



Problematic social media use and depressive symptoms among U.S. young adults: A nationally-representative study



Ariel Shensa, MA ^{a, b, *}, César G. Escobar-Viera, MD, PhD ^{b, c}, Jaime E. Sidani, PhD, MPH ^{a, b}, Nicholas D. Bowman, PhD ^d, Michael P. Marshal, PhD ^e, Brian A. Primack, MD, PhD ^{a, b}

^a Division of General Internal Medicine, Department of Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA, United States

^b Center for Research on Media, Technology, and Health, University of Pittsburgh, Pittsburgh, PA, United States

^c Health Policy Institute, University of Pittsburgh, Pittsburgh, PA, United States

^d Department of Communication Studies, West Virginia University, Morgantown, WV, United States

^e Department of Psychiatry, University of Pittsburgh, Pittsburgh, PA, United States

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ABSTRACT

Rationale: Depression is the leading cause of disability worldwide. The suggested association between social media use (SMU) and depression may be explained by the emerging maladaptive use pattern known as problematic social media use (PSMU), characterized by addictive components.

Objective: We aimed to assess the association between PSMU and depressive symptoms—controlling for overall time and frequency of SMU—among a large sample of U.S. young adults.

Methods: In October 2014, participants aged 19–32 ($N = 1749$) were randomly selected from a nationally-representative U.S. probability-based panel and subsequently invited to participate in an online survey. We assessed depressive symptoms using the validated Patient-Reported Outcomes Measurement Information System (PROMIS) brief depression scale. We measured PSMU using an adapted version of the Bergen Facebook Addiction Scale to encompass broader SMU. Using logistic regression models, we tested the association between PSMU and depressive symptoms, controlling for time and frequency of SMU as well as a comprehensive set of socio-demographic covariates.

Results: In the multivariable model, PSMU was significantly associated with a 9% increase in odds of depressive symptoms (AOR [adjusted odds ratio] = 1.09; 95% CI [confidence interval]: 1.05, 1.13; $p < 0.001$). Increased frequency of SMU was also significantly associated with increased depressive symptoms, whereas SMU time was not ($AOR = 1.01$; 95% CI: 1.00, 1.01; $p = 0.001$ and $AOR = 1.00$; 95% CI: 0.999–1.001; $p = 0.43$, respectively).

Conclusion: PSMU was strongly and independently associated with increased depressive symptoms in this nationally-representative sample of young adults. PSMU largely explained the association between SMU and depressive symptom, suggesting that it may be how we use social media, not how much, that poses a risk. Intervention efforts aimed at reducing depressive symptoms, such as screenings for maladaptive SMU, may be most successful if they address addictive components and frequency—rather than time—of SMU.

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Depression is the leading cause of disability worldwide (World Health Organization, 2016). In the U.S., the economic burden of depression is over \$210 billion (Greenberg et al., 2015). Moreover, many individuals with depression also experience physical or psychiatric comorbidities that contribute to the overall disease

* Corresponding author. Center for Research on Media, Technology, and Health, 230 McKee Place Suite 600, Pittsburgh, PA 15213, United States.

E-mail address: shensaa@upmc.edu (A. Shensa).

burden (Greenberg et al., 2015). The incidence of depression generally peaks in early adulthood, which puts these individuals at greater risk of problematic interpersonal relationships, employment, and psychological functioning (Child Trends, 2015).

Depression is associated with a combination of biological, psychological, and social factors (World Health Organization, 2016). Prior research has identified media exposures, such as video games, television, movies, and the Internet, to be associated with the development of depression among adolescents (Bickham et al., 2015; González et al., 2016; Holfeld and Sukhawathanakul, 2017;

Liu et al., 2016; Primack et al., 2009). Other research has extended this by suggesting that use of social media is associated with depressive symptoms and a decline in well-being among both adolescents (Pantic et al., 2012) and adults (Kross et al., 2013; Lin et al., 2016; McDougall et al., 2016; Shensa et al., 2016).

