



## Full length article

# Use of multiple social media platforms and symptoms of depression and anxiety: A nationally-representative study among U.S. young adults



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## ABSTRACT

**Introduction:** While increased time spent on social media (TSSM) has been associated with depression and anxiety, the independent role of using multiple social media (SM) platforms is unclear.

**Methods:** We surveyed a nationally-representative sample of 1787 U.S. young adults ages 19–32. Depression and anxiety symptoms were measured using the Patient-Reported Outcomes Measurement Information System (PROMIS). We assessed use of multiple SM platforms with an adapted Pew Internet Research scale. We used ordered logistic regression models to assess associations between use of multiple SM platforms and mental health outcomes while controlling for eight covariates, including overall TSSM.

**Results:** Compared to those who used 0–2 social media platforms, participants who used 7–11 social media platforms had substantially higher odds of having increased levels of both depression (Adjusted Odds Ratio [AOR] = 3.0, 95% CI = 1.9–4.8) and anxiety symptoms (AOR = 3.2, 95% CI = 2.0–5.1). Associations were linear ( $p < 0.001$  for all) and robust to all sensitivity analyses.

**Conclusions:** Use of multiple SM platforms is independently associated with symptoms of depression and anxiety, even when controlling for overall TSSM. These associations are strong enough that it may be valuable for clinicians to ask individuals with depression and anxiety about multiple platform use and to counsel regarding this potential contributing factor.

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## 1. Introduction

Depression and anxiety are associated with substantially increased morbidity and mortality (Kessler et al., 2010; Mathers & Loncar, 2006). Additionally, poor health outcomes related to these psychiatric disorders are increasing. For example, suicide in the U.S. is now at its highest level in 30 years (Curtin, Warner, & Hedegaard, 2016). Furthermore, the World Health Organization estimates that depression is now the second leading cause of worldwide disability adjusted life years (World Health Organization, 2016). One reason for being associated with such substantial overall morbidity is that

depression and anxiety affect many people in young adulthood, at a prime stage regarding productivity (World Health Organization, 2016).

Young adults are also increasingly engaged with social media. About 90% of young adults in the U.S. use social media, and the majority of users visit these sites at least once a day (Pew Research Center, 2015). There is some controversy as to whether social media use may exacerbate or alleviate conditions such as depression and anxiety. Engagement via platforms such as Facebook, Twitter, Reddit, Instagram, Snapchat, and Tumblr may provide opportunities for keeping in touch with family and friends as well as other social interactions that may increase social capital and alleviate depression and anxiety (Bessiere, Pressman, Kiesler, & Kraut, 2010; Ellison, Steinfield, & Lampe, 2007; de la Pena & Quintanilla, 2015). Similarly, use of social media may facilitate forming connections

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among people with potentially stigmatizing health conditions, including depression and anxiety (Evans, 2008; Merolli, Gray, & Martin-Sanchez, 2014). Moreover, against prevailing assumptions that in-person interaction is strictly needed for emotional contagion, it appears that emotional states can be transferred among participants of social media via observation of others' positive experiences (Kramer, Guillory, & Hancock, 2014).

However, most large-scale empiric work in this area suggests associations between time spent on social media (TSSM) and increased symptoms of depression and anxiety and decline in subjective well-being (Andreassen et al., 2016; Block et al., 2014; Kross et al., 2013; Lin et al., 2016; Woods & Scott, 2016). This may in part be because frequent users may substitute social media for face-to-face social interactions (Baek, Bae, & Jang, 2013; Marar, 2012). Similarly, frequent exposure to highly curated, unrealistic portrayals on social media may give people the impression that others are living happier, more connected lives, which may make people feel more socially isolated in comparison (Shensa, Sidani, Lin, Bowman, & Primack, 2016).

Associations between social media and self-reported depression and anxiety also may be related to the use of multiple social media (SM) platforms. The number of different social media platforms used is rising substantially. For example, use of 2 or more platforms increased by 10% in just one year, from 2013 to 2014 (Duggan, Ellison, Lampe, Lenhart, & Madden, 2014). In addition to their increase in number, social media platforms differ by type, functionality, and primary intended purpose. On one hand, increased use of multiple SM platforms may be associated with an increase in one's social capital and social support, which may subsequently be related to improvement of depression and anxiety symptoms (Ellison et al., 2007; Keitzmann, Hermkens, McCarthy, & Silvestre, 2011). However, it may also lead to multitasking between different SM platforms and/or increased multitasking between SM and other activities such as school or occupational work. Multitasking has been associated in the past with negative cognitive and mental health outcomes (Chen & Yan, 2016; Ophir, Nass, & Wagner, 2009). For example, multitasking has been related to decreased ability to sustain attention (Küsel, 2012; Litsa, 2014), poor academic performance (Cain, Leonard, Gabrieli, & Finn, 2016; Junco & Cotten, 2012; Rosen, Carrier, & Cheever, 2013), decreased subjective well-being (van der Schuur, Baumgartner, Sumter, & Valkenburg, 2015), and higher levels of depression and anxiety (Becker, Alzahabi, & Hopwood, 2013; Richards, Caldwell, & Go, 2015). Use of multiple SM platforms may also be related to negative mental health outcomes even if the different platforms are not all used at once. For example, the use of multiple SM platforms can lead to identity diffusion, which has been related to poor emotional health in the past (Marcia, 1980). It may also be related to additional opportunities for online misunderstandings, negative interactions, and/or feelings of being left out, each of which may be associated with negative mood states (Arnett, 1995).

