



UNIVERSITY OF PADOVA

Department of General Psychology

Bachelor's Degree Course in Psychological Science

Final dissertation

**Distracted in a Hyperconnected World: a Literature Review
of Social Media and Distraction**

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A handwritten signature in black ink, appearing to read 'Spironelli'.

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Academic Year 2022/2023

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INTRODUCTION

Social media

Social media are a pervasive aspect of today society. With an avalanche of posts and likes, the popularity of social media platforms such as WhatsApp, Facebook, Instagram, Twitter and TikTok attracts a surge of new users that log on to social media to connect with friends, interact with online communities, or mindlessly skim the virtually unlimited amount of available content.

Today, 30 years after the creation of the first social media platform, it is challenging to fully grasp the far-reaching ramifications of how social media influence users' attention and cognitive performances, both on the immediate and the sustained consequences. To understand social media consequences, we must first comprehend which factors contribute to social media use, and what mechanisms underlie the conscious and unconscious inclinations toward frequent social media checking. In essence, why are individuals drawn to social media?

The heightened popularity of social media can be accounted for by a plethora of factors: for the scope of this review, only the original aim of social media platforms has been considered, namely social connectivity, followed by the design of social connectivity features. It is nevertheless necessary to list vital circumstances that acted as catalysts for the popularity of social media, such as the widespread adoption of smartphones, internet accessibility, and the intrinsic popularity of social media platforms.

Social connectivity

Social connectivity, or the need for belongingness, has been deemed to 'be almost as compelling a need as food and that human culture is significantly conditioned

by the pressure to provide belongingness'; the roots of this desire stem from the vital role social bond play from an evolutionary perspective (Ainsworth, 1989; Baumeister & Leary, 1995 p.158).

The advent of social media revolutionized social interaction, providing users with a new medium to communicate and connect to their social network (Ellison et al., 2007; Whiting & Williams, 2013). According to the uses and gratifications theory (U&G), media are used to fulfill social and psychological needs (Katz et al., 1973). Although U&G originally considers only traditional media, its framework has recently been applied to social media, supporting the idea that social media provide individuals with the possibility to satisfy their need for social connectivity, thus increasing the users' tendency to rely on online social networking to meet affiliation needs (Lee & Chiou, 2013; Whiting & Williams, 2013).

Indeed, social connectivity is the first reported motive for social media use: the individual's social context provides the cues, through peer pressure and individual curiosity, to create a social media account; nevertheless, is the fulfillment of the expected gratification, namely social connectivity, that leads to a consistent use of the medium (Ellison et al., 2007, Quan-Haase & Young, 2010). Additionally, the need to belong and connect with peers is a predictor of social media use (Steinfeld et al., 2008).

The structure and features of social media differ across platforms, affecting the interface between users and, therefore, the level of gratifications perceived (Quan-Haase & Young, 2010). The difference in the design of the platform and the supported communication style accounts for the abundance of social media platforms and entails that users do not limit their social media activity to one platform, but instead switch between different applications to satisfy different needs: Facebook users engage with a

larger social network asynchronously, while instant messages platforms, such as WhatsApp and Messenger, offer a one-to-one private conversation that emulates in-person conversations, allowing for increased intimacy (Quan-Haase & Young, 2010).

While social connectivity seems to account for the popularity of social media, the debate concerning whether social media aid social connections is far from settled. A longitudinal study on adolescents supports the hypothesis that Facebook facilitates social connection, resulting particularly beneficial for individuals with lower self-esteem, as it reduces the difficulty of initiating communication, and users benefit from social interaction in isolated contexts (Steinfeld et al., 2008). Contrasting evidence from an experimental study found phone use prevents individuals from participating and engaging in social interactions, therefore reducing the enjoyment of face-to-face socialization (Dwyer et al., 2018). A possible explanation for such contrasting findings lies in the setting in which individuals use social media: while during a social gathering, social media might hinder sociability, when an individual is socially isolated, as the lockdown caused by the Covid-19 pandemic, social media provides a tool to fulfill the unmet need of social connection.

Social connectivity features

The vital role of social connectivity is perhaps best understood by considering the popularity of the linked social connectivity feature. Consider, for example, the “thumb up” or “like”, used to indicate positive feedback to social media content: receiving a “thumb up” affects the brain’s reward circuit, with consequences on future user’s behavior (Montag et al., 2019; Sherman et al., 2016).

