Addictive Technology: Prevalence and Potential Implications of Problematic Social Media Use

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ABSTRACT. College students spend a significant amount of time using social media, and there is evidence that at least some of the rapid growth in social media use may be driven by social media companies’ efforts to implement behavioral engineering strategies designed to maximize the amount of time individuals spend on their platforms. The purpose of the present study was to determine whether such behavioral engineering strategies are leading individuals to become addicted to social media and to examine whether those who report problematic social media use (PSMU) may be at risk for mental health problems. Two-hundred ninety-four college students completed an online survey asking about indicators of PSMU, mental health symptoms, and well-being. Depending on the cut score used, between 8.2% and 51.3% of college students may be at risk for PSMU. No matter which cut score was used, participants identified as being at risk for PSMU reported higher levels of mental health symptoms across several domains, as well as lower well-being. These results suggest that individuals who spend time using social media platforms may be at risk for PSMU and highlight the need for clinicians and researchers to establish empirically based diagnostic criteria, as well as effective treatments, for PSMU.

Keywords: social media, assessment, addictive behavior

Social media is fully integrated into society today, and the use of social media is currently the main activity of Internet-users (Jasso-Medrano & López-Rosales, 2018). With the advent of smartphones and the wide variety of platforms available, individuals can now seamlessly switch from site to site when browsing online. Indeed, Hardy and Castonguay (2018) found that millennials switch between media sites an average of 27 times per hour. Currently, the most popular social media platforms are Facebook and Instagram. As of 2017, Facebook had approximately 2 billion monthly users, which corresponds to over 25% of the world’s population (Østergaard, 2017). Facebook’s acquisition of Instagram, a highly visual social media platform, gave way to a broadened user base to include younger generations, in addition to the older population already found on Facebook. Instagram grew rapidly, beginning in 2010 and already had over 500 million users by 2016 (Sherlock & Wagstaff, 2018).

Facebook’s stated mission is “to give people the power to build community and bring the world closer together.” Consistent with that mission, Facebook was originally created to connect college students but has since expanded to connect people from around the world. With billions of users spending roughly 50 minutes per day on social media sites (Brailovskia & Margraf, 2016), it seems as though these platforms may allow individuals the opportunity to express their innate need to belong (Hardy & Castonguay, 2018). Social connection is conceptualized by psychologists as a vital human need, and researchers have long known that social relationships decrease the risk for a host of problems such as depression, alcoholism, and lowered immune response (Cacioppo & Cacioppo, 2014; House, Landis, & Umberson, 1988). As such, social media companies could potentially be viewed as providing a valuable service that contributes to the well-being of a significant proportion of the world’s population.
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Consistent with such a view, some research studies have supported the idea that the connections made via social media may benefit users. Individuals’ social attractiveness increases with the number of Facebook friends they have and is associated with higher life satisfaction (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013; Hardy & Castonguay, 2018; Utz, 2010). Such results support findings that the main motivation to use social networking sites is to facilitate and maintain social relationships in order to increase social capital (Johnston, Tanner, Lalla, & Kawalski, 2013). Social media sites can also serve as a platform for authentic self-presentation, which is associated with positive well-being in users (Berryman, Ferguson, & Negy, 2018). With its integration into daily life, many individuals find their social support online (Hardy & Castonguay, 2018), and college students report using social media as part of their daily routine for reasons such as escaping academic stress, having limited hobbies, and maintaining social relationships (Jasso-Medrano & López-Rosales, 2018). Several studies have also shown that college students frequently use social media sites such as Facebook as a “cry for help” and to openly discuss mental health (Berryman et al., 2018; Jelenchick, Eickhoff, & Moreno, 2013).