Therefore, the purpose of this study was to assess multivariable associations between use of multiple SM platforms and self-reports of both depression and anxiety in a nationally-representative sample of U.S. young adults. We focused on young adults because of the particularly high levels of both time spent and usage of multiple SM platforms, in this population (Pew Research Center, 2015). We aimed to determine these associations while controlling for a comprehensive set of covariates. Based on the background noted above, we hypothesized that increased use of multiple SM platforms would be independently associated with both depression (Hypothesis 1) and anxiety (Hypothesis 2), even controlling for essential demographic and socioeconomic covariates (i.e., age, race/ethnicity, relationship status, living situation, household income, and education level), as well as overall TSSM.

## 2. Methods

### 2.1. Design, participants, and setting

A detailed description of overall study methods has been reported (Lin et al., 2016). In brief, we surveyed a nationally-representative sample of U.S. young adults aged 19 to 32 regarding social media use, depression, and anxiety. We drew our sample from a probability-based online non-volunteer research panel maintained by Growth from Knowledge (GfK), which recruited participants via random digit dialing and address-based sampling (GfK KnowledgePanel®, 2013). This sampling method randomly selects addresses from the US Postal Service's Delivery Sequence File using a probability-based, without replacement sampling approach. Potential panel participants are invited to join via a series of mailings, both in English and Spanish, and by telephone follow-up to non-responders. Using this process, they maintained a sampling frame including over 97% of the U.S. population (GfK KnowledgePanel®, 2013). At the time of the study, GfK KnowledgePanel® consisted of approximately 50,000 individuals ages 18 and older. Panel members are selected to be invited to participate in online surveys using a probability proportional to size weighted sampling approach, and are supplied with e-mail addresses, computers, and Internet access if needed. However, considering the ubiquitous nature of electronic communications in today's world, facilitated access is rarely needed. This GfK's sampling strategy is a statistically valid method for surveying and analyzing health indicators from a nationally representative sample (GfK KnowledgePanel®, 2013).

From October to November 2014, our web-based survey was sent via email to a random sample of 3048 non-institutionalized adults, ages 19 to 32 that had consented to participate in a previous study wave that held no specific criteria except that participants had to be between 18 and 30 years at baseline. Data for this research were collected at one point in time, during the 18-month follow-up of that study. Responses were received from 1787 participants (59%). This represented a strong response rate, because at 18 months, many of the baseline respondents were likely no longer in the GfK panel, which turns over participants every 2 years so as to prevent cohorts from becoming fatigued by surveys. Additionally, survey weights accounted for non-response, and there were no demographic differences between responders and non-responders. Both of these facts attest to the strong external generalizability of our current results.

GfK instituted multiple strategies to improve data quality. For example, they screened all data sets for patterns suggesting lack of effort. GfK also implemented procedures such as minimizing survey length, reducing the need for scrolling, and avoiding the use of long grids. The median time for survey completion was 15 min, and participants received \$15 for their participation. This study was approved by the [Name of University removed for blind version] Institutional Review Board and was granted a Certificate of Confidentiality from the National Institutes of Health.

### 2.2. Measures

Participants completed online survey items including depression and anxiety (dependent variables), use of multiple SM platforms (independent variable), and covariates.

#### 2.2.1. Depression

We assessed depression using a 4-item scale developed by the Patient-Reported Outcomes Measurement Information System (PROMIS). PROMIS is a National Institutes of Health Roadmap initiative whose aim is to provide precise, valid, reliable, and

standardized questionnaires measuring patient-reported outcomes across the domains of physical, mental, and social health (Cella et al., 2010). The PROMIS depression scale was developed using item response theory to promote greater precision and decrease respondent burden (Cella et al., 2010). Specifically, the PROMIS depression scale has been correlated and validated with other commonly used depression instruments, including the Center for Epidemiological Studies Depression Scale (CES-D), the Beck Depression Inventory (BDI-II), and the Patient Health Questionnaire (PHQ-9) (Choi, Schalet, Cook, & Cella, 2014). The 4-item PROMIS depression scale asked participants how frequently in the past 7 days they had experienced feeling hopeless, worthless, helpless, or depressed. Each of these items was scored on a 5-point Likert scale ranging from 1 to 5, corresponding to responses of “Never,” “Rarely,” “Sometimes,” “Often” and “Always.” Thus, the total possible raw score was between 4 and 20. Based upon the non-normal distribution of data, the raw scores were collapsed into tertiles of mild, moderate, and severe for primary analysis. This was appropriate because one of the aims of the PROMIS depression scale was to grade the severity of depression, instead of merely providing a dichotomous clinical cut-off point. We classified those who did not endorse any depression as those in the “mild” group (raw score = 4), which represented 44.5% of the population. We then classified a “severe” group based on both the distribution of the data and the clinical cut-off for depression recommended by the American Psychiatry Association (APA) (American Psychiatric Association, 2013). This cut-off corresponded to a raw score of 9 or more (out of 20), which corresponds to a T-score of 57.3. Because the American Psychiatric Association uses 55 as a cutoff for diagnosing clinical depression, individuals in the “severe” group are more likely to experience enough depressive symptoms to meet the clinical criteria for a diagnosis of depressive episode (American Psychiatric Association, 2013). This group represented 26.3% of the population. Those with raw scores between 5 and 8 were classified as “moderate” and comprised 29.2% of the population. The scale exhibited excellent internal consistency reliability (Cronbach’s alpha = 0.92).

