



# Problematic Social Media Use and Impulsivity

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Accepted: 8 May 2023

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## Abstract

**Purpose of Review** In this article, we review and integrate the extant literature on problematic social media use (PSMU) and impulsivity. We present this literature organized by methodology, in which researchers used surveys or behavioral tasks to measure either general impulsivity or specific facets of impulsivity.

**Recent Findings** We found 17 publications overall which investigated the relationship between PSMU and some aspect of impulsivity across 21 studies. These studies generally demonstrate positive associations between PSMU and impulsivity, in that individuals with greater PSMU also demonstrate greater general impulsivity, or a facet of impulsivity (e.g., attentional impulsivity, impulsive choice, etc.). However, some aspects of impulsivity display mixed findings in relation to PSMU.

**Summary** Overall, PSMU is related to greater general impulsivity and certain facets of impulsivity. We also discuss limitations with the existing literature and potential future research investigating PSMU and impulsivity.

**Keywords** Attentional impulsivity · Motor impulsivity · Non-planning impulsivity · Decision making · Problematic social media use · Social media addiction

## Introduction

### Problematic Social Media Use

Almost five billion people worldwide use social media platforms like Facebook, Instagram, and TikTok [1]. The average user spends around 2.5 h daily on these platforms [1], observing and interacting with others in various ways. These interactions include behaviors such as sharing information (e.g., photos, text, videos) with one's online social network, providing/receiving social feedback on shared information (e.g., "likes," comments, reactions), sending/receiving network connection requests, and engaging in social comparisons with others. Many activities, such as receiving a "like," provide social rewards to users, reinforcing further use of these platforms [2]. In specific individuals, this rewarding and reinforcing aspect of social media can lead to excessive

and maladaptive use of these platforms, often referred to as problematic social media use (PSMU).

PSMU is defined as "being overly concerned about social media, to be driven by a strong motivation to log on to or use social media platforms and to devote so much time and effort to social media that it impairs other social activities, studies/job, interpersonal relationships, and/or psychological health and well-being" (p. 4054) [3]. In other words, PSMU differs from regular social media use, as users will continue to seek spontaneous and/or planned gratifications on these platforms despite impaired daily functioning and/or psychological distress. Similar to individuals with substance use disorders (SUDs), problematic social media users can display the following six symptoms: (a) preoccupation, which is constantly thinking and ruminating about social media, (b) mood modification, which is using these platforms to alter one's mood, (c) tolerance, which is needing to spend an increasing amount of time on these platforms to obtain rewards, (d) withdrawal, which is experiencing altered and unpleasant cognition and/or physical states during social media's absence, (e) conflict, which is experiencing adverse effects in other areas of life (work, relationships, etc.) due to social media use, and (f) relapse, which is the tendency to return to using these platforms after quitting) [4]. Important to note, however, PSMU is not currently

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included in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [5] and its potential to be termed an “addiction” is under debate in the literature [6]. Therefore, we use the term “problematic” to describe this maladaptive social media use. At the same time, other researchers utilize terms such as social media addiction or social media use disorder to describe this phenomenon. Regarding prevalence, a recent meta-analysis with 34,798 respondents across 32 countries revealed that around 5% of social media users experience PSMU [7]. Other meta-analyses have demonstrated consistent associations between PSMU and poor mental health, such as reduced well-being and self-esteem [8], and increased psychological distress, depression, and anxiety [9].