Similarly to the “thumb up”, social media embeds other features, elements designed for the end-goal of sustaining users’ engagement with the content of the social

media platform, such as the *endless scrolling* feature, which allows users to browse social media without the need to refresh the page (Montag et al., 2019). The new content appearing at the bottom of the screen is not randomly presented, rather, it is selected according to users' past behavior: social media newsfeeds differ among users of the same social media, based on past activity, such as the *likes* distribution and time spent viewing specific contents (Montag et al., 2019; Rader & Gray, 2015).

The endless scrolling feature combined with the personalized newsfeed provides, with every additional scroll, the possibility of viewing similar content as the kind *liked* in the past (Montag et al., 2019). The potential to experience positive feelings combined with the repetitive nature of the infinite scrolling feature creates a feeling of flow (Khang et al., 2013). In the concept of social media, flow is a self-reinforcing, immersive experience, characterized by a state of concentration in which individual perceives feelings of pleasure or satisfaction that drive them to repeat the ongoing activity, experiencing a distorted perception of time (Kwak et al., 2014). Linked to a lack of awareness of time spent browsing social media platforms, flow state in the context of social media use could lead to addictive behavior (Zhao & Zhou, 2021).

Social media excessive use

Most social media applications can be downloaded for free and do not rely on subscription fees to create; instead, the social media business model requires users to exchange personal data for allowance to utilize the service (Montag et al., 2019; Saura et al., 2021). The quantity of data users share with the platform increases with the time users spend on social media platforms and is directly proportional to the revenue generated by selling the data to advertisement companies. While there is no data to support the belief that social media features were constructed to encourage addictive behavior among its

users, it is reasonable to suppose that the goal of social media platform design is to maintain users online for a prolonged amount of time (Saura et al., 2021).

While social media excessive use is not listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) issued by the American Psychiatric Association, the addictive nature of social media use cannot be overlooked. Indeed, social media excessive use entails behaviors, mechanisms and features that overlap with those of other behavioral addictions (Griffiths, 2005). As previously discussed, the social media feature of endless scrolling provides users with the possibility of discovering new rewarding content, thus creating a mechanism of intermittent conditioning, a common denominator of addiction to slot machines (Montag et al., 2019; Saura et al., 2021). Furthermore, as a specific form of internet addiction, social media excessive use shares core components of behavioral addictions, such as salience, mood modification, tolerance, withdrawal, conflict and relapse (Griffiths, 2005).

The aforementioned factors provide a tentative explanation for the rationale of social media use and are key elements to understanding the implications social media have on users: the promised fulfillment of the social connectivity need, united with the potential addictiveness of the different features present on the platforms, capture the users' attention, distracting them from their daily life.

CHAPTER 1

1.1 Social media and distraction

Distraction can be both a consequence and a motive of social media use. Social media can create a distraction from the desired goal by drawing attention away from the goal-oriented behavior, causing an attention shift from the ongoing task to the social media platform (Koessmeier & Büttner, 2021). In this context, the distraction created by social media can be of two kinds: exogenous or endogenous. Additionally, users can employ social media as a coping mechanism; the need to get distracted and the susceptibility to distraction depends on individuals' cognitive and psychological state.

1.1.1 Exogenous distraction

An exogenous distraction occurs when an ongoing task is interrupted by social media cues generated by the external environment, such as notifications. When users are not engaging with social media platforms, notifications inform them of new messages or content (Pielot et al., 2014). Because of their visual, auditory and haptic components, notifications distract users, even when they resist the temptation of checking social media, and the magnitude of distraction increases when the task at hand is interrupted (Clapp et al., 2010; Stothart et al., 2015). Furthermore, communication through social media is subjected to social expectations. Social availability norms urge social media users to check for updates and respond to notifications shortly after their arrival (Pielot et al., 2014). This phenomenon persists even when the notifications are not perceived because the phone is silenced and can be accounted for by endogenous distraction.