### 2.2.2. Anxiety

We assessed anxiety symptoms using the 4-item PROMIS anxiety scale (Pilkonis et al., 2011). The PROMIS anxiety scale has been correlated and validated with other commonly used anxiety instruments, including the Mood and Anxiety Symptom Questionnaire (MASQ), the Positive and Negative Affect Schedule (PANAS), and Generalized Anxiety Disorder 7-item Scale (GAD-7) (Schalet, Cook, Choi, & Cella, 2014). The 4-item scale asked participants how frequently in the past 7 days they had experienced the following anxious symptoms: “I felt fearful,” “I felt it was hard to focus on anything other than my anxiety,” “My worries overwhelmed me,” and “I felt uneasy” (Pilkonis et al., 2011; Schalet et al., 2014). These items were scored on a 5-point Likert scale ranging from 1 to 5, corresponding to responses of “Never,” “Rarely,” “Sometimes,” “Often” and “Always.” Thus, the total possible raw score was between 4 and 20. Based upon the non-normal distribution of data, the raw scores were collapsed into tertiles of mild, moderate, and severe for primary analysis. This was appropriate because, like the PROMIS depression scale, the PROMIS anxiety scale aimed to grade the severity of anxiety. We classified those who did not endorse any depression as those in the mild group (raw score = 4), which represented 33.7% of the population. We then classified a severe group with a raw score of 9 or more (out of 20), which corresponds to a T-score of 57.7 (Johnston et al., 2016). Because the APA uses 55 as a cutoff for diagnosing clinical anxiety, individuals in the severe group have a high likelihood of experiencing some form of anxiety. This group represented 30.3% of the

population. Those with raw scores between 5 and 8 were classified as moderate and comprised 36.0% of the population. The scale exhibited excellent internal consistency reliability (Cronbach’s alpha = 0.90).

### 2.2.3. Use of multiple SM platforms

We asked participants to report their use of each of 11 widely used social media platforms, including Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit (Nielsen, 2012; Pew Research Center, 2015). Seven response choices ranged from “I do not use this platform” to “I use this platform 5 or more times a day.” We based these items on the measures used by Pew Internet Research (Pew Research Center, 2015). To operationalize this variable, we counted the number of different platforms that participants used with any frequency other than none. For primary analyses, and in order to improve interpretability of the ultimate results, we used the automated function within Stata to collapse these data into quartiles. Thus, the number of SM platforms was quantified as 0–2 sites, 3–4 sites, 5–6 sites, or 7–11 sites. We also performed sensitivity analyses treating this variable as continuous to make sure that results were similar.

### 2.2.4. Covariates

For analysis, we divided the sample into three age groups (19–23; 24–26; 27–32) and race/ethnicity into four mutually exclusive categories (White, non-Hispanic; Black, non-Hispanic; Hispanic; and other). We also assessed other environmental and personal factors that may affect social isolation and social media use (Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Pew Research Center, 2015). These factors included relationship status (single or in a committed relationship), living situation (with a parent or guardian; with a significant other; or other situation), household income (under \$30,000; \$30,000–\$74,999; or \$75,000 or more) and education level (high school or less; some college; or bachelor’s degree or higher).

We also asked participants to estimate total TSSM for personal use in order to use this as a covariate. This is because we wanted to isolate our primary variable—the number of platforms used—beyond the overall time spent on social media. This item specifically instructed participants to not count any time spent on social media for work. Participants provided estimates in numerical fields for hours and minutes on an average day. Again, to improve interpretability of results, we collapsed all independent variables into quartiles for primary analyses. However, to ensure robustness of results, we also conducted all analyses with this covariate as continuous.

## 2.3. Data analysis

We included all participants who had complete data on the dependent and independent variables. Because only about 1% of participants had missing data for these variables, this did not affect our results. To describe our sample, we computed percentages of the two dependent variables (depression and anxiety), the independent variable (use of multiple SM platforms), and the eight covariates. Next, we used chi-square tests to determine bivariable associations between the independent variable and each of the dependent variables.

The outcome variables were ordered categorical. Therefore, after confirming that the proportional odds assumption was met, we used ordered logistic regression to examine bivariable and multivariable associations between use of multiple SM platforms and each of the outcomes in separate models. We decided *a priori* to include all covariates in our primary multivariable models. To take advantage of the nationally-representative nature of the data, all

primary analyses were conducted using survey weights which took into account sex, age, race/ethnicity, education, household income, census region, metropolitan area, and internet access. We used similar regression analyses to examine whether there was an overall linear trend between each ordered categorical independent variable and the dependent variable.

We also conducted four sets of sensitivity analyses to examine the robustness of our results. First, we conducted all analyses with use of multiple social media platforms as continuous instead of ordered categorical. Second, we conducted additional analyses treating all covariates as continuous instead of categorical when possible (such as to assess the time spent on social media). Third, we conducted all analyses using only covariates that had a bivariable association of  $p < 0.15$  with the outcome. Fourth, we conducted all analyses without survey weights. Results from all sensitivity analyses showed similar levels of significance and magnitude to the primary analyses described here.

Statistical analyses were performed with Stata 13.1 (Stata Corp, College Station, Texas), and two-tailed  $p$ -values  $< 0.05$  were considered to be significant.