Researchers have created a variety of scales to assess PSMU. We briefly mention them here because this background is helpful for understanding the literature on PSMU and impulsivity. Several prevalent scales include: (a) the Bergen Social Media Addiction Scale (BSMAS) [10], (b) the Internet Addiction Test specified for social networking (IAT-SNS) [11], (c) the Social Media Disorder Scale [12], (d) the Mobile Social Media Dependence Questionnaire [13], (e) the Social Media Addiction Scale [14], and (f) the Excessive Use Scale [15]. The BSMAS directly assesses the six PSMU symptoms mentioned above, while the other scales may not capture all these symptoms, or they may capture these symptoms and more. For example, the IAT-SNS assesses loss of control/time management, emotional and relational conflict, craving/social problems, and preference for online relationships [16], whereas the Social Media Disorder Scale, assesses preoccupation, tolerance, withdrawal, persistence, displacement, problems, deception, escape, and conflict. Furthermore, some researchers have adapted scales of smartphone use to assess PSMU by replacing the word “smartphone” with “social media” (e.g., Smartphone Addiction Scale). The Smartphone Addiction Scale assesses daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented friendship, overuse, and tolerance, and this scale correlates with substance use disorders and diagnoses [17]. In addition to these measures, researchers have assessed platform-specific PSMU by asking questions about a particular platform (e.g., Facebook Intrusion Questionnaire) [18]. Of all these PSMU measurements, the BSMAS is thought to be the most commonly used scale [7, 19]. In addition, the BSMAS has been clinically validated with a Chinese sample of 252 individuals, establishing a diagnostic cutoff score of 24 (out of 30) to differentiate individuals with PSMU from regular social media users [20].

Researchers have also conducted initial neuroimaging research to better understand PSMU. This research has revealed the involvement of brain’s reward system (e.g., striatum and amygdala). For example, these regions are smaller in individuals with greater PSMU [21], similar to

individuals with SUDs [22, 23]. These brain regions are crucial for decision-making, and it is well established that individuals with SUDs exhibit aberrant decision-making and greater impulsivity [24–26]. Indeed, extensive research has explored the connection between SUDs and impulsivity. However, research into the relationship between PSMU and impulsivity is only in its infancy.

## Impulsivity

Impulsivity is “a predisposition towards rapid, unplanned reactions to internal and external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others” (p.1784) [27]. In other words, impulsivity is generally associated with a lack of planning, hasty decision-making, and a failure to inhibit actions likely to result in repercussions. Historically, impulsivity is often represented in personality models, with many researchers viewing it as a trait variable that is stable within an individual and varies across the population [28•].

Researchers have created a variety of surveys that capture impulsivity as a unified or multifaceted construct [27, 29, 30]. Survey measurements of impulsivity include: (a) the Barratt Impulsiveness Scale (BIS), which assesses attentional, motor, and non-planning facets of impulsivity [31], (b) the UPPS Impulsive Behavior Scale, which assesses positive urgency, negative urgency, lack of premeditation, lack of perseverance, and sensation seeking facets of impulsivity [32], (c) Eysenck’s Impulsiveness-Venturesomeness-Empathy Inventory [33], and (d) the Brief Self-Control Scale [34]. These scales assess general impulsivity, and the BIS and UPPS are often divided into the specific facets as mentioned above. These survey measures have been quite useful, although they require introspection and self-report by respondents. Conversely, behavioral measures of impulsivity (e.g., behavioral tasks) can skip this self-report aspect of surveys and directly assess the behavioral manifestation of impulsivity.

Researchers have developed various behavioral tasks to capture impulsivity, and Stevens and colleagues [28•] have categorized these tasks into ones that capture “**impulsive action**” or “**impulsive choice**.” Impulsive action can be defined as an inability to suppress inappropriate actions and can be broken down into two aspects: motor inhibition (e.g., the suppression of an automatic, prepotent, behavioral response) [35] and cognitive inhibition (e.g., the suppression of competing or distracting stimuli) [36]. Motor inhibition paradigms include tasks, such as the Go/No-Go Task, the Stop Signal Task, and the GoStop Task, and cognitive inhibition paradigms include tasks, such as the Stroop Task. In comparison, impulsive choice involves value-based decisions and can be defined as a preference for immediate rewards over long-term outcomes. Impulsive choice tasks

include temporal discounting paradigms, such as the Delay Discounting Task, and risky decision-making paradigms, such as the Iowa Gambling Task and the Balloon Analogue Risk Task.