Contradictory findings surrounding the association between SMU and depression may be attributed to the diversity of existing social media platforms and the difficulty characterizing the different types of usage associated with them. In this regard, problematic social media use (PSMU) has emerged as a maladaptive pattern of SMU. While current psychiatric nosology does not acknowledge PSMU as a diagnosis, there has been substantial research on the topic of PSMU (Andreassen, 2015; Andreassen et al., 2016b; Durak and Senol-Durak, 2014; Meena et al., 2012; Wang et al., 2015). Initial measurement of PSMU focused on Facebook only (Andreassen et al., 2012; Muench et al., 2015), coining the phrase, “Facebook addiction”. Subsequent studies found that Facebook addiction was indeed associated with depression among both high school (Hanprathet et al., 2015) and college students (Koc and Gulyagci, 2013). Furthermore, researchers have since addressed addictive characteristics of SMU more broadly, assessing addictive or problematic use of multiple social networking sites or across social media in general (Andreassen, 2015; Kuss and Griffiths, 2011; Meena et al., 2012). Thus, PSMU has been characterized by an excessive concern about social media, being driven by a strong motivation to use social media, and devoting so much time and effort to SMU that it impairs other social activities, studies/job, interpersonal relationships, and/or psychological health and well-being (Andreassen and Pallesen, 2014).

Research in U.S. and international populations has shown that the association between PSMU and depression is complex and likely influenced by both external and internal factors. For example, a study of teenagers in urban India concluded that excessive time spent on social media was associated with PSMU, which can negatively impact relationships, community involvement, and academic achievement (Meena et al., 2012). Indeed, external factors such as increased social isolation and decreased community engagement could lead to depression. Furthermore, results from a sample of German adolescent and young adults indicated that PSMU may be linked to depression via mediators such as self-regulation and use-expectation (Wegmann et al., 2015). This study suggests the association between PSMU and depression may be more of an internal process. In contrast, a recent large-scale Norwegian study of adults found that PSMU was associated with decreases in depressive symptoms, which may be attributable to social withdrawal often associated with depression (Andreassen et al., 2016a).

To our knowledge, no study has assessed whether there is an association between PSMU and depressive symptoms among a nationally representative sample of U.S. young adults, while controlling for overall SMU. Prior studies were conducted using small convenience samples, assessing the use of a single platform, such as Facebook, or focusing on older populations (Andreassen et al., 2016a; Hanprathet et al., 2015; Koc and Gulyagci, 2013). Examining this potential association more broadly could guide research and ultimately intervention. Therefore, the purpose of this study was to assess the association between PSMU and depressive symptoms while controlling for overall SMU and a comprehensive set of covariates among a nationally representative sample of young adults.

1. Methods

1.1. Participants and procedures

We conducted a survey among a nationally-representative

sample of U.S. adults aged 19 to 32. Participants were recruited from a probability-based online non-volunteer research panel via random digit dialing and address-based sampling. This is done by randomly selecting addresses from the U.S. Postal Service's Delivery Sequence File with a probability-based, without replacement sampling approach. Potential participants were sent emails inviting them to join, both in English and Spanish. Non-responders received additional invites via phone calls. This process generated a sampling frame that covers approximately 97% of U.S. households, and a panel consisting of approximately 55,000 members ages 18 and older maintained by Growth from Knowledge (GfK) (GfK KnowledgePanel®, 2013). Panel members are then invited to complete online surveys using a probability proportional to size weighted sampling approach.

In October 2014, as part of a longitudinal study of young adult health behaviors, GfK sent a survey including items on depression, PSMU, and SMU to 3048 panel members who had completed a baseline survey 18 months earlier. A total of 1796 individuals completed the follow-up survey (59% response rate). This study had no specific exclusion criteria except that participants were required to be aged 18–30 at baseline. Participants responded to questionnaire items using a computer-based interface; computers and internet access were provided to individuals who did not have them. Several strategies were used by GfK to assure good data quality (e.g. data was screened for patterns suggesting poor effort such as a high proportion of skipped responses). Median time for completion was 15 min, and participants received a \$15 cash-equivalent incentive. This study was approved by the University of Pittsburgh Institutional Review Board and was granted a Certificate of Confidentiality from the National Institutes of Health.

