligned with others. The key brain region implicated in this kind of conflict monitoring and detection behaviour is the anterior cingulate cortex, specifically its dorsal part. When a person detects a conflict between his own behaviour/opinion and the prevailing behaviour/opinion of the group, there is a significant increase in the activity of anterior cingulate cortex followed by the updating of one's own behaviour/opinion³⁰. Other brain regions have also been implicated in conflict monitoring and detection in social situations. The activation in ventral striatum and ventromedial prefrontal cortex have been found in situations when individuals update

their preferences to match group opinions as possible reflection of the anticipated social reward⁵⁷.

This has a severe implication when it comes to the formation of opinions and social norms. People feel like social media represents the average standpoint of the population, just as if participants thought that the rates they were shown in an experiment were approximate of their peers' opinions. These two situations have in common that they are both an illusion; just as the rating in the experiment was not a true measure of peer opinions, social media is not a true representation of population opinions. For example, a survey of 1471 Americans found that only 55% have ever left a comment on social media or websites⁵⁸. However, the neuroscience of social influence, especially social media influence, is relatively new area of study, and more research is needed to determine the exact relationship between the processes of social influence on social media and underlying brain mechanisms that contribute to attitude and behaviour change.

A significant aspect of the social media experience is whether users perceive what they see as real or as filtered version of reality. Unfortunately, research has not yet focused on this aspect of social media use to a large extent, but researchers have begun to investigate the authenticity of influencers on social media platforms. For example, Lee and Eastin⁵⁹ developed the Perceived Authenticity of Social Media Influencers scale. It would be interesting to investigate how people view others online: do they perceive posts as carefully selected, edited, and posted to benefit the user's online image, or do they perceive posts as an authentic and complete image of the person's everyday life. These different approaches to consuming posts could have noticeable effect on users' self-confidence, frequency of social comparison, and sense of accomplishment in life.

Possible Harms and Benefits of Social Media Use

During the outbreak of COVID-19 social media use skyrocketed since people were spending more and more time indoors, craving any kind of social interaction they could get. What seemed like already high consumption of social media increased even more, so scientists began to question the consequences of this type of behaviour. Marengo et al.⁶⁰ found that frequent Facebook use was negatively correlated with self-esteem, and along with the lower self-esteem came a decrease in happiness. On the other hand, positive response from followers on social media was correlated with an increase in happiness and self-esteem, and the more users post, the more positive feedback they receive.

Some researchers claim that social media created a new type of behavioural addiction or – social media addiction. This form of addiction has several characteristics. First, social media becomes an essential part of a person's life and it is used for mood modification. Than a person develops a tolerance needing more and more exposure to

get the same reward, and if he or she stops “using”, the withdrawal symptoms appear. Next, social media creates conflicts in both personal and professional life. Social media addiction can interfere with work skills by diverting attention from work obligations and lowering overall work performance, but only among employees who use social media for entertainment during work hours⁶¹. Finally, a person experiences relapse after the period of abstention⁶². He et al.⁶³ found a negative association between the amygdala volume and the frequency of Facebook use. They also determined that structural brain changes in social media addiction were similar to apparent gambling or substance addiction changes. There is evidence that narcissism and frequent social media use could be mutually reinforcing since social media provides a perfect outlet for a person with narcissistic traits⁶⁴.

Social media addiction is more prevalent in collectivistic nations (31%) than in individualistic ones (14%)⁶⁵. Gao et al.⁶⁶ conducted a study on a Chinese sample and determined that frequent social media use positively correlates with anxiety and depression. They argue that prevailing disinformation and expression of fear and negative emotion on social media contributed to these findings during the COVID-19 pandemic. Orben⁶⁷ showed that the correlation between social media use and adolescents’ psychological wellbeing is usually negative, but very small (range between $r = -0.15$ and $r = -0.10$). A study of social media use among Chinese students found that those who used social media more frequently were more likely to become addicted⁶⁸. These students also had lower scores on subjective well-being. An interesting finding was that rational social media use, characterized by behavioural control, enhanced subjective well-being. This suggests that social media can be used in a way that benefits its users. It seems that the main difference between detrimental and beneficial social media use is the user's behavioural control. If the users have adequate control over their social media habits and those habits align with their goals and intentions, then social media use can improve their quality of life.