The above-described surveys and tasks have only recently been used to investigate the relationship between impulsivity and PSMU. Researchers have theorized this relationship because individuals with PSMU continue to use social media platforms despite experiencing impaired daily functioning and/or psychological distress. This aberrant decision making is similar to what is observed with individuals with SUDs. As mentioned, there are also similarities between PSMU and SUDs with respect to the underlying symptomology and neuroscience. With this in mind, researchers have begun to investigate PSMU with respect to impulsivity. It could be that there is an association between these two constructs. Furthermore, regarding causality, it could be that individuals with PSMU develop greater impulsivity as a result of their social media use, or it could be that individuals who are already highly impulsive seek out and use social media sites in a more maladaptive way. In addition, PSMU and impulsivity could have a bidirectional, mutually reciprocal, relationship. This review aims to highlight and discuss this extant literature, providing readers with a structured overview of the field. To organize this review, we separate research by methodology, dividing sections into survey measures (general impulsivity and specific facets of impulsivity) and task measures (impulsive action and impulsive choice). We then end our review with a brief discussion of limitations in the field and directions for future research.

## PSMU and Survey Measures of Impulsivity

### General Impulsivity

In this section, we synthesize relationships between PSMU and a general, unidimensional construct of impulsivity. To date, three studies have assessed the relationship between PSMU and a survey measure of general impulsivity. Overall, this research demonstrates a positive relationship between PSMU and general impulsivity, in that individuals with greater PSMU also display greater impulsivity. For example, Wu and colleagues assessed PSMU with the IAT-SNS and related it to Eysenck's Impulsiveness Inventory of general impulsivity in a gender-balanced sample of 277 young adults [37•]. These researchers took two approaches towards analysis, assessing PSMU as both a continuous and categorical variable. When analyzed as a continuous variable, greater PSMU was related to greater impulsivity. To categorize participants, these researchers dichotomized PSMU scores to distinguish between non-problematic social media users (scores  $\leq 49$  out of 100) and problematic social media

users (scores  $\geq 50$ ), and 12% of this sample was classified as problematic users. When analyzed in this way, problematic users reported significantly greater impulsivity than non-problematic users.

The two other studies that also examined PSMU and general impulsivity only analyzed PSMU as a continuous variable, avoiding a cutoff threshold. Cudo and colleagues focused on the problematic use of Facebook with the Facebook Intrusion questionnaire in 234 predominantly female (91.5%) young adults and related this scale to general impulsivity as captured by the Brief Self-Control Scale [38]. In this study, greater problematic use of Facebook was associated with greater impulsivity. In another study, Sindermann and colleagues investigated the problematic use of three platforms (Facebook, Instagram, and Whatsapp) in 494 predominantly male young adults [39]. These researchers used the modified Smartphone Addiction Scale to capture PSMU and the BIS (without division by facet) to capture general impulsivity. Here, greater problematic use of each platform was related to greater general impulsivity.

In total, all three studies established positive relationships between PSMU and general impulsivity measures. These relationships held across three different measures of PSMU and three different measures of impulsivity. In addition, whether analyzed as both a continuous and categorical variable, greater PSMU is associated with greater general impulsivity.

### Facets of Impulsivity

As mentioned above, various surveys, such as the UPPS and BIS, have been developed to capture specific facets of impulsivity. To the best of our knowledge, only one study has examined relationships between PSMU and facets of the UPPS. Using the short version of the UPPS, Rothen and colleagues investigated problematic Facebook use, as measured by a modified version of the IAT-SNS, in a sample of 676 middle-aged, predominantly female adults ranging from 18 to 80 years of age [40]. These researchers revealed a positive association between problematic Facebook use and three impulsivity facets: negative urgency (rash actions after experiencing negative emotions), positive urgency (rash actions after experiencing positive emotions), and lack of perseverance (inability to maintain a behavior or goal). Other studies on specific facets of impulsivity have capitalized on the BIS to capture attentional, motor, and non-planning impulsivity. In the following, we review the five studies which took this approach to investigate PSMU.

### Attentional Impulsivity

Attentional impulsivity is defined as an inability to focus attention or concentrate on tasks at hand [31]. Concerning

social media use, manifestations of attentional impulsivity may look like repeatedly directing one's attention to social media sites (despite other tasks or responsibilities), "doom scrolling" (e.g., spending a long time mindlessly scrolling through social media sites), or constant rumination about social media.