1.1.2 Endogenous distraction

Endogenous distractions are caused by task-unrelated thoughts, such as thinking of unanswered social media notifications (Koessmeier & Büttner, 2021). The failure of executive control on thoughts gives rise to mind wandering or the free flow of one's thoughts, which is linked to social media use: the preoccupation with online content may cause task-unrelated thoughts and the need to check social media (Johannes et al., 2018; Kane & McVay, 2012). The relationship between mind wandering and social media is thought to be mediated by the user's interest in the ongoing task: a higher frequency of mind wandering is associated with low interest in the task (Hollis & Was, 2016). Contextually, the nature of the thought initiating the mind wandering furtherly divides endogenous distraction into social-related distraction and task-related distraction (Koessmeier & Büttner, 2021).

Social-related distraction entails higher vulnerability to distraction due to users' unfulfilled need for social connectivity. As previously discussed, social media is a socially rewarding activity, thus the search for social interaction is one of the leading causes of social media use (Brailovskaia et al., 2020).

Task-related distraction emerges from a state of discomfort with the ongoing situation, and it implies the use of social media to avoid or improve difficult or uncomfortable tasks. Using social media to escape negative emotions is a form of coping mechanism that could yield unfavorable outcomes.

1.2 Distraction as a coping mechanism

Oftentimes, distraction is not just the unforeseen consequence of social media use, but the end goal that users anticipate when browsing social media platforms. The surge

in social media use during the Covid-19 pandemic unveiled users' tendency to check social media when experiencing stress (Zhao & Zhou, 2021). By the users and gratification theory, users self-medicate by numbing their negative emotional response through the state of flow, and by relying on other users to receive empathetic support, fulfilling their need for social connectivity (Quan-Haase & Young, 2010; Zhao & Zhou, 2021). The flow state seems to mediate the relationship between stress perceived during the Covid-19 pandemic and social media use: falling into the pleasant state of flow caused by features such as infinite scrolling, users can briefly escape negative emotions (Zhao & Zhou, 2021). Using social media with the goal of mood modification, or forgetting offline problems, is a trait that characterizes behavioral addiction, thus providing further support to the claim of the addictiveness of the infinite scrolling feature, which allows users to avoid unpleasant emotions by generating a flow state (Griffiths, 2005; Zhao & Zhou, 2021).

1.3 Individual differences

According to the users and gratification theory, individual differences have a significant impact on media usage and its effects, thus it can be deduced that social-related and task-related distractions are a result of users' motivational dispositions (Koessmeier & Büttner, 2021). As social-related distraction and task-related distraction represent different facets of distractions, they are characterized by low self-regulatory abilities; however, they also inherently present different antecedents (Koessmeier & Büttner, 2021).

The most important predictor of social-related distraction is the Fear Of Missing Out (FOMO; Koessmeier & Büttner, 2021). Generated by a preoccupation with missing

out on rewarding experiences, FOMO is more present in individuals who present a deficit in their social connection needs (Przybylski et al., 2013). Feeling excluded from social situations can produce higher activity on social media, therefore it is hypothesized that users experiencing FOMO will undergo a higher amount of social media-related distractions. However, research has seemed to disprove this hypothesis, attributing the cause of social media distraction to social media addictive design, rather than FOMO (Siebers et al., 2022).

FOMO also plays a role in task-related distraction: users neglect their ongoing tasks to avoid missing out on social activity, both online and offline (Przybylski et al., 2013). Furthermore, task-related distraction is predicted by feelings of loss of control and craving, thus individuals with low self-control and a higher desire to balance their negative mood could experience diminished productivity when distracted by social media (Koessmeier & Büttner, 2021).

CHAPTER 2

2.1 Immediate consequences of distraction

The immediate consequences of social media distractions are characterized by the temporal proximity of the two. Separated only a brief amount of time, the process of the manipulation of the variables eases the determination of a cause-effect link between distraction and its consequences. The consequences of social media-related distraction are particularly important when considering two factors: the ubiquitous presence of social media and the causal link they maintain with distraction.

Smartphones and social media are omnipresent in today society (Vorderer et al., 2016). Also due to social media, smartphones have become the main interface to communicate with others. While most social media activity happens when no face-to-face interaction partner is present, sometimes online social connectivity is favored over offline social interactions, potentially harming individuals' social relationships (Clapp et al., 2010; Przybylski & Weinstein, 2013). An internet connection is essential to social media activity, to the point that its absence elicits negative strong feelings due to the sudden impossibility of social connectivity provided by social networks.