Despite the potential benefits of social media use noted by researchers, several studies have also found that frequent social media use correlates with several indicators of psychological distress. For example, there is a significant relationship between Facebook use and depression (Steers, Wickham, & Acitelli, 2014), poor self-esteem (Kalpidou, Costin, & Morris, 2011), high anxiety (Labrague, 2014), high body dissatisfaction (Fardouly & Vartanian, 2015), low self-perceived physical attractiveness (Haferkamp & Kramer, 2011), and lower overall well-being and life satisfaction (Shakya and Christakis, 2017; Tromholdt, 2016). Specifically, for highly visual social media sites such as Instagram, social comparison may play an important role, acting as a mediator for psychological well-being, such that the more people use Instagram and the more people they follow, the higher their levels of depressive symptoms and body dissatisfaction and the lower their self-esteem (Sherlock & Wagstaff, 2018; Tiggemann, Hayden, Brown, & Veldhuis, 2018). Consistent with such results, Shensa, Sidani, Dew, Escobar-Viera, and Primack (2018) found that using multiple social platforms is associated with increased levels of anxiety and depression, and excessive social media use has been strongly linked with poor sleep quality (Xanidis & Bignell, 2015).

Although such correlational studies cannot demonstrate causation, some recent studies have revealed that social media use does indeed appear to cause negative effects for users. Using a longitudinal design, Shakya and Christakis (2017) found that more active Facebook users showed worsening mental health and well-being over time, even when controlling for initial well-being. In another study, Tromholdt (2016) utilized an experimental design and found that Facebook users who abstained for a week had higher life satisfaction and mental well-being than those who did not abstain. Several other recent experimental studies have found that viewing images and appearance-related comments on Instagram leads to increased negative mood, anxiety, body dissatisfaction, drive for thinness, and decreased self-compensation and self-esteem, particularly for female users (Brown & Tiggemann, 2016; Hendrickse, Arpan, Clayton, & Ridgeway, 2017; Kleemans, Daalmans, Carbaat, & Anschutz, 2018; Sherlock & Wagstaff, 2018; Slater, Varsani, & Diedrichs, 2017; Tiggemann & Barbato, 2018; Tiggemann et al., 2018).

The undesirable outcomes associated with time spent on social media raise important questions about why the social connections touted by companies in their mission statements may have negative, rather than positive, effects on users. One possible explanation for this apparent paradox is that the kind of social connectivity accessed by social media use is not of sufficient quality to contribute to well-being. Because social media companies are almost entirely dependent on advertising revenue, their business model focuses on having the highest number of users possible spending as much time on their platform as possible. As recently stated by a former Facebook employee, “You have a business model designed to engage you and get you to basically suck as much time out of your life as possible and then selling that attention to advertisers” (Anderson, 2018). Theoretically, such companies could focus on maximizing the quality of the social connections they foster in order to achieve their desired quantity of user time and associated advertising revenue.

Unfortunately, there is evidence that these companies are instead investing heavily in behavioral engineering strategies designed solely to maximize user time on their platforms, and perhaps even entice users to become addicted. As noted by a former social media employee in a recent interview, “Behind every screen on your phone, there are generally like literally a thousand engineers that have worked on this thing to try to
make it maximally addicting” (Anderson, 2018). For example, Facebook and Instagram use artificial intelligence, that is informed by data based on user behavior, and a variable ratio schedule of reinforcement to customize user news feeds. This may be done not to inform, but rather to appeal to strong emotions and intermittently surprise users in order to spark dopaminergic reward pathways and keep users looking, posting, and sharing at as high a rate as possible for as long as possible (Deibert, 2019; Turel, He, Xue, Xiao, & Bechara, 2014). Other examples of behaviorally engineered “features” designed to promote addictive behavior include notifications (i.e., discriminative stimuli that prime users to pay attention to social media throughout the day so they can access the rewards doled out on that variable ratio reinforcement schedule), “streaks” on SnapChat that reward users for sending as many consecutive messages as possible, and auto-play on YouTube, which starts a new video as the one being watched ends so that users mindlessly keep watching as long as possible. All social media sites keep new content coming in an endless feed so that users have to opt out rather than opt in, which is a well-known way to increase compliance with desired behaviors due to the “status quo bias” (Samuelson & Zeckhauser, 1988). These habit-forming features are intentionally integrated throughout all social media platforms, and their effects on users are well-known to the companies themselves. As noted by a former Facebook employee, “there was definitely an awareness of the fact that the product was habit-forming and addictive” (Anderson, 2018).