The studies investigating PSMU and attentional impulsivity took various methodological approaches. Two studies employed the short version of the IAT-SNS to assess PSMU in relation to attentional impulsivity on the BIS. For example, Müller and colleagues collected data from 290 predominately female, university students and categorized participants according to their PSMU scores, specifying a "PSMU" group ( $> 1$  SD above the mean on IAT-SNS) and a "non-PSMU" group ( $< 1$  SD below the mean on IAT-SNS) [41•]. When the researchers compared these two groups with respect to attentional impulsivity, the PSMU group displayed significantly greater attentional impulsivity compared to the non-PSMU group. A second study by Wegmann and colleagues employed the same short version of both the IAT-SNS and BIS in a gender-balanced sample of 112 adults between 17 and 53 years of age [42••]. These researchers did not categorize participants according to PSMU scores and analyzed PSMU as a continuous variable. Here, greater PSMU scores were associated with greater attentional impulsivity.

The three other studies utilized a variety of other PSMU measurements to assess the relationship with attentional impulsivity. Tutal and colleagues collected data from 178 Turkish adults between 18 and 65 years of age, using the Social Media Addiction Scale as their measure of PSMU and the BIS measure of impulsivity [43]. These researchers divided PSMU into virtual tolerance and virtual communication, and both dimensions of PSMU positively correlated with greater attentional impulsivity. However, when explored through separate regressions with mental health symptoms (e.g., anxiety, depression) as covariates, neither dimension of PSMU was related to attentional impulsivity. To note, while some items of the virtual communication and virtual tolerance dimensions are conceptually related with PSMU symptoms, such as tolerance ("I am eager to go on social media") and conflict ("Even when my family frowns upon, I cannot give up using social media"), these dimensions do not completely overlap with typical addiction symptomology outlined by Griffiths [4••]. Another study conducted by He and Yang collected data from a Chinese population of 767 predominately female undergraduate students and assessed PSMU with the Mobile Social Media Dependence Questionnaire [44]. This study revealed a positive association between PSMU and attentional impulsivity as measured by the BIS. For the last study, Guo and colleagues collected data from a gender-balanced sample of 325 Chinese adults to investigate relationship between PSMU,

as assessed by the BSMAS, and attentional impulsivity, as assessed by the BIS [45]. These researchers conducted a network analysis wherein each item of BSMAS (depicting the six PSMU symptoms) and each facet of BIS (attentional, motor, and non-planning) were treated as separate, distinct "nodes," connected through "edges," representing partial correlations between these nodes. This analysis revealed that no single PSMU symptom was significantly related with attentional impulsivity.

In total, four out of five studies demonstrated significant relationships between PSMU and attentional impulsivity as measured by the BIS. However, the study which analyzed virtual tolerance and virtual communication dimensions of the social media addiction scale only demonstrated significant findings in their correlation analyses [43]. These results did not remain significant after controlling for mental health variables as covariates in a regression. In addition, one study employing a network analysis approach did not demonstrate any significant relationships [45].

### Motor Impulsivity

Motor impulsivity is defined as action without thinking, and individuals with greater motor impulsivity often have difficulty inhibiting behavioral responses [27]. Concerning social media use, manifestations of motor impulsivity may look like checking social media unconsciously or automatically, excessive/binge posting, greater susceptibility to purchasing in-app features, or clicking on advertisements.

The same five studies described in detail above, in the attentional impulsivity section, also assessed the relationship between PSMU and motor impulsivity through the use of the BIS. The two studies utilizing the short version of both the IAT-SNS, and BIS found no relationship between PSMU and motor impulsivity [41•, 42••]. However, the three studies which used other measurements of PSMU demonstrated positive relationships. Tutal and colleagues, who divided PSMU into virtual tolerance and virtual communication, demonstrated a significant relationship between virtual communication and motor impulsivity in both their correlation analysis and a regression model with mental health symptoms as covariates [43]. In addition, the study conducted by He and Yang demonstrated positive correlations between the Mobile Social Media Dependence Questionnaire measure of PSMU and the BIS measure of motor impulsivity [44]. Finally, in the network analysis study by Guo and colleagues, two symptoms of PSMU (mood modification and relapse on the BSMAS) had more robust, significant connections with BIS motor impulsivity than any other symptom or impulsivity facet [45].