Distraction is a direct consequence of social media use. Understanding the consequence of social media-created distractions is fundamental due to the negative impact they bear on cognitive performance: the competing tendencies of allocating attention between different tasks result in attentional failure, thus negatively impacting the quality of task performance (Xie et al., 2021). Indeed, external distractions disrupt working memory: individuals who allocate lower attention levels to the distractor

consistently perform better than individuals who cannot suppress the distraction (Clapp et al., 2010).

Due to the limited availability of cognitive resources, social media distractions subtract attention away from the interrupted task, allocating it to social media activity. Thus, the consequences of social media distraction are contextually dependent on the nature of the interrupted task. For the scope of this review, the consequences of distraction have been considered in four contexts: consequences of distraction on sleep, on road safety, in the academic environment, and professional environment.

2.1.1 Distraction consequences on sleep

Sleep plays a vital role in determining individuals' cognitive alertness and performance of executive functions during daily life. Browsed on smartphones past bedtime, social media have the potential to distract individuals from sleeping, disrupting the quality and quantity of sleep, and negatively impacting cognitive performances of the following day (Bowler & Bourke, 2019; Green et al., 2018). Indeed, sleep latency plays a mediator role in the association between exposure to a digital device screen, and decreased cognitive performances during the following day (Green et al., 2018). Even if employed for a brief temporal duration, bedtime social media activity might produce daytime dysfunctions due to the interaction of two factors: the light emitted by smartphones and the nature of the content viewed during the active temporal interval (Bowler & Bourke, 2019).

Smartphone use exposes individuals to *short light wavelengths* (SWL), also known as blue light, which constitute an environmental cue to an individual's biological clock, and, when present, signal daytime (Green et al., 2018). When perceived during the

evening, SWL can alter the secretion of melatonin, creating a state of sustained alertness and a delayed sleep onset (Bowler & Bourke, 2019; Green et al., 2018). The wavelengths of light affect individuals' sleep quality and have negative implications on cognitive and behavioral levels (Bowler & Bourke, 2019).

Social media content is tailored to each user's likes, and selected by an algorithm that aims to promote prolonged screen time by presenting posts that are relevant to the user. Therefore, social media content can be divided into high-arousing and low-arousing, based on users' individual preferences. Low-arousing content consists of posts perceived as uninteresting and unexciting due to their lack of possibility for social cognition and interaction. Contrarily, viewing high-arousing content elicits strong feelings within the users, creating a psychological vigilance state that negatively impacts the quality of sleep (Bowler & Bourke, 2019). The two variables were manipulated by presenting low-arousing content and high-arousing content in a full light condition and in the presence of a SWL filter, which blocks the blue light. As shown in Figure 1, eliminating the SWL created a significant result only in the low-arousing condition (Bowler & Bourke, 2019).