2. Measures

Depressive symptoms (dependent variable). We measured depressive symptoms using the four-item Patient-Reported Outcomes Measurement Information System (PROMIS) depression scale for adults. PROMIS, an initiative of the National Institutes of Health, is a set of standardized questionnaires to evaluate patient-reported outcomes across the domains of health—social, mental and physical. The goal of this initiative is to provide efficient, flexible, and precise measurement of commonly-studied health outcomes (Cella et al., 2010). There is strong evidence of construct validity for the PROMIS depression scale, which has been validated against the Center for Epidemiological Studies Depression Scale (CES-D), the Beck Depression Inventory (BDI-II), and the Patient Health Questionnaire (PHQ-9) (Choi et al., 2014; Pilkonis et al., 2014). We used the PROMIS four-item scale in this study to reduce respondent burden, while still obtaining a reliable and valid measure of depression. The items stated, “In the past 7 days ... I felt [hopeless, worthless, helpless, depressed]” ((Pilkonis et al., 2011). The response scale for each item was a five-point Likert-type scale ranging from one to five, corresponding to responses of *Never* (1), *Rarely* (2), *Sometimes* (3), *Often* (4), and *Always* (5). The resulting composite scale ranged from 4 to 20 and served as the dependent variable in our model.

Problematic social media use (PSMU) (independent variable). We assessed problematic social media use (PSMU) using a set of items adapted from the Bergen Facebook Addiction Scale (BFAS) (Andreassen et al., 2012). Each item represented one of six core elements of addiction (salience, mood modification, tolerance, withdrawal, conflict, and relapse) (see Table 1 for complete item wording). In the context of this study, we did not use this scale as a diagnostic tool but instead sought to characterize a pattern of maladaptive SMU. We asked participants to respond based upon past year frequency using a Likert-type response scale with anchors

of *Very rarely* (0) and *Very often* (4). While original items specified “Facebook,” we substituted “social media” to encompass more general SMU. The resulting composite scale ranged from 0 to 24 and served as the independent variable in our model.

Social media use time and frequency (covariates). We assessed social media use (SMU) in both time and frequency. We first asked participants to estimate total time per day spent on social media for personal use; the item explicitly instructed participants not to include work-related use in their estimates. Participants were provided with open-ended boxes for hours and minutes, and total time was converted to minutes for analysis. The resulting variable, SMU time, served as a covariate in our model. Then, a set of items prompted participants to indicate how frequently they visited each of the following eleven social media platforms: Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit. These platforms were selected based on their popularity with the young adult age group at the time of the study (Nielsen, 2012; Pew Research Center, 2015). Each item included the following seven response categories, based on the formal SMU assessment developed by the Pew Internet Research Center (Pew Research Center, 2015): *I don't use this platform, less than once a week, 1–2 days a week, 3–6 days a week, about once a day, 2–4 times a day, and 5 or more times a day*. We calculated the frequency of participants' SMU by converting the response categories into weekly numeric averages. For response categories that gave a weekly range, we used the average. For response categories given in days, we took the average and multiplied it by seven to arrive at a weekly average. For example, *less than once a week* was recoded as 0 site visits per week, *1–2 days a week* was recoded as 1.5 site visits per week, *2–4 times a day* was recoded as 21 site visits per week, and *5 or more times a day* was recoded as 35 site visits per week. We computed a composite score based upon these standardized responses for all eleven platforms. The resulting composite scale, SMU frequency, ranged from 0 to 385 and served as a covariate in our model.

Socio-demographic characteristics (covariates). GfK maintains socio-demographic information on panel members, including age, sex, race/ethnicity, and household income. For this study, we used age in its original scale ranging from 19 to 32 years of age. We divided race/ethnicity into four categories (White, non-Hispanic; Black, non-Hispanic; Hispanic; Other, non-Hispanic) and household income into three categories (low, under \$30,000; medium, \$30,000–74,999; high, \$75,000 and above). Relationship status (single; in a committed relationship), living situation (with parent/guardian; with significant other; other), and education level (high school or less; some college; bachelor's degree or higher) were obtained via self-report from participants.

2.1. Data analysis

We included all participants with complete data for the independent and dependent variables, as well as the two SMU covariates. Additionally, we screened data for extreme or unfeasible responses. Because only 47 out of 1796 individuals (<3%) were missing data, this is unlikely to have changed results. Therefore, we addressed missing data using casewise deletion rather than imputation.