In total, three out of five studies, which vary in measurement and methodological differences, demonstrated significant relationships between PSMU and motor impulsivity.



However, two studies, which employed the short IAT-SNS measure of PSMU, did not reveal a relationship with motor impulsivity.

### Non-Planning Impulsivity

Non-planning impulsivity occurs when an individual orients their thinking towards the present moment without regard for future consequences [27]. Concerning social media use, manifestations of non-planning impulsivity may look like posting risky content or seeking out short-term rewards, such as likes and positive comments, at the expense of developing more sustained relationships.

Research on PSMU and non-planning impulsivity presents mixed findings across the same five studies discussed above. The two studies utilizing the short version of both the IAT-SNS and BIS [41•, 42••] revealed no significant relationships between PSMU and non-planning impulsivity. However, He and Yang demonstrated that greater PSMU on the Mobile Social Media Dependence Questionnaire was related to greater non-planning impulsivity on the BIS [44]. Tatal and colleagues also established positive relationships between the virtual tolerance dimension of PSMU and non-planning impulsivity, across both correlations and regression model with mental health symptoms as covariates [43]. Finally, the study that employed a network analysis between individual BSMAS symptoms and all BIS facets did not reveal any significant connections between PSMU and non-planning impulsivity [45].

Therefore, two out of five studies demonstrated significant relationships between PSMU and non-planning impulsivity. To note, both studies that demonstrated positive associations were the only study to use their specific questionnaire of PSMU.

## PSMU and Task Measures of Impulsivity

### Impulsive Action

Impulsive action can be defined as an inability to suppress inappropriate actions and can be broken down into two aspects: motor inhibition (e.g., failure to inhibit a behavioral response) or cognitive inhibition (e.g., failure to inhibit competing stimuli) [28•]. Concerning social media use, manifestations of impulsive action may look similar to motor impulsivity behaviors described above, such as automatically checking social media, excessive/binge posting, greater susceptibility to purchasing in-app features, or clicking on advertisements. Impulsive action tasks include ones that assess the motor inhibition dimension (e.g., Go/No-Go Task and Stop Signal Task) and ones that assess the cognitive dimension (e.g., Stroop Task) [28•]. To the best of our

knowledge, researchers have used these tasks to investigate PSMU and impulsive action in eight studies.

### Motor Inhibition

We believe that five studies have investigated the motor inhibition dimension of impulsive action. Two of these studies collected neuroimaging data during task performance, hence their relatively smaller sample sizes. In the first, Turel and colleagues assessed problematic Facebook use with the Facebook Addiction Scale and a visual Go/No-Go Task in a gender-balanced sample of 45 university students [46]. These researchers used a Facebook-specific Go/No-Go Task with Facebook-related (e.g., Facebook logo) and neutral (e.g., traffic signs) stimuli. In one condition, the neutral images appeared for the Go trials, whereas the Facebook-related images appeared for the No-Go trials, and in the second condition, these associations were reversed. In this study, there were no significant relationships between problematic Facebook use and any behavioral performance on the Go/No-Go Task (e.g., reaction times, accuracy). In the second study, Gao and colleagues collected data from a gender-balanced sample of 43 Chinese students [47]. These researchers assessed PSMU with the Excessive Use Scale and categorized participants into a “PSMU” group (scores > 1.96 SD above mean) and a “non-PSMU” group (scores < 1.96 SD below mean). Similar to the above study, these researchers used social media-related and neutral images in a Go/No-Go Task. The PSMU group did not perform significantly differently in the task in comparison to the non-PSMU group.