### 3. Results

#### 3.1. Participants

A total of 1768 participants had complete data for these analyses. The weighted sample was 50.1% female, 57.4% White, 13.1% African American, 20.6% Hispanic and 8.9% biracial/multiracial or other. Of these, slightly more than half (55.6%) were in a committed relationship and approximately a third (35.5%) reported living with a significant other. In terms of household income, 22.7% were in the “low” category (under \$30,000) and 38.7% were in the “high” category (\$75,000 and above). About one-third (35.6%) of participants had not attended any college, while a quarter (25.9%) had a B.A. or higher. There were no differences between responders and non-responders in terms of age ( $p = 0.12$ ), sex ( $p = 0.07$ ), or race ( $p = 0.21$ ). All descriptions of covariates, including bivariable associations with outcome variables, are noted in [Tables 1 and 2](#).

#### 3.2. Depression and anxiety

Accounting for survey weights, 41%, 30%, and 29% of respondents were classified as having mild, moderate, and severe levels of self-reported depression, respectively. Also accounting for survey weights, 34%, 36%, and 30% of respondents were classified as having mild, moderate, severe levels of anxiety symptoms, respectively.

#### 3.3. Use of multiple SM platforms

Only 55 (3%) of individuals reported using none of the 11 social media platforms, and 52 (3%) reported using all of them. Usage of multiple SM platforms was normally distributed, with a mean of 4.2 and a standard deviation of 2.5 on a scale ranging from 0 to 11. As noted above, we collapsed this variable into quartiles for primary analyses to improve interpretability of results. Thus, use of multiple SM platforms was classified as 0–2, 3–4, 5–6, or 7–11. However, we also treated this variable as continuous in sensitivity analyses.

#### 3.4. Bivariable analyses

Unadjusted bivariable odds ratios for outcomes of depression and anxiety are presented in the first columns of [Tables 3 and 4](#), respectively. Both high use of multiple SM platforms ( $p < 0.001$ ) and higher total TSSM ( $p = 0.001$ ) were associated with increased

self-reported depression ([Table 3](#)). Other covariates associated with increased depression included female sex, multiracial status, being single, having lower income, and being less educated ([Table 3](#)). Similarly, high use of multiple SM platforms ( $p < 0.001$ ) and higher total TSSM ( $p < 0.001$ ) were associated with increased self-report of anxiety ([Table 4](#)). In bivariable analyses, other covariates associated with increased anxiety also included female sex, multiracial status, being single, having lower income, and being less educated ([Table 4](#)).

### 3.5. Multivariable analyses

#### 3.5.1. Depression

In a fully-adjusted multivariable model that controlled for all covariates and TSSM, compared with those who used 0–2 platforms, those who used 7–11 platforms had about three times the odds of reporting high levels of depressive symptoms (OR = 3.1, 95% CI = 1.9, 5.0) ([Table 3](#)). There was a linear association between use of multiple SM platforms and depression in this multivariable analyses; for increasing quartiles of multiple platforms use, odds ratios for increased level of depressive symptoms were 1.0 (reference), 1.6, 2.2, and 3.1 respectively ( $p < 0.001$  for overall linear association) ([Table 3](#)). Therefore, Hypothesis 1 was upheld. However, in this multivariable model TSSM, female sex, and being single were no longer independently associated with depression ([Table 3](#)). Multiracial status, lower income, and less education remained significantly associated with depression.

#### 3.5.2. Anxiety

In a fully-adjusted multivariable model that controlled for all covariates and TSSM, compared with those who used 0–2 platforms, those who used 7–11 platforms had more than three times the odds of reporting high levels of anxiety symptoms (OR = 3.3, 95% CI = 2.0, 5.3) ([Table 3](#)). Again, there was a linear association between use of multiple SM platforms and anxiety in this multivariable analyses; for increasing quartiles of multiple SM platforms use odds ratios for increased level of anxiety symptomatology were 1.0 (reference), 1.4, 1.9, and 3.3 respectively ( $p < 0.001$  for overall linear association) ([Table 4](#)). Therefore, Hypothesis 2 was upheld. In this multivariable analysis, TSSM and being single were no longer independently associated with anxiety symptoms ([Table 4](#)). However, female sex, multiracial status, lower income, and less education remained significantly associated with anxiety.

## 4. Discussion

Among a nationally-representative cohort of individuals ages 19–32, we found robust linear associations between increased use of multiple SM platforms and both self-reported depression and anxiety, even after adjusting for a comprehensive set of covariates that included overall TSSM. Notably, in both multivariable models, the initially significant association between TSSM and depressive and anxiety symptoms did not remain significant.

Our results are broadly consistent with previous research that has suggested associations between overall TSSM and both depression and anxiety ([Chou & Edge, 2012](#); [Kross et al., 2013](#); [Lin et al., 2016](#); [Sagioglou & Greitemeyer, 2014](#); [Shensa et al., 2016](#)). However, our analyses make an important contribution to the literature by suggesting that the association between social media use and symptoms of depression and anxiety may be related less to the total amount of time spent on social media and more to the number of different social media platforms used.

Because our data were cross-sectional, the directionality of this association is unclear. It may be that individuals who suffer from depressive symptoms and/or anxiety symptoms tend to

**Table 1**  
Whole sample characteristics and bivariable associations between use of multiple SM platforms, covariates, and depressive symptoms.