Because the PSMU scale had been slightly modified from the previously validated version (by assessing social media in general rather than Facebook in particular), we performed a factor analysis using principal components analysis (PCA) with varimax rotation to examine the underlying factor structure of these items. We calculated Cronbach's alpha to measure the internal consistency for scales with multiple items (PSMU and depressive symptoms). Additionally, we described the distribution of our resulting

Table 1

Problematic social media use (PSMU) scale items and factor analysis results.

Complete Item	Factor loading
Spent a lot of time thinking about SM or planned use of SM?	0.76
Felt an urge to use SM more and more?	0.84
Used SM in order to forget about personal problems?	0.83
Tried to cut down on the use of SM without success?	0.80
Become restless or troubled if you have been prohibited from using SM?	0.83
Used SM so much that it has had a negative impact on your job/studies?	0.77
Cronbach's α (internal consistency of items)	0.89
Factor 1 variance (assessing percentage of explained common variance)	0.65

independent variable, two SMU covariates and depressive symptoms using median, interquartile range [IQR], skewness, and kurtosis.

We performed thorough diagnostics on our data to assess the viability of a linear regression model using both graphic and non-graphic methods. Visual inspection of our dependent variable suggested a substantial deviation from normality; therefore, we examined the distribution of the standardized residuals using kernel density and Q-Q plots and assessed normality using the Shapiro-Wilk test. Next, we assessed homogeneity of variance by plotting the residuals against the fitted predicted values and using the White's test for heteroscedasticity. Then, we assessed linearity of the independent variable and two SMU covariates on the dependent variable by plotting the standardized residuals against the independent variable and each SMU covariate. Finally, we screened our model for multicollinearity among the independent variable and covariates by calculating the variance inflation factors (VIFs) as well as pairwise correlations using Pearson's correlation coefficient.

We assessed bivariable associations between each independent variable, covariate, and our dependent variable using the non-parametric equality-of-medians test for continuous variables and χ^2 tests for categorical variables. Having ruled out the viability of linear regression and confirming that our models met the proportional odds assumption, we then conducted ordinal logistic regression—assessing both the bivariable association between each independent variable and covariate with depressive symptoms and the multivariable association between each independent variable and covariate with depressive symptoms including all variables in one model.

We applied study-specific survey weights to our models. These weights were provided from GfK and computed to adjust for non-response, non-coverage, under-, or over-sampling resulting from the sampling design and based upon rigorously tested procedures (Dennis, 2010). We performed all statistical analyses in Stata 14.1 (StataCorp, 2016), and two-tailed p values of < 0.05 were considered to be significant.

3. Results

3.1. Participants

Our final sample consisted of 1749 individuals 19–32 years of age. There were no significant differences between individuals with complete vs. incomplete data in terms of socio-demographic or SMU characteristics, PSMU, or depressive symptoms (p values ranging from 0.16 to 0.93). The majority of our sample self-identified as White non-Hispanic (57.3%), being in a committed relationship (55.6%), having a yearly household income of \$30,000 or above (75.3%), and having attended at least some college (64.4%).

Complete participant socio-demographic characteristics are presented in Table 2.

3.2. Problematic social media use (PSMU)

PCA revealed a 1-factor solution, with an eigenvalue = 3.90 explaining 65% of the variance. Factor loadings ranged from 0.76 to 0.84 (Table 1). Internal consistency was high, with Cronbach's $\alpha = 0.89$. Composite scores ranged from 0 to 24, with a median of 4 (IQR = 0–8), skewness of 0.89, and kurtosis of 3.49. Approximately 44% of participants received a score of 6 or above, indicative of problematic use using a liberal scoring approach, and approximately 14% scored 12 or above, indicative of problematic use using a more conservative scoring approach (Andreassen et al., 2012).

3.3. Social media use (SMU) covariates

Total minutes spent on social media per day (SMU time) was non-normally distributed with a median of 61 (IQR = 30–135) minutes, skewness of 4.13, and kurtosis of 33.14. Frequency of site visits per week (SMU frequency) was also non-normally distributed with a median of 30 (IQR = 9–57), skewness of 2.91, and kurtosis of 18.68.

