



Problematic use of five different social networking sites is associated with depressive symptoms and loneliness

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Accepted: 21 March 2024

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Abstract

Social media users often engage with more than one platform, spending almost three hours per day on these sites. These platforms provide social rewards to individuals, reinforcing their use. Importantly, due to this inherently reinforcing nature, some individuals may develop problematic social media use (PSMU), where they continue to use social media despite experiencing negative consequences such as psychological distress and/or impaired daily functioning. Researchers have found that PSMU is associated with worsened mental health. However, current research has primarily investigated these relationships across all platforms broadly, or with respect to only a single platform (usually Facebook). No research has investigated these relationships with respect to multiple, distinct, social media platforms, and only limited research has investigated mental health in relation to the problematic use of Twitter and Snapchat, in particular. To address this, we conducted a survey to assess PSMU of five different social media platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter), as well as two measures of mental health (depression and loneliness). Linear regression models revealed that greater problematic use of all five platforms is related with greater depression and loneliness. In other words, the greater one's problematic use of each platform, the poorer their mental health. We discuss our results, along with limitations and future directions for research on the role of PSMU in mental health.

Keywords Social media addiction · Social networking addiction · Mental health · Depression · Social isolation · Loneliness

Introduction

In the United States alone, over 300 million users engage with popular social media platforms such as Facebook, Instagram, Snapchat, TikTok, and Twitter (Statista, 2022). Platforms such as TikTok in particular are rapidly increasing in prevalence, now boasting over 150 million users (TikTok, 2023). Similarly, Instagram and Facebook remain two of the top social media platforms, with over 70 million and

45 million downloads, respectively, in 2022 (Statista, 2022). These social media platforms provide users with the ability to connect and interact with others, and these features provide social rewards to users (Meshi et al., 2015). Importantly, the strong drive to obtain these social rewards can lead to problematic social media use (PSMU), a maladaptive form of social media use. PSMU differs from regular social media use due to the inability for individuals to effectively control their use despite experiencing negative consequences, such as psychological distress and/or impaired daily functioning (Andreassen et al., 2014; Bányai et al., 2017). Symptoms of PSMU mirror those of substance use disorders, including: mood modification, salience, tolerance, withdrawal symptoms, conflict, and relapse (Griffiths et al., 2014; Kuss & Griffiths, 2011). It is important to note, however, PSMU is not currently included in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, 2013) and its potential to be termed an “addiction” is under debate in the literature (Carbonell & Panova, 2017). Therefore, we use the term “problematic” to describe

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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. A meta-analysis of over 34,000 participants across 32 nations revealed that around 5% of young adults worldwide display PSMU (Cheng et al., 2021). With this prevalence in mind, researchers have aimed to better understand PSMU, especially its links with mental health.

One-in-five individuals in the United States live with a mental illness, with the highest prevalence reported in adults between 18 and 25 years (Merikangas et al., 2010). Therefore, research on mental health and its possible relationship to PSMU is of paramount importance in this demographic. Indeed, a large body of work supports a relationship between PSMU and poor mental health – when investigating overall PSMU, and with respect to the problematic use of a specific platform, a meta-analysis of 133 independent studies revealed that greater PSMU is linked with greater depression, loneliness, and reduced overall psychological well-being (Huang, 2020). When investigating individual platforms, studies have revealed detrimental relationships between PSMU and various facets of mental health. For example, individuals who report greater problematic Facebook use also report greater depression (Brailovskaia & Margraf, 2022; Hong et al., 2014; Koc & Gulyagci, 2013), greater loneliness (Atroszko et al., 2018; Biolcati et al., 2018), greater psychological distress, and reduced well-being (Marino et al., 2018). Individuals who report greater problematic Instagram use also display similar relationships with greater depression and loneliness (Ahmed & Dixon, 2023; Forough et al., 2021; Moretta & Buodo, 2020; Pon-nusamy et al., 2020; Yurdagül et al., 2019). Extant literature also demonstrates that individuals with greater problematic use of TikTok report greater depression, anxiety, stress, and loneliness (Sha & Dong, 2021; Smith, 2023). In addition, greater depression and social anxiety serve as predictors of a greater severity of problematic TikTok use (Yao et al., 2023).