There is a burgeoning consensus that such behavioral engineering efforts are successful in increasing user time on social media and may also be leading to addictive behavior in some individuals. For example, approximately 24% of U.S. teens report being online “almost constantly” with most of that time being spent on social media applications (Barry, Sidoti, Briggs, Reiter, & Lindsey, 2017). Zaremohzzabieh, Samah, Omar, Bolong, and Kamarudin (2014) argued that Facebook addiction is similar to other behavioral addictions such as gambling, shopping, or even abusing substances. Consistent with such a view, excessive social media use is believed to be associated with loss of control, negative repercussions (i.e., impairments to daily functioning), poor selective and sustained attention, reduction in physical activity, giving up other interests and activities, and an anxiety to remain connected (Echeburúa, 2013; Kim, Kim, & Jee, 2015). Additionally, researchers have found neurobiological differences in individuals with social media addiction that are consistent with those found in individuals with substance use disorders such as reduced gray matter in the insula (Turel, He, Brevers, & Bechara, 2018). Further supporting the validity of the concept of social media addiction are the findings of Beison and Rademacher (2017) that a family history of alcohol dependence may exist. Indeed, the DSM-5 includes proposed diagnostic criteria for Internet gaming disorder as a “condition for further study,” and the most recent version of the International Classification of Diseases (World Health Organization, 2018) includes gaming disorder as an official diagnosis in its section on Disorders due to addictive behaviours.” Expanding this work, several researchers have proposed that social media addiction is also a legitimate disorder, while also noting significant and problematic variability across studies in how social media addiction is defined and measured (see Ryan, Chester, Reece, & Xenos, 2014, for a review).

In an attempt to develop a reliable and valid measure of social media addiction, van den Eijnden, Lemmons, and Valkenburg (2016) modified the proposed DSM-5 criteria for Internet gaming disorder to be applicable to social media use, thus creating the Social Media Disorder Scale (SMDS-9). The authors did so based on the belief that Internet gaming disorder and problematic social media use (PSMU) are specific forms of the broader construct of Internet addiction. Supporting that belief, van Eijnden and colleagues conducted a psychometric evaluation of the SMDS-9 and evaluated its test-retest and internal consistency reliability, factor structure, content, convergent, and criterion validity, and sensitivity and specificity. The authors concluded that the SMDS-9 could provide a reliable and valid measure of PSMU (see van den Eijnden et al., 2016, for details).
Another important consideration that needs to be addressed is the prevalence of PSMU. Because prevalence estimates are necessarily affected by the cut score that is used as part of the determination of whether an individual may meet diagnostic criteria for any disorder, it is critical to determine how many symptoms an individual must exhibit to potentially qualify for a diagnosis of PSMU. In their study, van den Eijnden and colleagues (2016) used a cut score of 5 out of 9 symptoms, which is the experimental cut score proposed in the DSM-5 for Internet gaming disorder, and found that between 7.3% and 11.6% of adolescents across three studies met criteria for PSMU. However, the DSM-5 notes that a cut score of 5 symptoms provides a conservative definition of Internet gaming disorder that may be adjusted as empirical evidence accumulates. Indeed, the DSM-5 criteria for substance use disorders requires the presence of only 2 symptoms, whereas the criteria for gambling disorder requires the presence of 4 symptoms. This uncertainty around cut scores raises the possibility that the actual prevalence of PSMU may increase if a cut score lower than 5 is eventually adopted.

Finally, it is also necessary to determine whether PSMU has negative impacts aside from those included in the symptoms themselves. For example, do individuals who show PSMU have worse mental and/or physical health than those who do not? Van den Eijnden and colleagues (2016) found that SMD-9 scores were significantly correlated with depression, loneliness, attentional problems, impulsivity, and low self-esteem. However, it is important to note that the correlations were not particularly strong, ranging from .19 to .37, nor did the researchers determine whether there were significant differences on those variables between those who met their criteria for PSMU and those who did not.