Three other studies also analyzed relationships between PSMU and motor inhibition. Chung and colleagues collected data from a gender-balanced sample of 128 Malaysian young adults to assess relationships between PSMU, with the BSMAS, and performance on the visual Go/Stop Impulsivity Task [48]. Similar to the above two studies, PSMU was not significantly related to the motor inhibition dimension of impulsive action in the task. Next, the study by Wegmann and colleagues, which was described above in the three BIS impulsivity facets sections, investigated PSMU, with the short IAT-SNS, and motor inhibition, with an auditory Go/No-Go Task [42••]. These researchers created a social-media-specific Go/No-Go Task, with both social media related (e.g., WhatsApp message sound) and neutral (e.g., bike bell) stimuli. Again, this study showed no direct association between PSMU and the motor inhibition dimension of impulsive action. However, there was a significant interaction between PSMU, task performance, and attentional impulsivity. Specifically, participants who reported greater PSMU also displayed poorer task performance (lower accuracy), but only if paired with high attentional impulsivity.

In the last and most recent study on PSMU and motor inhibition, Reed collected online data from a gender-balanced sample of 347 UK young adults to explore relationships between the BSMAS and a visual Go/No-Go task [49]. Again, this task presented social media-related logos (e.g., Facebook, Instagram) and non-social media-related logos (e.g., McDonalds, Starbucks) as stimuli. The social media platform logos were stimuli for the go trials; scrambled social media logos were stimuli for the no-go trials, and the non-social logos were stimuli for the neutral trials. This researcher first analyzed PSMU as a continuous variable and revealed a positive association with task performance, with greater PSMU related to a greater number of errors on no-go trials. Participants were then grouped into a “PSMU” and “non-PSMU” group according to a cutoff score of 24 (out of 30), with 57 of the 347 individuals falling into the PSMU group. Individuals in the PSMU group made significantly more errors than the non-PSMU group on no-go trials (with scrambled social media logos), and this difference was not evident for neutral trials (with non-social media logos).

In total, four out of five studies revealed no direct relationships between PSMU and the motor inhibition dimension of impulsive action. Only one study found significant differences between a PSMU group and a non-PSMU group on an impulsive action task and this study was the only to have participants perform the task online rather than in-person [49].

### Cognitive Inhibition

To the best of our knowledge, three studies have investigated the cognitive inhibition dimension of impulsive action. The study by Wegmann and colleagues, described above, compared PSMU with the IAT-SNS and the color-word Stroop Task. This study revealed no relationship between PSMU and any measure of Stroop performance [42••]. A separate study by Zhao and colleagues investigated PSMU with the Stroop Task, in a sample of 60 Chinese students [50]. These researchers categorized participants according to their PSMU on the BSMAS, with a cutoff score of 24, with an equal number of participants in the PSMU and non-PSMU groups. Unlike the previous study, these researchers employed the emotional Stroop Task, and participants were presented with either sad or neutral faces as stimuli. Regardless, they did not find a significant difference between the PSMU and the non-PSMU group with respect to task performance.

In the last and most recent study on PSMU and cognitive inhibition, Reed collected data from a gender-balanced sample of 378 UK adults to explore the relationship between PSMU and the color-word Stroop Task [49]. This study was published together with the motor inhibition study by Reed described above. Again, in this experiment, participants were

grouped into a “PSMU” and “non-PSMU” group according to a cutoff score of 24, with 37 of the 378 individuals falling into the PSMU group. Of note, only one individual in the PSMU group was male. In this study, the author analyzed PSMU as a continuous variable and with respect to differences between the PSMU and non-PSMU group. Neither of these analyses revealed significant associations between PSMU and performance in the Stroop Task [49].

In total, all three studies revealed no direct relationships between PSMU and cognitive inhibition. This pattern held across various demographics and Stroop Task variations. Overall, as currently assessed, the cognitive inhibition dimension of impulsive action does not appear to be related to PSMU.

### Impulsive Choice

Impulsive choice involves a preference for immediate rewards while disregarding (potentially negative) long-term consequences of one’s decisions [28•]. Concerning social media use, manifestations of impulsive choice may look like posting riskier content for immediate social rewards (e.g., “likes”) at the expense of delayed consequences (e.g., reputation damage). Impulsive choice tasks include the Delay Discounting Task, the Balloon Analogue Risk Task, and the Iowa Gambling Task. To the best of our knowledge, researchers have used these tasks to investigate PSMU and impulsive choice in seven studies.