3.4. Regression diagnostics

Visual inspection of our residual plots and the result from the Shapiro-Wilk test indicated significant and substantial departure

from normality among the residuals of the dependent variable ($p < 0.001$). Additionally, scatter plots and White's test for homogeneity of variance demonstrated significant departures from homogeneity of variance ($p < 0.001$). There was no evidence of multicollinearity among covariates and PSMU with variance inflation factors (VIFs) ranging from 1.26 to 1.29. Additionally, pairwise correlations revealed small to moderate positive associations between PSMU and SMU time ($r = 0.40$, $p < 0.001$), PSMU and SMU frequency ($r = 0.37$, $p < 0.001$), and SMU time and SMU frequency ($r = 0.38$, $p < 0.001$).

3.5. Depressive symptoms

Internal consistency of the four depressive symptom items was high ($\alpha = 0.93$). Data were skewed right, with a mean of 7 ($SD = 4$), median of 5 (IQR = 4–9), skewness of 1.12, and kurtosis of 3.47. Due to the regression diagnostics reported above, we were unable to use linear regression, which requires using our dependent variable in its original continuous scale. Therefore, we collapsed depressive symptoms into three categories: None (4); mild (5–10); and moderate (11–20). These categories represent 40.9%, 40.7%, and 18.4% of the sample, respectively. The three categories differentiate between individuals using meaningful and relevant clinical cut-points for depression. For example, “none” represents individuals who responded “never” to all four items measuring depressive symptoms. The most severe category of depressive symptoms—“moderate”—corresponds a *T*-score of 60.5–79.4, which the American Psychiatric Association (APA) interprets as moderate to

Table 2
Whole sample characteristics and bivariable associations with depressive symptoms ($N = 1749$).

Independent Variable and Covariates	Whole Sample ^a	Depressive Symptoms ^d			p^b
		None ($n = 714$)	Mild ($n = 713$)	Moderate ($n = 322$)	
Problematic Social Media Use (PSMU), Median (IQR)	4 (0–8)	3 (0–6)	5 (1–9)	7 (2–12)	<0.001
Covariates					
SMU Time ^c , Median (IQR)	61 (30–135)	60 (30–120)	80 (40–150)	103 (57–180)	<0.001
SMU Frequency ^d , Median (IQR)	30 (9–57)	24 (7–47)	35 (11–60)	38 (14–66)	<0.001
Age, y, Median (IQR)	25 (23–28)	25 (23–29)	25 (23–28)	25 (23–28)	0.26
Sex, %					0.01
Female	50.1	44.2	56.2	51.7	
Male	49.9	55.8	43.8	48.3	
Race, %					0.01
White, non-Hispanic	57.3	59.8	56.1	53.6	
Black, non-Hispanic	13.2	16.2	9.2	14.0	
Hispanic	20.7	19.1	22.1	21.5	
Other ^e	8.9	4.9	12.6	10.9	
Relationship Status, %					0.09
Single ^f	44.4	40.0	47.7	49.2	
In a committed relationship ^g	55.6	60.0	52.3	50.8	
Living Situation, %					0.45
Parent/Guardian	34.0	33.3	33.8	36.4	
Significant other	35.4	33.8	32.7	32.6	
Other ^h	30.6	27.9	33.5	31.1	
Household Income, %					<0.001
Low (under \$30,000)	22.8	18.7	19.6	40.3	
Medium (\$30,000–\$74,999)	38.6	39.1	39.8	34.5	
High (\$75,000 and above)	36.7	42.2	40.6	25.2	
Education Level, %					0.003
High school or less	35.6	32.5	33.5	48.4	
Some college	38.6	38.5	39.3	37.5	
Bachelor's degree or higher	25.8	29.0	27.2	14.1	

^a Values may not total 100 due to rounding.

^b *P* value derived using the equality-of-medians and Fisher's exact tests.

^c Assessed in minutes per day, non-work-related.

^d Measuring site visits per week; includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.

^e Includes Multiracial.

^f Includes widowed, divorced, and separated.

^g Includes engaged, married, and in a domestic partnership.