While research on the relationships between problematic use of some platforms (primarily Facebook, Instagram, and TikTok) and mental health has been more extensive, research on other platforms has been less common, especially with respect to Twitter and Snapchat. Despite the popularity of Twitter and Snapchat (Statista, 2022), there is still little research on the problematic use of these particular platforms, especially in regard to mental health. Unlike research on Facebook, Instagram, and TikTok, one study on problematic Twitter use did not reveal significant relationships with depression or anxiety (Laconi et al., 2018). To the best of our knowledge, no study has specifically investigated links between problematic Snapchat use and mental health. Therefore, there is limited knowledge on how these

relationships between PSMU and mental health may vary for these platforms. In addition, while a large amount of literature establishes links between overall PSMU and poor mental health, less research has looked at the problematic use of multiple, distinct, platforms in a single study. Rather, current literature primarily focuses on problematic use in general (agnostic to platform) or problematic use of only a single platform in a study (usually Facebook or Instagram). Our understanding of social media and mental health would greatly benefit to discover platform differences in these relationships (e.g., if only select platforms are linked with poor mental health), as researchers and clinicians could provide more tailored recommendations to individuals suffering from consequences of either PSMU or mental health. Previous research on PSMU and other constructs has investigated problematic use of multiple, distinct, platforms to find relationships specific to platforms, for example in regard to trait social comparisons (Lewin et al., 2022) and social reward preferences (Meshi et al., 2020). With this in mind, we conducted an online survey to explore relationships between the problematic use of five different social media platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter) and two primary mental health constructs (depression and loneliness) in young adults. To the best of our knowledge, no other study has collectively examined the problematic use of these popular social media platforms in a single survey with the aim of comparing and contrasting their relationships to mental health.

Method

Participants

Participants were students recruited through an online undergraduate pool at a large Midwestern U.S. university and received course credit for participation. All eligible participants used at least one social media platform (Facebook, Instagram, Snapchat, TikTok, or Twitter). Our final sample size included 601 participants (female = 395, 65.7%; male = 206, 34.3%), after excluding 15 cases for the following reasons: two participants entered a nonsensical text value for a question (e.g., ‘1’ for age); three participants failed a survey attention check (see below); and 10 participants self-identified as “other” for a demographic question (e.g., gender, race) so we excluded them due to the inability to statistically account for such a small number. Participants ranged from 18 to 32 years of age ($M = 20.0$, $SD = 1.6$) and used an average of 4.33 ($SD = 0.98$) of the five social media platforms that we assessed. Racial and ethnic identities included 391 (65.1%) White, 43 (7.2%) Black/African American, 113 (18.8%) Asian/Asian American, 29 (4.8%)

multi-racial, 17 (2.8%) Hispanic/Latino, five (0.8%) Arab/Middle Eastern, one (0.2%) Indigenous/Native American, and two (0.3%) other.

Procedure

All data were collected through Qualtrics, an online survey website. Participants had the opportunity to voluntarily sign up online for this study as part of an extra credit opportunity for their university courses. After signing up, participants received a link to the online survey, where they first provided informed consent. Next, participants indicated which social media platforms they had an account on and then completed scales assessing their PSMU of each of those platforms (see below). Participants then responded to questionnaires about their mental health and demographic characteristics. Three attention-check questions were included within the survey to ensure that participants were carefully reading each question. Attention-checks consisted of simple common-sense questions that all participants would know. All procedures were approved by the university's Institutional Review Board.

Measures

Problematic social media use

Problematic use of five different social media platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter) was assessed through modified versions of the Bergen Facebook Addiction Scale (Andreassen et al., 2012). This scale was adapted for four of the specific platforms (Instagram, Snapchat, TikTok, and Twitter) each by replacing the word "Facebook" with the individual platform name,

in accordance with previous literature (Andreassen et al., 2017; Lewin et al., 2022; Meshi et al., 2020). The scale consists of six items which assess a core aspect of addiction: salience (preoccupation), mood modification, tolerance, conflict, withdrawal, and relapse (Griffiths et al., 2014). For example, the item in the Bergen Facebook Addiction Scale which assessed withdrawal asked: "How often do you become restless or troubled if you are prohibited from using Facebook?" Response options range on a five-point scale from 1 ("very rarely") to 5 ("very often"). Responses were summed to create a composite score ranging from 6 to 30 for each of the five platforms, with higher scores reflecting increased degree of problematic use. The internal consistencies for each scale were either good or excellent (Table 1).

Depressive symptoms

Depressive symptoms were measured with the nine-item Patient Health Questionnaire (PHQ-9), assessing the frequency of depressive symptoms over the past two weeks (Kroenke & Spitzer, 2002). Participants were asked to self-report how frequently they felt any of the following symptoms on a four-point scale from 0 ("not at all") to 3 ("nearly every day"). Statements were designed to assess various indicators of depression by asking how often individuals felt things such as "little interest or pleasure in doing things", or "trouble falling or staying asleep, or sleeping too much". Scores were summed to create a composite score for each participant, with higher scores indicating greater depressive symptoms. The internal consistency of the PHQ-9 was good (Cronbach's $\alpha = 0.89$).