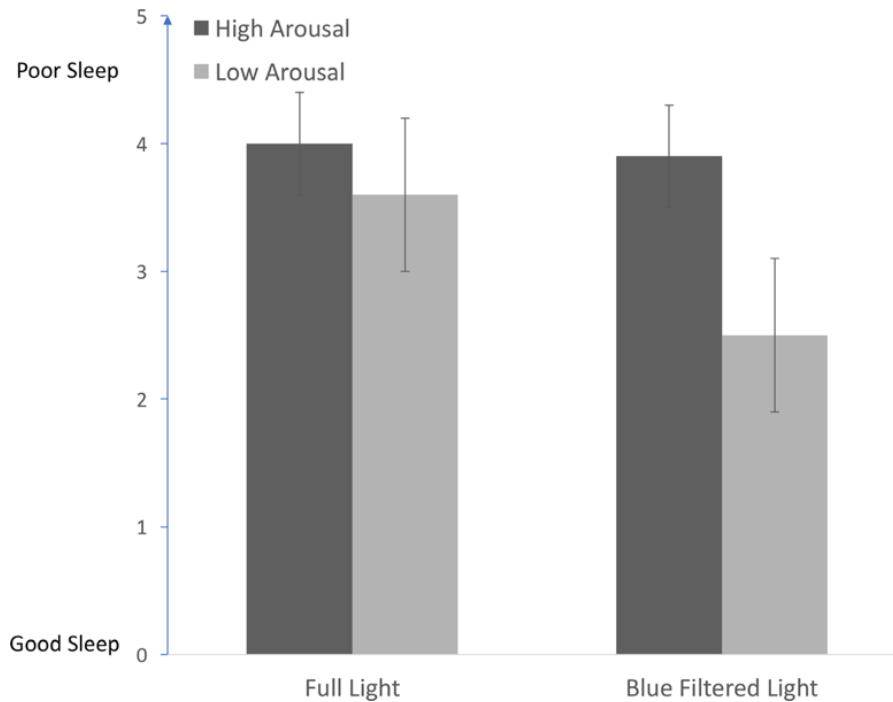


Figure 1. Participants' sleep quality was measured while viewing their newsfeed (high-arousal condition) or a mock Facebook account (low-arousal condition) with and without a blue wavelength filter. Results were recorded on the modified Pittsburgh Sleep Quality Index, with lower numbers indicating higher quality of sleep. One standard error bar is shown. *Source:* Bowler & Bourke (2019).

2.1.2 Distraction consequences on the road

In daily life, exogenous and endogenous distractions can temporally overlap, thus complicating the process of analyzing them and attributing to each their respective consequences. An exception is constituted by on-the-road social media use: while driving a car, social media distraction can be mostly attributed to notifications. As social media popularity skyrocketed, so did the number of road accidents caused by responding to notifications and checking social media newsfeeds (Klauer et al., 2014). Using eye tracking as an indicator of attention allocation, it has been determined that social media notifications cause drivers' attention to transition alternatively from the road to their smartphones, thus slowing individuals' reaction time to external events, such as the need to engage the automobile braking system (Klauer et al., 2014; Wang, 2016).

An aggravating factor to multitasking is users' general impression that social media scrolling is less dangerous than texting. While using social media, individuals present a greater number of gaze fixations on the road than the number reported while individuals are texting, which leads individuals to create a skewed subjective perception of their performance, responsible for a false sense of safety (Wang, 2016). Compared to the condition in which individuals did not use a phone, both social media use and texting share a lower mean of fixation duration on the road (Wang, 2016). Therefore, the two activities are comparable in terms of processing data from the environment, and, consequently, seem to be equally dangerous (Wang, 2016).

2.1.3 Distraction consequences in academia

The immediate and active participation required by social media can negatively impact other activities that require high concentration, such as studying (David et al., 2015). Indeed, a negative relationship is present between time spent on social media and academic achievement (Feng et al., 2019). The disruption of academic performance can be attributed to two behaviors linked to social media distraction: procrastination and multitasking.

Procrastination refers to the act of postponing the start of a task, and it is positively correlated with social media use (Meier et al., 2016). Procrastination negatively affects academic performance due to students' choice to delay their academic duties in favor of social media activity, which results in neglect of their studies (Durak, 2020). Procrastination might stem from a desire for immediate gratification when the ongoing activity is not considered rewarding.

Social media activity is also positively correlated with multitasking behavior (David et al., 2015; Durak, 2020). *Multitasking* refers to the process of attending different activities during the same temporal period: social media notifications evince an otherwise unsolicited need to begin interacting with the device, therefore splitting users' attention between the social media platform and the learning activity, thus creating a deficit of academic efficiency and consequences on individuals' psychological well-being (David et al., 2015).

2.1.4 Distraction consequences in a professional context

Social media distractions are a form of online interruption that can obstacle task completion in professional contexts (Zahmat Doost & Zhang, 2023). The high number of social media-generated distractions combined with the time necessary to re-engage with the abandoned task influence negatively the performance and mental workload (Zahmat Doost & Zhang, 2023). Furthermore, social media interruption during work is linked to higher levels of rumination, task anxiety, and social anxiety, further enhancing social media use and negatively affecting workers' well-being (Majid et al., 2020).

Social media distractions are linked with a lower level of job satisfaction and a higher level of stress, that negatively impact task performance (Zahmat Doost & Zhang, 2023). The interaction between distraction and task performance depends on the inherent nature of the task. From the least to most demanding in terms of cognitive behavior, tasks can either be resolved with acquired skills (skill-based), with a rule encoded in working memory (rule-based), or with problem-solving abilities requiring previous knowledge (knowledge-based), in a crescent cognitive demand (Zahmat Doost & Zhang, 2023).