^h Defined as not living with a parent/guardian or significant other.

severe (American Psychiatric Association, 2013). Because these cut-points were established using the 8-item form, not the 4-item short form used in this study, we use these interpretations with caution and apply the more conservative label of “moderate” to encompass both moderate and severe scores.

3.6. Bivariable and multivariable models

After confirming our models met the proportional odds assumption, we conducted ordinal logistic regression based on the three-level ordered categorical nature of our dependent variable.

PSMU was significantly associated with an 11% increase in odds of depressive symptoms in bivariable and a 9% increase in odds of depressive symptoms in multivariable models ($OR = 1.11$; 95% $CI = 1.08, 1.15$; $p < 0.001$ and $AOR = 1.09$; 95% $CI = 1.05, 1.13$; $p < 0.001$, respectively). Among covariates, SMU frequency was significantly associated with marginal increases in odds of depressive symptoms in both bi- and multivariable models ($OR = 1.01$; 95% $CI = 1.01, 1.01$; $p < 0.001$ and $AOR = 1.01$; 95% $CI = 1.00, 1.01$; $p = 0.001$, respectively); whereas SMU time was only significantly associated with increased depressive symptoms in the bivariable model (see Table 3). Several other socio-demographic covariates were significantly associated with depressive symptoms in the multivariable model. For example, being of Other race/ethnicity (including Multiracial) was associated with increased odds of depressive symptoms; whereas having a medium or high household income, and having a Bachelor's degree or higher education level was associated with decreased odds of depressive symptoms (Table 3).

4. Discussion

This study of a nationally-representative sample of young adults found that problematic social media use (PSMU) was significantly associated with depressive symptoms. This association remained significant after including two measures of overall social media use (SMU) and a comprehensive set of socio-demographic variables to the model. Moreover, the association between one measure of SMU—frequency—remained significantly associated with depressive symptom in the multivariable model, whereas the other (time) did not. Our findings are consistent with others who have found positive associations between PSMU and depression (Hanprathet et al., 2015; Koc and Gulyagci, 2013) and are contrary to one who recently did not (Andreassen et al., 2016a). However, our results also extend these findings by suggesting that PSMU is independently associated with depressive symptoms regardless of overall time spent on social media and that frequency of SMU may be an additional behavioral risk factor to examine in a more fine-grained manner.

PSMU was independently and strongly associated with increased depressive symptoms. It is possible that individuals with greater PSMU neglect other constructive aspects of their lives, which could contribute to depressive symptomatology. For example, engagement in computer-mediated activity may lead to fewer face-to-face social interactions, decreased physical activity, and interrupted sleep (Choi et al., 2009; Moreno et al., 2013; Morrison and Gore, 2010; Pollet et al., 2011; Younes et al., 2016); resulting in depressive symptoms. It is also plausible that increased PSMU affects the way an individual internalizes these online experiences, which may contribute to depression. For example, individuals who spend much time thinking about social media (a component of PSMU) may engage in excessive self-comparison with others' idealized portrayals of themselves (Fox and Moreland, 2015; Sidani et al., 2016; Steers et al., 2014; Tandoc

et al., 2015). For the individual with higher PSMU, this may translate into a maladaptive pattern of repetitive visits, escalated engagement, and consequent negative self-image (Meier and Gray, 2014; Przybylski et al., 2013; Steers et al., 2014).

Alternatively, it may be that individuals experiencing depressive symptoms are prone to PSMU. For example, anhedonic depressed individuals may forgo face-to-face social interaction in favor of SMU because of its high accessibility and the possibility of socialization in a controlled setting (Lin et al., 2016). These individuals experiencing depressive symptoms may be prone to PSMU as they are to behavioral addictions such as gambling, Internet addiction, and eating disorders (Andreassen et al., 2016a; Ciccarelli et al., 2016; Korkeila, 2012; Lister et al., 2015; Rodgers et al., 2013). Another plausible scenario is that the association between PSMU and depressive symptoms is bidirectional—each influences and subsequently contributes to increases in the other (Seabrook et al., 2016). Future work involving more complex longitudinal designs would be helpful in this regard.