Table 1 Sample descriptive statistics and bivariate correlation matrix of all covariates and variables of interest

Variable	1	2	3	4	5	6	7	8	9	10
Mean	20.0	-	4.3	8.9	13.7	13.5	15.4	10.4	8.0 ^a	44.6 ^b
SD	1.6	-	1.0	4.0	5.0	5.7	6.2	5.1	6.0	10.1
Cronbach's α				0.91	0.87	0.89	0.89	0.92	0.89	0.91
1. Age	-									
2. Gender	-0.09*	-								
3. Total SM Platforms Used	-0.06	0.09*	-							
4. Problematic Facebook Use	0.20**	-0.04	-0.06	-						
5. Problematic Instagram Use	0.06	0.15**	0.07	0.47**	-					
6. Problematic Snapchat Use	-0.13**	0.08	0.09*	0.42**	0.61**	-				
7. Problematic TikTok Use	-0.13**	0.20**	-0.05	0.26**	0.50**	0.52**	-			
8. Problematic Twitter Use	0.09	-0.09	0.09	0.55**	0.37**	0.39**	0.27**	-		
9. Depressive Symptoms	-0.00	0.17**	0.11**	0.17**	0.24**	0.21**	0.29**	0.25**	-	
10. Loneliness	0.02	0.02	-0.03	0.19**	0.19**	0.13**	0.26**	0.25**	0.53**	-

^aScores of 5–9 indicate mild depression

^bScores range from 20–80, with higher scores indicating a greater severity of loneliness. *Note.* Correlations with problematic social media use contain different *n*'s; * $p < .05$, ** $p < .01$; Gender was coded as Male = 1, Female = 2; SM = social media

Loneliness

Loneliness was assessed with the 20-item UCLA Loneliness Scale, Version 3 (Russell, 1996). Participants were asked to self-report how often they felt the following statements were descriptive of them on a four-point scale from 1 (“never”) to 4 (“always”). Statements were designed to assess various indicators of loneliness with questions such as “how often do you feel alone?” or “how often do you feel left out?”. Scores were summed for each participant, with higher scores indicating a greater degree of loneliness. The internal consistency of this scale was excellent (Cronbach’s $\alpha = 0.91$).

Data analysis

All statistical analyses were performed using SPSS (version 26). We first analyzed relationships between all variables using bivariate Pearson’s or point-biserial correlations (where appropriate). Next, we performed five linear regression models predicting depressive symptoms from the problematic use of each platform (Facebook, Instagram, Snapchat, TikTok, and Twitter). We then performed five linear regression models predicting loneliness from the problematic use of each of the five social media platforms. In each model, we controlled for age, gender, and total number of platforms used by individuals as covariates. Age and gender were included as covariates due to established differences in levels of depression, loneliness, and social media use in these demographics (Barreto et al., 2021; Gallo et al., 1994; Nolen-Hoeksema & Hilt, 2009; Pew Research Center, 2021). We also controlled for the number of platforms each participant used to ensure that our results were due to the problematic use of the specific social media platform, and not from the possible compounding effects of using multiple platforms.

Results

Demographic characteristics, descriptive statistics, and correlations between all variables are presented in Table 1. Briefly, mean self-reported depressive symptoms scores were 8.0 ($SD = 6.0$; indicating mild depression), and mean loneliness scores were 44.6 ($SD = 10.1$; scored out of 80, with greater scores indicating greater loneliness). Regarding problematic social media use scores, participants reported mean scores of 8.9 ($SD = 4.0$) for problematic Facebook use, 13.7 ($SD = 5.0$) for problematic Instagram use, 13.5 ($SD = 5.7$) for problematic Snapchat use, 15.4 ($SD = 6.2$) for problematic TikTok use, and 10.4 ($SD = 5.1$) for problematic Twitter use. To address our research question about

depression, we conducted five linear regression models predicting depressive symptoms from the problematic use of each platform (Table 2). Problematic use of all five platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter) was positively associated with depressive symptoms (all β ’s > 0.21 , all p ’s < 0.001). In other words, individuals who reported greater problematic use of each individual platform also reported greater depressive symptoms. To address our research question about loneliness, we conducted five linear regression models predicting loneliness from the problematic use of each platform (Table 3). Similar to depressive symptoms, problematic use of all five platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter) was positively associated with loneliness (all β ’s > 0.25 , all p ’s < 0.001). In other words, individuals who reported greater problematic use of each platform also reported greater loneliness.