Independent Variable and Covariates	Whole Sample (N = 1768) Column % <sup>b</sup> (Unweighted %)	Depression			p Value <sup>a</sup>
		Low (n = 724) Column % <sup>b</sup>	Medium (n = 538)	High (n = 506)	
<b>Use of Multiple SM Platforms<sup>c</sup></b>					<0.001
Q1 (0–2)	30.4 (26.4)	38.5	21.8	26.2	
Q2 (3–4)	32.3 (33.4)	31.4	37.6	27.9	
Q3 (5–6)	21.3 (23.0)	19.2	23.2	23.0	
Q4 (7–11)	16.0 (17.3)	10.9	17.4	23.0	
<b>Covariates</b>					
<b>Time Spent on Social Media (TSSM), minutes</b>					0.006
Q1 (0–30)	29.8 (29.0)	36.0	24.9	24.7	
Q2 (31–60)	20.8 (20.9)	22.0	22.7	16.6	
Q3 (61–120)	24.0 (24.2)	20.3	24.1	30.1	
Q4 (121 and above)	25.5 (25.9)	21.8	28.3	28.6	
<b>Age, y</b>					0.04
19–23	33.6 (28.6)	34.3	36.7	29.0	
24–26	24.5 (36.4)	20.6	23.9	32.1	
27 and above	41.8 (35.0)	45.1	39.4	38.9	
<b>Sex</b>					0.008
Female	50.1 (61.8)	44.2	57.6	51.6	
Male	49.9 (38.2)	55.8	42.4	48.4	
<b>Race</b>					0.02
White, non-Hispanic	57.4 (64.3)	60.0	54.8	55.9	
Black, non-Hispanic	13.1 (10.1)	16.1	10.6	10.8	
Hispanic	20.6 (16.5)	18.9	21.3	22.7	
Other <sup>d</sup>	8.9 (9.2)	5.0	13.4	10.5	
<b>Relationship Status</b>					0.07
Single <sup>e</sup>	44.4 (41.5)	39.7	47.3	49.1	
In a committed Relationship <sup>f</sup>	55.6 (58.5)	60.3	52.7	50.9	
<b>Living Situation</b>					0.09
Parent/Guardian	33.9 (28.1)	33.0	30.1	39.7	
Significant other	35.5 (40.6)	38.9	33.7	31.6	
Other <sup>g</sup>	30.6 (31.3)	28.0	36.2	28.8	
<b>Yearly Household Income</b>					0.002
Low (under \$30,000)	22.7 (33.2)	18.5	20.3	32.6	
Medium (\$30,000–\$74,999)	38.5 (37.9)	38.9	38.6	37.5	
High (\$75,000 and above)	38.9 (28.9)	42.6	41.1	29.9	
<b>Education Level</b>					0.004
High school or less	35.6 (20.4)	32.6	31.4	45.7	
Some college	38.5 (41.5)	38.2	40.3	36.9	
Bachelor's degree or higher	26.0 (38.1)	29.3	28.2	17.4	

<sup>a</sup> P value derived using Chi-square analyses comparing proportion of users in each category.

<sup>b</sup> Values may not total 100 due to rounding. Percentages were calculated using survey-specific weights unless otherwise specified.

<sup>c</sup> Includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.

<sup>d</sup> Includes Multiracial.

<sup>e</sup> Includes widowed, divorced, and separated.

<sup>f</sup> Includes engaged, married, and in a domestic partnership.

<sup>g</sup> Defined as not living with a parent/guardian or significant other.

subsequently use a broader range of social media outlets. This may be because these individuals tend to search multiple avenues for a setting that feels most comfortable and in which they feel most accepted (Lin & Lu, 2011).

It may also be that using a wide variety of different social media platforms subsequently leads to depressive and/or anxiety symptoms. There are a number of possible reasons for this. One is that participation in many different social media platforms may lead to multitasking between platforms, which is known to be related to poor cognitive and mental health outcomes (Becker et al., 2013; Chen & Yan, 2016; Kiisel, 2012; Litsa, 2014; Ophir et al., 2009; Richards et al., 2015). A second reason is that each social media platform has its own distinct set of unwritten rules, cultural assumptions, and idiosyncrasies. Therefore, an individual who uses only one or two platforms may easily learn these idiosyncrasies and succeed at leveraging that platform for positive social capital and positive interaction. However, as the number of platforms used increases, individuals may experience difficulty navigating these multiple different worlds successfully, leading to potentially negative mood and emotions. Moreover, a third possible reason for

use of multiple SM platforms leading to depressive or anxiety symptoms may involve an increased risk of damaging gaffes. While in a personal social situation, an error of judgment or miscommunication may lead to a certain level of embarrassment, in social media circles there is the risk that misinterpreted or insensitive language may be magnified substantially. In extreme cases, these types of situations can lead to severe distress and even self-harm (Luxton, June, & Fairall, 2012). Using multiple SM platforms enable a number of potential sources of embarrassment, thus increasing the risk of an untoward event that may ultimately lead to symptoms of depression and/or anxiety.

It is also possible that both directions of this association between use of multiple SM platforms and depression and anxiety may be valid. For example, it may be that depressed individuals turn to multiple different platforms for support, but that the subsequent increased interaction does not fill that void. In fact, it may even lead to more feelings of exclusion and/or disillusionment. This may perpetuate a cycle of reliance on multiple SM platforms and negative mental health outcomes.