This study found a significant association between frequency of SMU—but not overall time of SMU—and depressive symptoms in the multivariable model. This finding highlights an important distinction between SMU frequency and SMU time and underscores their disparate associations with depressive symptoms. For example, it may be that frequency of SMU exposes users to multitasking, either when switching between different social media platforms, or between social media and other daily activities, thus leading to depressive symptoms. Media multitasking has been associated with negative health outcomes in the past (Becker et al., 2013; Rosen et al., 2013a). One reason for this could be the increased exposure to negative content that elicits more attention and for longer durations (Katsyri et al., 2016). It may also be that SMU frequency is technology-related, such that how an individual accesses social media is driving this association rather than the social media exposure itself. To this point, the association between SMU frequency and depressive symptoms could be driven by technological anxiety or dependence (Rosen et al., 2013b). Because the association between SMU frequency and depressive symptoms remained strong in the multivariable model that included PSMU, it is likely that SMU frequency is capturing a different and perhaps complimentary behavioral component of problematic social media use. For example, SMU frequency could measure more compulsive behavior, while SMU time measures more planned or controlled use. Therefore, measuring the frequency of SMU could provide information on the amount of subjective impairment associated with a particular frequency of use, thus signaling a potential target for preventive programs. In summary, PSMU represents an additional target for intervention and not a replacement for addressing excessive SMU frequency.

Our findings show that when included in a model with PSMU, SMU time, unlike SMU frequency, does not have an independent association with depressive symptoms. This provides important insight into previously demonstrated associations between overall SMU and depression that did not include a measure of PSMU (McDougall et al., 2016; Pantic et al., 2012). First, these results indicate that for individuals who consume the most social media, even if it is associated with depressive symptoms, this is likely due to an alternative mechanism, such as a problematic or addictive component, and not simply substantial amounts of time on social media. Alternatively, it may be that self-reported time is simply not an accurate measure of actual social media use, as indicated by prior research, and measurement of SMU should include instruments that have undergone more rigorous empiric validation (Junco, 2013; McDougall et al., 2016; Rosen et al., 2013b).

Table 3

Bivariable and multivariable associations between problematic social media use (PSMU) and depressive symptoms.

Independent Variable and Covariates	Depressive Symptoms ^a			
	OR [95% CI]	<i>p</i> ^b	AOR ^c [95% CI]	<i>p</i> ^b
PSMU ^d	1.11 [1.08, 1.15]	<0.001	1.09 [1.05, 1.13]	<0.001
SMU Time ^{d,e}	1.00 [1.00, 1.00]	<0.001	1.00 [0.999, 1.001]	0.43
SMU Frequency ^{d,f}	1.01 [1.01, 1.01]	<0.001	1.01 [1.00, 1.01]	0.001
Age ^d , years	0.99 [0.96, 1.03]	0.65	1.02 [0.98, 1.06]	0.38
Sex				
Female	1 [Reference]		1 [Reference]	
Male	0.72 [0.54, 0.95]	0.02	0.78 [0.60, 1.05]	0.10
Race				
White, non-Hispanic	1 [Reference]		1 [Reference]	
Black, non-Hispanic	0.80 [0.48, 1.34]	0.39	0.61 [0.36–1.03]	0.06
Hispanic	1.21 [0.85–1.74]	0.30	0.99 [0.68, 1.44]	0.97
Other ^g	1.97 [1.35, 2.89]	0.001	1.62 [1.06, 2.49]	0.03
Relationship Status				
Single ^h	1 [Reference]		1 [Reference]	
In a committed relationship ⁱ	0.74 [0.56, 0.98]	0.03	0.81 [0.57, 1.16]	0.26
Living Situation				
Parent/Guardian	1 [Reference]		1 [Reference]	
Significant other	0.81 [0.58, 1.14]	0.24	0.98 [0.63, 1.51]	0.92
Other ^j	1.07 [0.76, 1.50]	0.70	0.99 [0.70, 1.42]	0.97
Household Income				
Low (under \$30,000)	1 [Reference]		1 [Reference]	
Medium (\$30,000–\$74,999)	0.56 [0.38, 0.82]	0.003	0.46 [0.51, 0.97]	0.03
High (\$75,000 and above)	0.47 [0.32, 0.68]	<0.001	0.55 [0.37, 0.81]	0.003
Education Level				
High school or less	1 [Reference]		1 [Reference]	
Some college	0.78 [0.55, 1.11]	0.17	0.81 [0.56, 1.17]	0.27
Bachelor's degree or higher	0.58 [0.41, 0.81]	0.002	0.60 [0.40, 0.91]	0.02