Of interest, we entered the total number of social media platforms into our regressions to ensure that our results were due to the problematic use of the specific social media platform, and not from the possible compounding effects of using multiple platforms. The total number of social media platforms was not significantly related to depressive symptoms (all p ’s > 0.05). However, this measure was negatively related with loneliness in all regressions, with the exception of problematic Facebook use (all β ’s < -1.18 , all p ’s < 0.05). Therefore, the more platforms a participant used, the lower their reported loneliness.

Discussion

We investigated relationships between PSMU of five different platforms (Facebook, Instagram, Snapchat, TikTok, and Twitter) and two constructs of mental health (depressive symptoms and loneliness). Overall, problematic use of Facebook, Instagram, Snapchat, TikTok, and Twitter were all positively associated with both depressive symptoms and loneliness. Therefore, individuals who reported greater levels of PSMU of any of these five platforms were also more likely to report increased depressive symptoms and loneliness.

Our findings with depressive symptoms agree with a large body of previous literature on PSMU and depression. As mentioned previously, research on overall PSMU (without regard to platform distinctions) found greater PSMU linked with greater depression (Huang, 2020). Research on individual platforms also found positive relationships between depression and problematic use of Facebook (Brailovskaia & Margraf, 2022; Hong et al., 2014; Koc & Gulyagci, 2013), problematic use of Instagram (Ahmed & Dixon, 2023; Forough et al., 2021; Yurdagül et al., 2019;), and problematic use of TikTok (Sha & Dong, 2021). Our findings differ from

Table 2 Multiple linear regression models with problematic social media use predicting depressive symptoms

Variable	Model 1 Facebook N = 514 R ² = 0.050***			Model 2 Instagram N = 578 R ² = 0.071***			Model 3 Snapchat N = 555 R ² = 0.070***			Model 4 TikTok N = 475 R ² = 0.096***			Model 5 Twitter N = 456 R ² = 0.086***		
	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.
Age	-0.05	0.17	-0.39, 0.29	0.08	0.16	-0.24, 0.40	0.13	0.16	-0.19, 0.44	0.39*	0.19	0.02, 0.77	-0.03	0.16	-0.34, 0.29
Gender	1.72**	0.58	0.58, 2.86	1.56**	0.53	0.52, 2.60	1.98***	0.54	0.92, 3.05	0.91	0.60	-0.28, 2.09	1.88**	0.58	0.73, 3.02
Total SM Platforms Used	0.35	0.35	-0.33, 1.03	0.15	0.29	-0.42, 0.73	0.02	0.32	-0.60, 0.65	0.02	0.37	-0.71, 0.76	-0.02	0.42	-0.84, 0.79
Problematic SM Use	0.28***	0.07	0.15, 0.41	0.26***	0.05	0.16, 0.35	0.22***	0.05	0.13, 0.31	0.28***	0.04	0.19, 0.37	0.31***	0.05	0.21, 0.41

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; Gender was coded as Male = 1, Female = 2; SM = social media

one previous study on problematic Twitter use which did not find a significant relationship between depressive symptoms (Laconi et al., 2018). However, this discrepancy could be attributed to sample differences, as this study was conducted in French participants, therefore the Bergen addiction scale was modified for Twitter and translated by the authors. Discrepancies could also be attributed to measurement differences regarding mental health. Laconi and colleagues used the French version of the 53-item Brief Symptom Inventory (BSI) which measures nine different mental health dimensions intermixed throughout (6 questions for depression), whereas our study utilized a separate scale specifically for depression. Overall, we replicate previous research between depressive symptoms and problematic use of Facebook, Instagram, and TikTok. However, we extend this research and offer novel findings by establishing these same relationships in problematic use of Snapchat and Twitter. Overall, our findings complement and contribute to extant literature by demonstrating a clear relationship between the problematic use of five, distinct, social media platforms, and depressive symptoms.

Our findings regarding loneliness also agree with previous literature examining the relationship between PSMU and this mental health construct. For example, research on overall PSMU demonstrates similar positive associations with loneliness (Marttila et al., 2021; O’Day & Heimberg, 2021; Yin et al., 2023). Furthermore, our research aligns with prior research on problematic use of individual platforms and loneliness. For example, we replicate studies which establish greater loneliness symptoms in individuals with greater problematic use of Facebook (Atroszko et al., 2018; Biolcati et al., 2018), problematic use of Instagram (Moretta & Buodo, 2020; Ponnusamy et al., 2020), and problematic use of TikTok (Smith, 2023). To the best of our knowledge, our study is the first to establish relationships with loneliness in problematic Snapchat and Twitter use. Overall, our study supports and expands upon extant literature by examining relationships with loneliness across five, distinct, social media platforms, rather than with respect to problematic use overall, or in regard to only a single platform.