It is noteworthy that our results present rates of self-reported

**Table 2**  
Whole sample characteristics and bivariable associations between use of multiple SM platforms, covariates, and anxiety symptoms.

Independent Variable and Covariates	Whole Sample (N = 1768) Column % <sup>b</sup> (Unweighted %)	Anxiety Symptoms			p Value <sup>a</sup>
		Low (n = 597) Column % <sup>b</sup>	Medium (n = 634)	High (n = 537)	
<b>Use of Multiple SM Platforms<sup>c</sup></b>					<0.001
Q1 (0–2)	30.4 (26.4)	40.3	23.7	24.9	
Q2 (3–4)	32.3 (33.4)	32.5	34.0	30.2	
Q3 (5–6)	21.3 (23.0)	18.6	25.0	20.6	
Q4 (7–11)	16.0 (17.3)	8.6	17.3	24.3	
<b>Covariates</b>					
<b>Time Spent on Social Media (TSSM), minutes</b>					0.001
Q1 (0–30)	29.8 (29.0)	36.9	26.8	23.6	
Q2 (31–60)	20.8 (20.9)	24.0	17.9	20.0	
Q3 (61–120)	24.0 (24.2)	20.3	27.2	25.1	
Q4 (121 and above)	25.5 (25.9)	18.8	28.2	31.3	
<b>Age, y</b>					0.05
19–23	33.6 (28.6)	30.5	40.1	30.4	
24–26	24.5 (36.4)	23.0	24.1	27.2	
27 and above	41.8 (35.0)	46.5	35.9	42.4	
<b>Sex</b>					0.001
Female	50.1 (61.8)	41.5	54.9	56.0	
Male	49.9 (38.2)	58.5	45.1	49.9	
<b>Race</b>					0.04
White, non-Hispanic	57.4 (64.3)	59.6	60.5	50.9	
Black, non-Hispanic	13.1 (10.1)	14.7	12.8	11.3	
Hispanic	20.6 (16.5)	20.4	17.7	24.3	
Other <sup>d</sup>	8.9 (9.2)	5.3	9.1	13.5	
<b>Relationship Status</b>					0.06
Single <sup>e</sup>	44.4 (41.5)	39.4	45.3	50.1	
In a committed relationship <sup>f</sup>	55.6 (58.5)	60.6	54.7	49.9	
<b>Living Situation</b>					0.07
Parent/Guardian	33.9 (28.1)	32.0	31.6	39.1	
Significant other	35.5 (40.6)	40.7	33.3	31.0	
Other <sup>g</sup>	30.6 (31.3)	27.3	35.1	29.9	
<b>Yearly Household Income</b>					0.06
Low (under \$30,000)	22.7 (33.2)	19.3	21.0	29.2	
Medium (\$30,000–\$74,999)	38.5 (37.9)	38.2	38.7	38.5	
High (\$75,000 and above)	38.9 (28.9)	42.4	40.3	32.3	
<b>Education Level</b>					0.03
High school or less	35.6 (20.4)	33.6	31.5	43.2	
Some college	38.5 (41.5)	39.7	38.3	37.0	
Bachelor's degree or higher	25.9 (38.1)	26.7	30.2	19.8	

<sup>a</sup> P value derived using Chi-square analyses comparing proportion of users in each category.

<sup>b</sup> Values may not total 100 due to rounding. Percentages were calculated using survey-specific weights unless otherwise specified.

<sup>c</sup> Includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.

<sup>d</sup> Includes Multiracial.

<sup>e</sup> Includes widowed, divorced, and separated.

<sup>f</sup> Includes engaged, married, and in a domestic partnership.

<sup>g</sup> Defined as not living with a parent/guardian or significant other.

depressive and anxiety symptoms. These may or may not translate into clinical diagnoses of depression or anxiety disorders. Related to this, both depression and anxiety symptoms surveyed for this research may correspond with a number of different psychiatric disorders (e.g. unipolar or bipolar depression, and dysthymia among depressive disorders, and panic, obsessive-compulsive, or posttraumatic stress disorder, among anxiety disorders). This presents a rich field for future research. While these conditions share a common ground of either a mood or an anxiety disorder, symptoms among them are different in nature, severity, cognitive impairment, and potential disability. These characteristics may shape different ways of individuals' interactions with social media. For example, given the consistently depressive mood of individual with unipolar depression, this might use multiple SM platforms with a more consistent frequency and purpose. Meanwhile, given the cyclic nature of the condition (which makes part of a more complex condition called bipolar disorder), a person with bipolar depression may exhibit a changing pattern of social media use, both in frequency and number of platforms used, which might vary according

the current phase of the individual's illness. Understanding these variations may help in designing and implementing educational public health interventions that are as personalized as possible.

For the same reason, it may also be valuable for future research to look at the role of urban and rural environments in the impact of usage of multiple SM platforms on levels of depressive and/or anxiety symptoms. While Pew Research Center has reported that, compared to their urban counterparts, rural young adults lag behind in their use of social media (Pew Research Center, 2015), some researchers have found a slightly higher level of self-reported depression among rural young adults, perhaps due to geographic isolation of these areas (Block et al., 2014). A possible reason for this to happen is that social media might be a potential enabler of social interactions, networking, and support in areas where otherwise these would be difficult for individuals to have access to, due to geography.