One study explored the relationship between PSMU and impulsive choice with the Delay Discounting Task [51•]. Delaney and colleagues collected data from a gender-balanced sample of 75 university students and explored the relationship between scores on the Bergen Facebook Addiction Scale and performance in the Delay Discounting Task. These researchers divided participants into three levels of problematic Facebook use (low, moderate, and high) by assessing the top, middle, and bottom thirds of the sample’s survey score. Results indicated significant relationships between problematic Facebook use and delay discounting values (*k*-value and area under the curve), with greater problematic Facebook use related with greater impulsive choice.

Another publication investigated the relationship between PSMU and impulsive choice with the Balloon Analogue Risk Task across three studies [52]. Meshi and colleagues compared PSMU, as captured by the BSMAS, with performance on this task in three separate experiments with undergraduate students. These researchers analyzed BSMAS scores as a continuous variable, and taken together, these three studies demonstrated no relationship between PSMU and risky, impulsive decision making, unless an individual receives negative feedback and then encounters a situation with less actual risk (applying the risk from one situation to another). If this situation occurs,

a negative relationship was observed, in that individuals with greater PSMU display less impulsivity and a reduced propensity for risk-taking.

Three other studies explored relationships between PSMU and impulsive choice with the Iowa Gambling Task. In the first, Meshi and colleagues collected data from a gender-balanced sample of 71 German university students, and they assessed PSMU as a continuous variable with the Bergen Facebook Addiction Scale [53•]. Here, PSMU correlated with task performance, indicating that individuals with greater problematic Facebook use made more impulsive, risky decisions.

Next, Reed investigated relationships between PSMU and the Iowa Gambling Task across two separate studies in one publication [49]. In one study, this researcher collected online data from a gender-balanced sample of 378 UK adults, in the same sample described above for the Stroop Task. The results demonstrated a relationship between PSMU (when analyzed as a continuous variable) and performance on the Iowa Gambling Task, which was replicated when participants were categorized by degree of PSMU, using a cutoff score of 24. When participants were split into a PSMU and non-PSMU group, the PSMU group displayed more impulsive, risky decisions than the non-PSMU group. These findings replicate the relationships demonstrated in the previous Iowa Gambling Task study by Meshi and colleagues [53•].

In the second study, with a different sample of participants, Reed collected data from 160 predominately female, young adults, to compare performance of the Iowa Gambling Task before and after social media exposure [49]. In this experiment, participants were exposed to either 10 min on social media or 10 min reading a book of their choice in a laboratory setting. Four participant groups were created, according to PSMU, again with a cutoff of 24 on the BSMAS (PSMU vs. non-PSMU) and social media exposure (exposed vs. non-exposed). These yielded only 20 participants in the exposed PSMU group, 20 participants in the non-exposed PSMU group, 59 participants in the exposed, non-PSMU group, and 61 in the non-exposed, non-PSMU group. When comparing task performance between these four groups, the exposed PSMU group participants demonstrated greater impulsivity in the Iowa Gambling Task in comparison to the exposed non-PSMU and/or non-exposed groups.

In total, seven studies investigated the relationship between PSMU and impulsive choice across three tasks and a variety of demographics. Significant positive relationships were revealed in studies that used the Delay Discounting Task and Iowa Gambling Task. Whereas, studies that used the Balloon Analogue Risk Task revealed either no relationship between PSMU and impulsive choice or reduced impulsive choice specifically when an individual receives

negative feedback on a decision and then encounters a situation with less actual risk.

## Conclusions and Future Directions

Social media provide online platforms to interact with others and obtain social rewards, but these social rewards can reinforce use, leading to PSMU. Individuals with PSMU experience similar symptoms as individuals with SUDs, and importantly, individuals with PSMU continue to engage with social media platforms despite impaired daily functioning and/or psychological distress. This would lead one to expect that individuals who display PSMU also display greater impulsivity. Indeed, researchers have published 17 papers consisting of 21 experiments that examined the relationship between PSMU and impulsivity.