We found that the number of social media platforms used by individuals was associated with lower loneliness in all models, apart from Facebook use. It could be that the more platforms a participant has access to, the more chances one has to form connections with users on these platforms (Instagram, Snapchat, TikTok, Twitter). Therefore, it could be that the increased connections reduce one’s feelings of loneliness due to increased community across multiple different spaces. Of course, this is speculation and would require future research to establish this causal relationship.

Our study has several limitations that deserve mention. For example, our participants were all young adults, which

Table 3 Multiple linear regressions with problematic social media use predicting loneliness

Variable	Model 1			Model 2			Model 3			Model 4			Model 5		
	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.	β	SE	C.I.
Age	-0.14	0.29	-0.71, 0.43	0.01	0.28	-0.54, 0.56	0.08	0.28	-0.47, 0.62	0.22	0.33	-0.42, 0.86	-0.09	0.27	-0.63, 0.44
Gender	0.21	0.97	-1.69, 2.11	0.36	0.91	-1.43, 2.15	0.79	0.94	-1.05, 2.63	-1.38	1.03	-3.41, 0.64	1.04	0.98	-0.88, 2.97
Total SM Platforms Used	-1.03	0.58	-2.16, 0.11	-1.38**	0.50	-2.37, -0.39	-1.18*	0.55	-2.26, -0.11	-2.05**	0.64	-3.30, -0.79	-1.90**	0.70	-3.27, -0.53
Problematic SM Use	0.45***	0.11	0.23, 0.66	0.40***	0.09	0.23, 0.56	0.26***	0.08	0.11, 0.41	0.46***	0.08	0.31, 0.60	0.49***	0.09	0.31, 0.66

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; Gender was coded as Male = 1, Female = 2; SM = social media

limits the generalizability of our findings to the greater population. To note, however, individuals in this age group are among the most frequent users of the five social media platforms that we measured (Cheng et al., 2021; Pew Research Center, 2021). Therefore, understanding PSMU within this demographic is especially important. Also, due to the cross-sectional design of this study, we cannot make any causal inferences with our findings. It could be that individuals who already display higher depressive symptoms or loneliness are more at-risk of developing problematic social media use. Conversely, it could be that greater initial problematic social media use may lead to greater feelings of depression and loneliness. To note, a recent longitudinal study revealed that overall PSMU significantly positively predicted increased loneliness 15-months later, whereas loneliness did not significantly lead to greater PSMU (Marttila et al., 2021). However, more research is needed when considering individual social media platforms. It is also possible that PSMU and negative mental health outcomes work in a bidirectional manner, as previous research on affective disorders outside the context of social media supports a bidirectional relationship within a social domain that contributes to the illness (Marroquín, 2011). Finally, we would have liked to compare the strength of our revealed relationships between platforms. Unfortunately, due to the large amount of overlapping variance between users of the individual platforms, it was not possible to directly compare platforms within our current statistical framework. Future research would potentially benefit from different experimental designs and more advanced statistical analyses which may permit direct cross-platform comparisons.

To summarize, we found that individuals who report greater PSMU of five, distinct, platforms also report greater symptoms of depression and greater loneliness. These findings highlight the broad relationship between PSMU and negative mental health. Our study is novel in elucidating these relationships in previously understudied platforms of Snapchat and Twitter. We found relationships with depression and loneliness to be consistent across PSMU of all five platforms, however, future research could investigate whether other mental health constructs may differ depending on platform-specific problematic use. For example, future studies could build on our findings by investigating the causal relationship between platform-specific PSMU and mental health constructs. This could be done with longitudinal research designs, and would allow the field to gain a more comprehensive understanding of these relationships. Furthermore, the underlying mechanisms of the relationships that we revealed could be investigated. This could be accomplished by including mediators in future studies, such as social support and social comparison (Lewin et al., 2022; Meshi & Ellithorpe, 2021). To explain, even though

problematic use of all platforms we tested showed similar relationships to mental health, the mechanisms for these relationships may be different. Our findings also provide groundwork for informing the public and policy makers behind the potential mental health ramifications of problematic social media use, demonstrating that these relationships don't appear to exist for just a single social media platform. Clinicians can also consider that these relationships between PSMU and mental health hold across platforms. However, future social media platforms may reveal important nuances, so platform-specific relationships should continue to be a consideration in both research and clinical practice.

Data availability Data will be made available upon request.

Declarations

Disclosure of interest The authors report there are no competing interests to declare.

Compliance with ethical standards This study was approved by the University's Institutional Review Board and all participants provided informed consent. The authors declare no competing interests and this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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