It has also been found that individuals who are addicted to social media are less aware of their thoughts and emotions and tend to use social media to cope with problems, which in turn leads to even less awareness and exhaustion that once again promotes further social media use⁶⁹. A lower self-esteem, which accompanies social media addiction, is likely the result of the negative feedback that users can receive on social media, as well as the tendency to engage in upward social comparisons⁷⁰. This phenomenon is especially prevalent in the era of influencers, when the goal is to present a “perfect” life. There is a growing awareness of this problem, and movements are emerging that encourage users to show their “real skin”, “real life”, and “real problems”. It would be interesting to compare different types of social media content, such as polished and unpolished content, and study the effects that both types of content have on user well-being.

On the other hand, social media use can be beneficial for psychiatric patients by facilitating social interaction in a more comfortable way for individuals with impaired social functioning and by connecting them with support groups⁷¹. Orben⁶⁷ highlights that social media positively affects well-being, social outcomes, and authentic self-presentation. It is important to differentiate passive social media use linked to a decrease in well-being through increased envy⁸ and active social media use linked to an increase in wellbeing. If used correctly, some studies show that social media can present a new platform for improving mental health. Indeed, one of the reasons social media became an area of interest among psychologists and neuroscientists is its ability to change the way people think and behave based on the brain's big capacity for plasticity, especially in adolescence. Rejection, as well as acceptance, is at the core of social media. From followers to other people's posts, a user can decide whether they accept or reject that person and its content. As much as it seems that social media alone has a massive effect on adolescents' views, this effect becomes apparent only when peers agree with the social media ideals. For example, girls experience negative body image only when their peers agree with the thin-body ideal that is present in the media⁷². This shows how individuals still have much power over what is considered normal and ideal, despite the social media standpoint. If those girls were surrounded by peers that did not agree with the social media view of women's bodies, they would not have negative body image either. Social media and its reward capacity can also be used for good and increase prosocial behaviour among peers. Van Hoorn et al.⁷³ found that receiving likes for giving donations increased the willingness to donate and the amount that has been donated to others. However, positive effects of social media use may be only short-term since increase in positive emotions lasts only ten minutes after posting on social media, with no effects after 30 minutes or two weeks⁷⁴.

Even though frequent social media use seems to create inadequate environment for cognitive functioning during critical periods of brain development, i.e. childhood and early adolescence¹², the opposite might be true in a different part of the lifespan – older adulthood. Kuhn et al.⁷⁵ found structural plasticity effects in right hippocampal formation and right dorsolateral prefrontal cortex elicited by a video gaming intervention, which might be applicable in clinical settings to counteract known risk factors for mental disease (smaller hippocampus and prefrontal cortex volume) for instance in post-traumatic stress disorder or neurodegenerative diseases. In fact, video game training enhances cognitive control processes, like multitasking, in older adults (60 to 85 years of age), attaining levels beyond those achieved by untrained 20-year olds⁷⁶. Even EEG showed changes after training in older adults, including enhanced midline frontal theta power and frontal–posterior theta coherence – important for sustained attention and working memory.

Advancements in technology have completely changed the way we retrieve and store information. We can access

knowledge about almost any topic in just a few seconds using digital technology. Moreover, just as technology became an essential part of education, social media can become a part of it as well. Many teachers doubt whether social media can be used in education since it was not invented for pedagogical use⁷⁷. The biggest obstacle for teachers is a perceived lack of expertise and experience when it comes to social media. Other teachers see many benefits of using social media in education and are willing to integrate social media as a part of the teaching process. Most benefits come from increased peer and social support and the opportunity for self-instructed studying, goal setting, and intrinsically motivated planning⁷⁸. It has also been found that social media increase the motivation and engagement of students⁷⁹. However, students perceive social media positively only when they are aware of educational benefits that come with using these platforms in the classroom, contrary to the notion that students will use social media only because it is fun. The use of technology and social media is not as effective in every field of education. Students in the humanities, education, and fine arts were least prone to use technology in the classroom, while engineering, business, and physical sciences students showed the highest preference for the use of technology in learning⁸¹.

When discussing the harms and benefits of social media use, it is important to consider which groups are being compared. To conclude that moderate media use is associated with increased well-being compared to no media use, we need to pay attention to how the no media use group was recruited. Did the researchers stop a group of people who previously used media from using media for a set period of time, or did they find people who do not use social media in their everyday lives? It would be a big challenge to find a group of people who do not use social media in today's media-driven world. Therefore, research should focus on defining what it means to (not)use social media and how to create such conditions in research without unintentionally interfering with the results.