The extant research with survey measures demonstrates positive relationships between PSMU and general impulsivity. Regarding specific facets of impulsivity, greater PSMU appears to be related to greater negative urgency, positive urgency, and lack of perseverance facets of the UPPS scale of impulsivity. In regard to the BIS scale of impulsivity, each subscale displays varying relationships with PSMU. A direct positive relationship was observed between PSMU with attentional impulsivity (4 out of 5 studies), motor impulsivity (3 out of 5 studies), and non-planning impulsivity (2 out of 5 studies). For survey measurements, it appears that a strong relationship exists between PSMU and attentional impulsivity. However, a future meta-analysis can better discern the strength of these relationships between PSMU and the BIS facets of impulsivity.

For task measures of impulsivity, the current literature on PSMU can be divided into studies which investigated impulsive action and those which investigated impulsive choice. Regarding impulsive action, seven out eight studies reported no significant links to PSMU. Furthermore, impulsive action can be subdivided into motor inhibition, where four out of five studies found no relationships with PSMU, and cognitive inhibition, where all three studies found no relationship with PSMU. Therefore, it appears that no relationship exists between PSMU and impulsive action; although, a future meta-analysis would be able to better establish this speculation. Also of note, multiple impulsive action studies replaced traditional neutral stimuli with social-media specific stimuli (e.g., Go/No-Go task). Most of these studies did not reveal relationships with respect to these stimuli. It could be theorized that social-media specific stimuli may have a more substantial effect on individuals with PSMU due to the increased importance and saliency of these stimuli; however, this was not strongly supported by the research. Researchers investigating PSMU and impulsivity in the future may want to consider the nature of their stimuli as they proceed.

Regarding impulsive choice, all four studies that used either the Delay Discounting Task or the Iowa Gambling Task revealed a relationship with PSMU. Specifically, greater PSMU was related to greater impulsive choice. That said, three experiments were conducted with the Balloon Analogue Risk Task, revealing that greater PSMU was not associated with impulsive decisions, unless after receiving negative feedback. Overall, future research needs to be done to tease apart the differences observed between these different tasks.

We now briefly turn to discussing the limitations of the above-described studies and the future studies that can address them. First, all of the reviewed studies are cross-sectional in nature. Currently, no research has attempted to address causality in the relationship between PSMU and impulsivity in any of the observed relationships. For example, it could be that individuals who already display high trait impulsivity are more likely to develop PSMU. However, it could also be that excessive and problematic use of social media platforms, themselves, cause individuals to develop impulsive tendencies. Specific features of these platforms may encourage these impulsive tendencies. For example, social media platforms can provide users with immediate, virtual social rewards (e.g., likes), and in a quick attempt to gain more of these rewards, users may post content without thinking of the consequences of their actions. In addition, some social media platforms provide the opportunity for anonymous communication. This anonymity may create a sense of detachment from the outcome of one's actions, which could further encourage impulsive behavior. Future studies could address this causal link in the above-mentioned relationships through a longitudinal research design.

Next, the majority of reviewed studies either focused on overall PSMU or a single platform (usually Facebook). Only one study investigated relationships between impulsivity and more than one platform (Facebook, Instagram, and Snapchat) [39]. It could be that impulsivity is related to the problematic use of a single platform and not others, as platforms offer different features and user experiences. Therefore, this relationship might be overlooked or “washed out” when assessing general PSMU. To address this, future research could expand the scope of the extant literature, investigating specific platforms.

Finally, the current literature has greatly focused on a particular demographic—young adults—and therefore, the relationship between PSMU and impulsivity may differ depending on age groups. Importantly, adolescents may pose a greater risk of PSMU due to a greater prevalence of social media use while starting at a younger age. For example, one Pew Research report indicates that one-in-five adolescents uses a social media platform “almost constantly,” and 54% of adolescents on social media report that these platforms

would be difficult to give up [54]. We look forward to future research on impulsivity with younger, adolescent samples.

In sum, relationships between greater PSMU appear to be more consistently related with greater general impulsivity, attentional impulsivity, and impulsive choice. Relationships with motor impulsivity, non-planning impulsivity, and impulsive actions have been demonstrated to be less consistent or almost absent. We look forward to future research on the topic, as importantly, identifying which aspects of impulsivity are related to PSMU may yield feasible points of intervention for clinicians treating individuals with PSMU.

## Declarations

**Conflict of Interest** The authors declare no competing interests.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

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