Mental workload (MWL) refers to the amount of mental effort needed to complete a task. MWL is proportional to the cognitive requirement of the task (Zahmat Doost & Zhang, 2023). Furthermore, due to increased mental demand, a rise in MWL levels is linked to an alteration of physiological markers such as heart rate (Zahmat Doost & Zhang, 2023). As shown in Figure 2, when a task with a high cognitive workload is interrupted, it is perceived as more demanding.

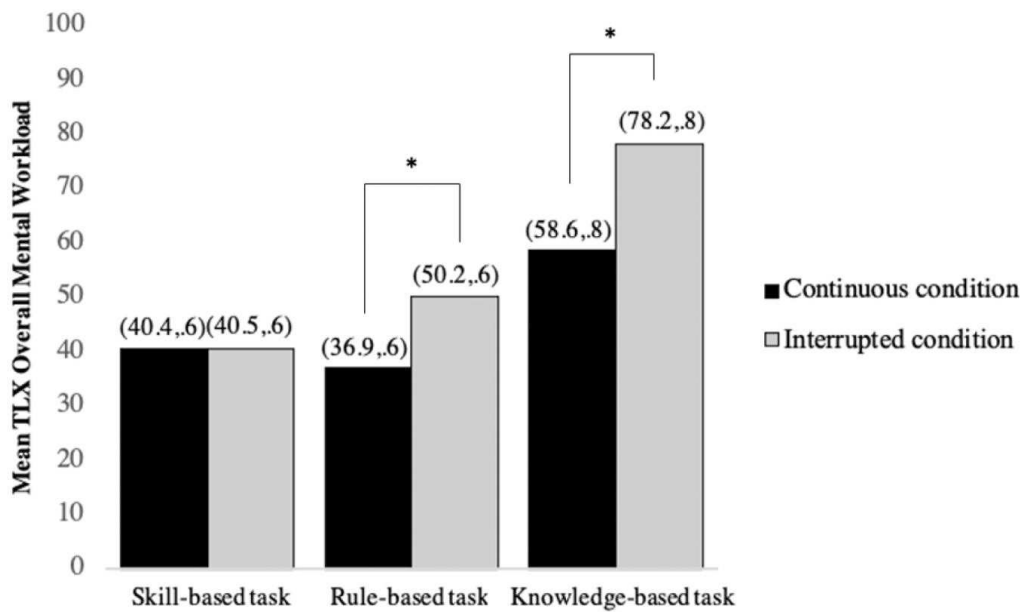


Figure 2. Effect of interruptions on the levels of mental workload during the three conditions: skill-based, rule-based, and knowledge based. *Source:* Zahmat Doost & Zhang (2023).

2.2 Long-term effect of social-media distraction

Individuals can determine how to react and handle social media distractions. There are three possible reactions to social media distraction: ignoring the distractor and continuing the task, interrupting the task at hand to check social media, or multitasking, switching their attention between the ongoing task and social media activity. The long-term implications vary with each situation.

When disregarding social media, individuals are utilizing self-control strategies to manage situational temptations and prevent social media-related distractions (Siebers et al., 2022). A set of pre-determined and self-imposed rules in place to prevent access and modifying device features to reduce distraction, like turning off the smartphone to avoid receiving notifications (Brevers & Turel, 2019).

When attending to the distractions and engaging with social media, the consequences that social media use will exert on future behavior are still unknown. An eye-tracking study supports the theory that social media's fast-paced content influences the fashion in which users process information during offline tasks, disrupting individuals' performance and ability to ignore distractions (Alloway & Alloway, 2012; Xie et al., 2021). Furthermore, it is hypothesized that excessive social media use is linked with brain anatomy alteration in the regions of the amygdala and the cingulate cortex, respectively responsible for impulsive behaviors and self-control, thus responsible for individuals' susceptibility to distractions (He et al., 2017). As shown in Figure 3, social media excessive use is linked to the pruning of the amygdala and an increase in grey matter volume (GMV) of the anterior and mid-cingulate cortex (He et al., 2017). While the amygdala, involved in generating impulsive behavior, shows a decrease of GMV also present in other behavioral addictions, the cingulate cortex alterations are unique to social media excessive use (He et al., 2017). Additionally, contrarily to substance addictions, there were no reported structural changes to the Nucleus Accubens (He et al., 2017).