^a The variable depressive symptoms is divided into 3 categories; the upper level representing greater severity.^b Significance level determined by the *t*-test comparing each OR/AOR to the null value (equal to one or not significantly different from the reference group).^c Adjusted for all the variables in the table.^d Results for these continuous variables represent the odds of moderate depressive symptoms (versus combined none and mild) per a one unit increase in the variable.^e Assessed in minutes per day, non-work-related.^f Assessed in site visits per week; includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.^g Includes Multiracial.^h Includes widowed, divorced, and separated.ⁱ Includes engaged, married, and in a domestic partnership.^j Defined as not living with a parent/guardian or significant other.

5. Limitations

A major limitation is that the cross-sectional nature of these data limits our ability to establish directionality. Both longitudinal studies and qualitative assessments may be helpful in better characterizing directionality. It should also be noted that, because our sample included only adults aged 19–32, these findings may not generalize to other populations. An additional limitation of this study is that the original scales of several key variables, including SMU frequency and depressive symptoms, required data recoding for analysis either due to lack of standardization across scale items or violation of analytic model assumptions. Also, these data were self-reported and not externally validated. For example, self-reported SMU can under- or overestimate actual use. Nonetheless, we attempted to increase the validity of our measures by assessing SMU in multiple ways (i.e., both time and frequency). Similarly, participants self-reported depressive symptoms, and some individuals underreport stigmatizing conditions such as this. However, because responses were anonymous and all participants were informed that the study received a Certification of Confidentiality from the National Institutes of Health, it would be unlikely for participants to be untruthful. Finally, a limitation of survey research is the lag between data collection and dissemination of results. However, given evidence of the growing trends of both social media use (Greenwood et al., 2016) and depression (Hidaka, 2012), it is likely that our findings are conservative estimates of current states.

It would be beneficial for future research to utilize both

longitudinal designs and qualitative methods. For example, utilizing a longitudinal design—following participants over a greater time span and with multiple time points—would provide strong evidence of directionality that cross-sectional studies lack. Furthermore, including baseline predictors of depression, such as adverse childhood events or family history of mental health problems, which were unavailable for this study, would help isolate the effect of PSMU on depression. It may also be valuable to explore the moderating role of socio-demographic factors in future work on PSMU and depression. Additionally, use of qualitative methods, such as a grounded theory approach, among a sample of depressed individuals who use social media, would be beneficial in expanding the current measurement of PSMU. We also suggest the use of scales to assess depressive symptoms that may be more likely to result in normally-distributed data as well as scales that assess SMU with greater accuracy. For example, future studies may benefit from the use of a more granular measure of SMU frequency in tandem with a more rigorously validated measure of SMU time to elucidate the distinct associations between SMU frequency and SMU time with depressive symptoms. Finally, development of a conceptual model that incorporates the growing body of research on SMU, PSMU, and depressive symptoms would be highly beneficial to future studies in these areas.

6. Conclusion

To our knowledge, ours is the first study to examine the association between PSMU and depressive symptoms among a

nationally-representative sample of U.S. young adults while controlling for overall time and frequency of SMU. Among this large sample of young adults, we found significant positive associations between PSMU and depressive symptoms. Moreover, SMU frequency but not SMU time remained significantly and independently associated with depressive symptoms in our multivariable model. This finding suggests that it may not be how much, but rather how, we use social media that is associated with depressive symptoms. Furthermore, SMU frequency may be capturing a different and perhaps complimentary behavioral component of PSMU. Therefore, intervention efforts aimed at reducing depressive symptoms, such as screenings for maladaptive SMU, may be most successful if they address the addictive components and frequency, rather than overall time, of SMU. It may be valuable for future research to involve more nuanced and fine-grained aspects of SMU frequency, such as type and quality of interactions. And finally, future longitudinal studies are essential to help determine directionality of associations.

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