Conclusion

It is very clear that social media is very important part of our everyday lives and is changing the ways we gather information and connect with others. Although research in this area has just begun, we found several ways how social media use can affect our cognitive processes and the underlying brain structures. Social media has extraordinary power to capture our attention and the constant growth of available information requires that we divide our attention across multiple media sources. Even though it was thought that this would improve individual's atten-

tional capacities, research results seem to go in opposite direction. Individuals who frequently engage in media multitasking are actually more susceptible to interference from irrelevant stimuli, because they are sensitive to distraction, which reduces their ability to filter out irrelevant information and successfully resolve the task at hand. Instead, they need to invest more cognitive effort to maintain focus, which is reflected in additional activation of the right prefrontal brain regions, important for attentional and inhibitory control. Some studies even show that extensive social media multitasking in childhood and adolescence has adverse effects on the developing brain. Although the available studies are still scarce and the results we have are conflicting, one thing is very clear – the use of social media changes cognitive systems and the supporting brain networks. For example, social media use in adolescence is linked to thinning of the LPFC and TPJ. Since social media users perceive likes as a form of social reward, they are more prone to align their behaviour to get the maximum reward, expecting that others thus perceive them positively. By using mentalization people adjust their behaviour and opinions so they would be approved by society. People, especially adolescents and young adults, are prone to change how they act if they believe that their behaviour is not aligned with others. This has a severe implication when it comes to the formation of opinions and social norms. However, the neuroscience of social influence, especially social media influence, is relatively new area of study, and more research is needed to determine the exact relationship between the processes social influence on social media and underlying brain mechanisms that contribute to attitude and behaviour change. Finally, social media use can be beneficial for different groups. For instance, psychiatric patients can benefit from using social media, because it facilitates social interaction in a more comfortable way for those with impaired social functioning. If used correctly, some studies confirm that social media can present a new platform for improving mental health. To the older adults who experience cognitive decline the online environment may provide a new source of positive cognitive stimulation. Social media is now an essential part of education as well, and for teachers and students who are willing to integrate social media in the classroom, it could have positive benefits on goal setting, intrinsically motivated planning and even student-teacher communication. With the knowledge that we have already acquired, we should aim to educate the broader audience of the way social media shapes our opinions. We should also work on programs that help people gain awareness of media influence and control over their media use habits.

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PSIHOLOGIJA DRUŠTVENIH MEDIJA I MOZGOVNI PROCESI U PODLOZI

SAŽETAK

U današnjem svijetu društveni mediji vrlo su važan dio našeg svakodnevnog života. Gotovo 50% svjetskog stanovništva koristi društvene medije, trošeći oko 3,5 sata dnevno na njih. Za usporedbu, samo 40% ima WC školjku ili primjerene sanitarne čvorove, a 18% ih koristi automobile. Utjecaj društvenih medija na osobnu i interpersonalnu dobrobit temeljito je proučavan tijekom posljednjih nekoliko desetljeća. Međutim, odnos korištenja društvenih medija, kognitivnog funkcioniranja i mozgovnih mehanizama u njihovoj podlozi tek je nedavno počeo privlačiti pozornost istraživača. Cilj ovog rada je pružiti sveobuhvatan pregled najnovijih i relevantnih istraživanja o psihološkim i neuroznanstvenim odrednicama korištenja društvenih medija. Nastojali smo predstaviti najistaknutije koncepte u ovom području i učiniti rad pristupačnim za iskusne istraživače i početnike. Prvo smo istražili neke od razloga zašto ljudi koriste društvene medije u tako velikom broju i tako često. Iako je primarna svrha korištenja društvenih medija komunikacija s drugima, među važne motive spadaju i traženje informacija, protek vremena, zabava i opuštanje, kao i prikupljanje informacije o drugima, pa čak špijuniranje bez ugrožavanja vlastite anonimnosti. Nakon toga usmjerili smo se na nalaze iz neuroznanosti i kognitivne psihologije kako bismo opisali neurološke sustave i kognitivne funkcije koji se nalaze u podlozi korištenja društvenih medija. Posebnu pažnju posvetili smo primarnim korisnicima takvih tehnologija – djeci i adolescentima, te nekim temeljnim kognitivnim konceptima poput mentaliziranja, prebacivanja između zadataka i kapaciteta pažnje. Budući da istraživanja pokazuju da različiti oblici korištenja društvenih medija različito utječu na mozak i kognitivno funkcioniranje, na kraju rada razmotrili smo moguće štete i koristi društvenih mreža. Iako su dostupne studije još uvijek oskudne, a rezultati koje imamo proturječni, jedna stvar je vrlo jasna – korištenje društvenih medija mijenja kognitivne procese i mozgovne sustave u njihovoj podlozi.