The current study sought to add to the research literature on social media addiction by examining the percentage of college students who may be at risk for PSMU. Expanding the work of van den Eijnden and colleagues (2016), we elected to evaluate two cut scores in the present study: the conservative cut score of 5 used in the DSM-5 experimental criteria for Internet gaming disorder, and the more liberal cut score of 2 used in the established and widely used DSM-5 substance use disorder diagnostic criteria (American Psychiatric Association, 2013). It was hypothesized that those who met either cut score for PSMU would report higher levels of mental health symptoms and lower well-being.

**Method**

**Participants**

Data was collected between September and December 2018 using a Qualtrics survey that was distributed to students at a private university in the northwest United States via Facebook posts and an online research participation system for students enrolled in an introductory psychology course (n = 294). The sample averaged 18.9 years of age (SD = 1.2) and was comprised of 61.1% first-year students, 18.2% second-year students, 8.1% third-year students, and 11.8% fourth-year students. Women comprised 77% of the sample. Reported ethnicities included White or European American (58.6%), Asian American (16.0%), Hispanic or Latino (14.9%), Hawaiian/Pacific Islander (4.4%), Black or African American (2.4%), and Native American or Alaska Native (1.0%). Ninety-five percent of respondents reported being native English speakers and 94.3% reported the United States as their country of origin. Eighty-three percent of participants’ parents or grandparents attended college. Eighty-eight percent of participants reported being heterosexual, 1.4% were gay or lesbian, and 8.8% were bisexual.

**Procedures**

Participants completed an online survey comprised of the Social Media Disorder Scale-9 (SMDS-9), the Symptoms and Assets Screening Scale (SASS), and a demographic survey. Students currently enrolled in introductory psychology classes received class credit for survey completion. The University of Portland institutional review board approved all procedures and materials used in this study, and each participant provided informed consent prior to completing the study.

**Measures**

**Social Media Disorder Scale-9 (SMDS-9).** The SMDS-9 is a 9-item instrument designed to assess whether a respondent potentially displays disordered social media use. The SMDS-9 items were modified versions of the proposed diagnostic criteria for Internet gaming disorder, which is included in the DSM-5 (American Psychiatric Association, 2013). Participants responded “yes” or “no” to nine items such as “During the past year, have you tried to spend less time on social media, but failed?” Affirmative responses were summed to create a score for each participant who indicated the number of PSMU symptoms they reported experiencing in the past year. Psychometric evaluation of
the SMDS-9 revealed internal consistency reliability coefficients (Cronbach’s α) ranging from .76 to .83 for the 9-item scale across three studies, and a test-retest reliability coefficient of .66. Regarding validity, SMDS-9 scores were significantly and positively correlated with compulsive Internet use (r = .51) and self-declared social media addiction (r = .48; see van den Eijnden et al., 2016 for additional psychometric data).

Because an empirically based cut score for PSMU has not yet been determined, we elected to examine cut scores of 5 (i.e., the experimental cut score for Internet gaming disorder) and 2 (i.e., the established cut score for substance use disorders) in the present study. Participants who endorsed 5 or more out of 9 symptoms were defined as at-risk for “High Cut Score PSMU” and those who endorsed 2 or more symptoms were defined as at-risk for “Low Cut Score PSMU.”