While more research is necessary to confirm and better understand these associations, it may not be too soon to suggest that individuals with depressive and/or anxiety symptoms, and who use

**Table 3**  
Bivariable and multivariable associations between use of multiple SM platforms, covariates, and depressive symptoms.

Independent Variable and Covariates	Depressive Symptoms <sup>a</sup>			
	OR (95% CI)	p <sup>b</sup>	AOR <sup>c</sup> (95% CI)	p <sup>b</sup>
Use of Multiple SM Platforms <sup>d</sup>		<0.001		<0.001
Q1 (0–2)	1.0 [Reference]		1.0 [Reference]	
Q2 (3–4)	1.45 (1.02–2.07)		1.57 (1.08–2.26)	
Q3 (5–6)	1.75 (1.18–2.59)		2.16 (1.40–3.33)	
Q4 (7–11)	2.67 (1.71–4.17)		3.08 (1.91–4.99)	
Time Spent on Social Media (TSSM), minutes		<0.001		0.21
Q1 (0–30)	1.0 [Reference]		1.0 [Reference]	
Q2 (31–60)	1.19 (0.81–1.74)		0.95 (0.63–1.42)	
Q3 (61–120)	1.90 (1.29–2.80)		1.32 (0.88–1.99)	
Q4 (121 and above)	1.75 (1.22–2.52)		1.20 (0.81–1.78)	
Age, y		0.76		0.17
19–23	1.0 [Reference]		1.0 [Reference]	
24–26	1.54 (1.09–2.17)		2.04 (1.39–2.98)	
27 and above	0.96 (0.70–1.32)		1.38 (0.95–2.03)	
Sex				
Female	1.0 [Reference]		1.0 [Reference]	
Male	0.74 (0.56–0.98)		0.79 (0.61–1.04)	
Race				
White, non-Hispanic	1.0 [Reference]		1.0 [Reference]	
Black, non-Hispanic	0.74 (0.46–1.19)		0.52 (0.32–0.82)	
Hispanic	1.23 (0.86–1.77)		0.94 (0.65–1.38)	
Other <sup>e</sup>	1.82 (1.24–2.67)		1.62 (1.09–2.40)	
Relationship Status				
Single <sup>f</sup>	1.0 [Reference]		1.0 [Reference]	
In a committed relationship <sup>g</sup>	0.73 (0.56–0.96)		0.81 (0.56–1.16)	
Living Situation				
Parent/Guardian	1.0 [Reference]		1.0 [Reference]	
Significant other	0.75 (0.53–1.06)		0.88 (0.56–1.37)	
Other <sup>h</sup>	0.95 (0.68–1.33)		0.89 (0.62–1.26)	
Yearly Household Income		0.001		0.002
Low (under \$30,000)	1.0 [Reference]		1.0 [Reference]	
Medium (\$30,000–\$74,999)	0.63 (0.44–0.90)		0.65 (0.46–0.93)	
High (\$75,000 and above)	0.52 (0.36–0.73)		0.55 (0.37–0.82)	
Education Level		0.001		0.002
High school or less	1.0 [Reference]		1.0 [Reference]	
Some college	0.77 (0.55–1.09)		0.74 (0.51–1.07)	
Bachelor's degree or higher	0.58 (0.41–0.81)		0.47 (0.31–0.71)	

Abbreviations: OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio.

<sup>a</sup> Depressive symptoms are divided into low, medium, and high tertiles.

<sup>b</sup> Significance level determined by tests for overall linear trend of the ordered categorical independent variable.

<sup>c</sup> Adjusted for all independent variables and covariates listed in the table.

<sup>d</sup> Includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.

<sup>e</sup> Includes Multiracial.

<sup>f</sup> Includes widowed, divorced, and separated.

<sup>g</sup> Includes engaged, married, and in a domestic partnership.

<sup>h</sup> Defined as not living with a parent/guardian or significant other.

a high number of different social media platforms may wish to decrease the number of platforms used, especially given the strength of the associations we found. While this research is in its early stages, this may be worth considering especially because the risk of adverse mental health outcomes associated with decreasing the number of platforms used should be low.

However, it is important to note that, in today's world, and especially among young adults, it may be more difficult than it sounds to decrease the number of social media platforms used. This is because young people tend to use different platforms for different reasons (Pantic, 2014), and thus they may be reluctant to give up any one of these. For example, many people in this age range maintain Facebook accounts but use them primarily for posting photos and receiving information from formal groups such as college related activities. These individuals may use Snapchat instead for private conversations with close friends. Meanwhile, Twitter and Reddit are common sources of news, while LinkedIn can be important occupationally. Finally, sites such as Tumblr, Instagram and Pinterest tend to be more popular among individuals with artistic and or craft related aspirations.

Therefore, understanding that many people may not wish to significantly decrease the total number of platforms used, another potential solution may be to utilize educational interventions that specifically help individuals to manage social network use. This type of education may help individuals—especially those just beginning to use social media—to better understand the unwritten rules and idiosyncrasies of various platforms, which may help them to potentially avoid embarrassing posts that may ultimately lead to anxiety or depression. This type of education may also help people to consider which platforms are truly necessary to their lives and valuable for their goals, and which ones may not be.

#### 4.1. Limitations

As discussed above, our data were cross-sectional. Therefore, longitudinal studies may be valuable to explore in the future. It should be reiterated that we studied young adults ages 19–32; therefore, these results cannot be generalized to other populations.