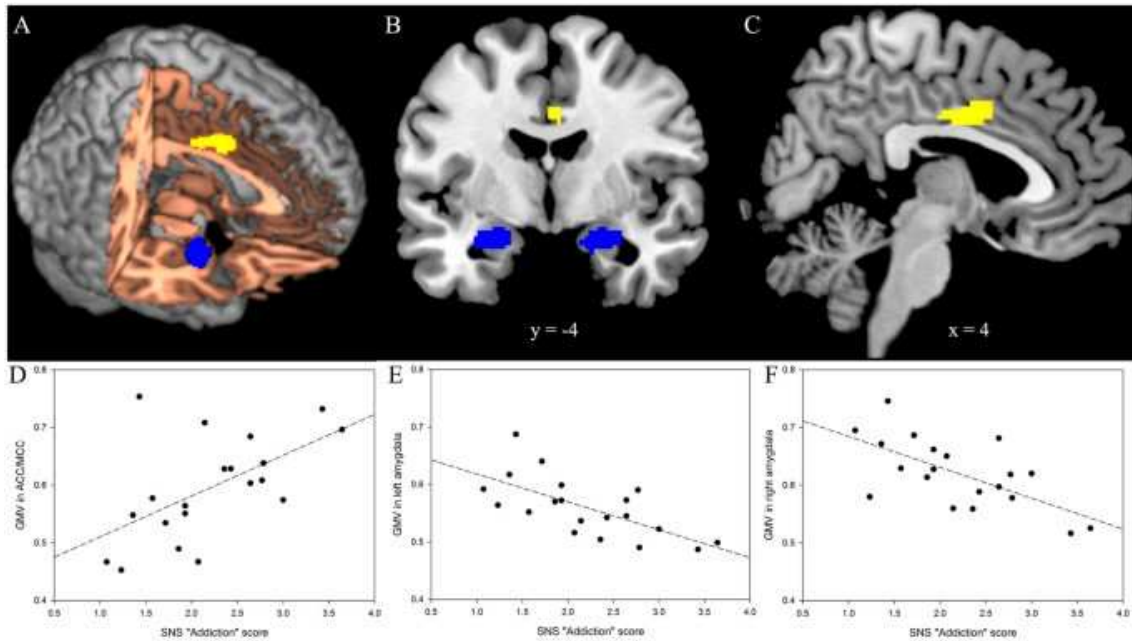


Figure 3. Three different views of the brain: rendered brain (A), coronal brain (B), and sagittal brain (C). The SNS addiction score was negatively correlated with GMV in bilateral amygdala (blue areas) and positively correlated with GMV in the anterior/mid cingulate cortex (yellow area). *Source:* He et al. (2017).

When multitasking, individuals process multiple streams of information by splitting their attention between different stimuli (Koessmeier & Büttner, 2021). Due to its nature of switching attention focus, multitasking is linked with distractibility (Moisala et al., 2016).

While multitasking, individuals might perceive an increased difficulty in differentiating between relevant and irrelevant stimuli, with a detrimental impact on performances (Moisala et al., 2016).

CHAPTER 3

3.1 Discussion and conclusions

Social media popularity is unquestioned. It is hardly a stretch to believe that social media impact users' life in ways of which we are still unaware. What is clear is that social media use is linked to distraction both in the immediate and sustained time frame. What is less clear is the extent to which social media distraction can modify individuals' cognitive processes and affect other aspects of daily life in the long term.

One limitation is that many studies thus far are based on correlation, which prohibits inferences of directionality between the variables and to understand the underlying cause-effect relation. Since social networks have gained popularity, many studies attempted to unveil the consequences of social media distraction; most of these studies employed surveys and are therefore subjected to the limitations of self-reporting measures.

What remains to be determined is the effects of extensive social media use in the long-term, the way brain plasticity accommodates this constant, fast-paced, stream of information. Will the next generations of digital natives develop different brain circuits arrangement to adapt to hyperconnectivity? Or will these new technologies be preferred over face-to-face interaction? Taken together, while further research is necessary to fully assess the complete range of impacts posed by social media, the utilization of eye-tracking and fMRI studies holds immense potential in distinguishing between causal effects and mere correlations.

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