It is also important to note that our primary independent variable was simply the number of platforms used. A site was coded as

**Table 4**  
Bivariable and multivariable associations between use of multiple SM platforms, covariates, and anxiety symptoms.

Independent Variable and Covariates	Anxiety Symptoms <sup>a</sup>			
	OR (95% CI)	p <sup>b</sup>	AOR <sup>c</sup> (95% CI)	p <sup>b</sup>
Use of Multiple SM Platforms <sup>d</sup>		<0.001		<0.001
Q1 (0–2)	1.0 [Reference]		1.0 [Reference]	
Q2 (3–4)	1.49 (1.04–2.14)		1.43 (0.99–2.07)	
Q3 (5–6)	1.71 (1.18–2.49)		1.89 (1.26–2.82)	
Q4 (7–11)	3.27 (2.12–5.03)		3.27 (2.01–5.29)	
Time Spent on Social Media (TSSM), minutes		<0.001		0.09
Q1 (0–30)	1.0 [Reference]		1.0 [Reference]	
Q2 (31–60)	1.20 (0.80–1.81)		0.93 (0.61–1.41)	
Q3 (61–120)	1.69 (1.18–2.44)		1.14 (0.77–1.69)	
Q4 (121 and above)	2.08 (1.46–2.98)		1.36 (0.92–2.01)	
Age, y		0.43		0.38
19–23	1.0 [Reference]		1.0 [Reference]	
24–26	1.10 (0.79–1.53)		1.32 (0.92–1.90)	
27 and above	0.88 (0.64–1.20)		1.16 (0.79–1.70)	
Sex				
Female	1.0 [Reference]		1.0 [Reference]	
Male	0.63 (0.48–0.83)		0.65 (0.50–0.86)	
Race				
White, non-Hispanic	1.0 [Reference]		1.0 [Reference]	
Black, non-Hispanic	0.91 (0.58–1.42)		0.70 (0.46–1.10)	
Hispanic	1.25 (0.85–1.84)		1.0 (0.68–1.48)	
Other <sup>e</sup>	2.20 (1.37–3.53)		1.64 (1.02–2.64)	
Relationship Status				
Single <sup>f</sup>	1.0 [Reference]		1.0 [Reference]	
In a committed relationship <sup>g</sup>	0.72 (0.55–0.95)		0.85 (0.60–1.20)	
Living Situation				
Parent/Guardian	1.0 [Reference]		1.0 [Reference]	
Significant other	0.70 (0.50–0.98)		0.77 (0.50–1.19)	
Other <sup>h</sup>	0.94 (0.67–1.31)		0.83 (0.58–1.17)	
Yearly Household Income		0.008		0.01
Low (under \$30,000)	1.0 [Reference]		1.0 [Reference]	
Medium (\$30,000–\$74,999)	0.73 (0.52–1.04)		0.79 (0.56–1.12)	
High (\$75,000 and above)	0.61 (0.43–0.87)		0.62 (0.42–0.92)	
Education Level		0.04		0.04
High school or less	1.0 [Reference]		1.0 [Reference]	
Some college	0.79 (0.56–1.11)		0.74 (0.51–1.05)	
Bachelor's degree or higher	0.71 (0.50–0.99)		0.66 (0.44–0.99)	

Abbreviations: OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio.

<sup>a</sup> Anxiety symptoms are divided into low, medium, and high tertiles.

<sup>b</sup> Significance level determined by tests for overall linear trend of the ordered categorical independent variable.

<sup>c</sup> Adjusted for all independent variables and covariates listed in the table.

<sup>d</sup> Includes Facebook, Twitter, Google+, YouTube, LinkedIn, Instagram, Pinterest, Tumblr, Vine, Snapchat, and Reddit.

<sup>e</sup> Includes Multiracial.

<sup>f</sup> Includes widowed, divorced, and separated.

<sup>g</sup> Includes engaged, married, and in a domestic partnership.

<sup>h</sup> Defined as not living with a parent/guardian or significant other.

being used if it was used with any frequency, even just once a month. Therefore, it may be valuable for future studies to use more granular measures related to frequency. Related to this, our study did not examine more nuanced usage patterns. For example, some users tend to passively consume social media content while others engage in more active communication. Thus, it may be that those who use only a couple of social media platforms are more empowered to engage in active social media interactions, which may reduce their likelihood of feeling isolated, depressed, or anxious (Ellison et al., 2007). However, it may also be that active users are more prone to having negative experiences such as arguments, which ultimately can be detrimental.

This study was also limited in its ability to fully capture the nuanced, dynamic way in which SM platforms are used, both individually and in combination. Therefore, it would be valuable for future work in this area to examine finer-grained independent variables integrating usage dynamics.

Finally, we did not assess a comprehensive set of intrinsic factors such as personality, which may be relevant to these questions. For example, highly extroverted individuals may have less difficulty

navigating multiple social media platforms, while those who are introverted may find this more challenging.

## 5. Conclusion

Despite these limitations, it is noteworthy that we found increased use of multiple SM platforms to be strongly and independently associated with both depressive and anxiety symptoms in a nationally representative sample of young adults—even when controlling for overall TSSM. In fact, use of multiple social media platforms ultimately turned out to have stronger associations with outcomes than did overall TSSM. These are important findings, especially considering the fact that use of multiple platforms is increasing over time. Future assessments with more fine-grained measurements will help us to appropriately develop and target interventions.

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