**Symptoms and Assets Screening Scale (SASS).**

The SASS is a 30-item self-report screening measure that was developed to assess mental health in the college student population. Participants rated each of the 30 items on a 4-point Likert-type scale ranging from 0 (not true) to 3 (certainly true). The SASS generates a 23-item overall psychological distress score ranging from 0 to 69, as well as the following 5-item subscale scores ranging from 0 to 15: Depressive Symptoms (e.g., “I feel hopeless”), Anxious Symptoms (e.g., “I get scared easily or often feel afraid”), Substance Problems (e.g., “I have difficulty limiting or cutting down on my use of alcohol or drugs”), Eating Problems (e.g., “I am very afraid of gaining weight or becoming fat”), and Well-Being/Assets (e.g., “I feel good about myself”). A psychometric evaluation of the SASS generated internal consistency reliability coefficients (Cronbach’s α) ranging from .73 to .81 for the five subscales and .86 for the 23-item overall distress measure, as well as test-retest coefficients ranging from .75 to .83 for the subscales and .87 for the overall distress scale. In the same study, the SASS subscales and overall distress scale were significantly and positively correlated with well-established measures of their respective constructs with coefficients ranging from .68 to .83 (see Downs, Boucher, Campbell, & Dasse, 2013, for additional psychometric data).

**Demographics.** The survey ended with demographic questions, including gender, age, ethnicity, country of origin, native language, sexual orientation, and year in college.

### Results

**Prevalence of PSMU**

Table 1 shows the percentage of participants who endorsed each possible number of indicators of PSMU (0 through 9). Overall, 8.1% of participants (4.5% of men and 9.2% of women) qualified as at risk for High Cut Score PSMU, as measured by the conservative experimental criteria of 5 or more indicators used to identify Internet gaming disorder. Over 51% of participants (37.9% of men and 54.8% of women) qualified as at risk for Low Cut Score PSMU as measured by the more liberal criteria of 2 or more indicators used to identify substance use disorders. Men endorsed a mean of 1.26 (SD = 1.49) out of 9 PSMU indicators, whereas women endorsed a significantly higher mean of 1.85 (SD = 1.67) indicators, t(290) = 2.61, p = .009, d = 0.37.

Table 2 shows the percentage of participants who endorsed each specific indicator of PSMU. As seen in the table, the most common indicators reported by participants were trying to spend less time on social media but failing, and using social media to escape from negative feelings. The least common indicator reported by participants was having serious conflicts with family, friends, or others because of social media use.

**PSMU and Mental Health**

Presented in Table 3 are bivariate Pearson correlation coefficients for all study variables. As expected, the number of PSMU indicators endorsed by participants was significantly correlated with all mental

<table>
<thead>
<tr>
<th>Number of Indicators</th>
<th>Percentage of All Participants</th>
<th>Percentage of Men</th>
<th>Percentage of Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>24.7</td>
<td>38.3</td>
<td>21.1</td>
</tr>
<tr>
<td>1</td>
<td>21.8</td>
<td>20.0</td>
<td>22.1</td>
</tr>
<tr>
<td>2</td>
<td>29.1</td>
<td>25.0</td>
<td>30.5</td>
</tr>
<tr>
<td>3</td>
<td>11.3</td>
<td>5.0</td>
<td>12.7</td>
</tr>
<tr>
<td>4</td>
<td>4.7</td>
<td>6.7</td>
<td>4.2</td>
</tr>
<tr>
<td>5</td>
<td>5.5</td>
<td>3.3</td>
<td>6.1</td>
</tr>
<tr>
<td>6</td>
<td>1.8</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>7</td>
<td>0.4</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>8</td>
<td>0.4</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>9</td>
<td>0.4</td>
<td>0</td>
<td>0.5</td>
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</table>
health symptoms. Specifically, PSMU indicators were significantly and positively correlated with eating problems, $r(293) = .33$, $p < .001$, anxiety symptoms, $r(293) = .27$, $p < .001$, depressive symptoms, $r(293) = .22$, $p < .001$, substance use problems, $r(223) = .15$, $p = .03$, and total symptoms, $r(291) = .34$, $p < .001$, and were significantly inversely correlated with well-being, $r(291) = -.23$, $p < .001$. Also as expected, all mental health symptom subscale scores on the SASS were significantly positively correlated with each other, and were significantly inversely correlated with well-being.

Following those correlational analyses, a series of independent-samples $t$ tests were conducted to determine whether participants who were considered at risk for PSMU reported more mental health symptoms than those who were not classified at risk for PSMU. Because there is not yet an established cut score for a potential diagnosis of PSMU, we first compared participants who endorsed 5 or more indicators (High Cut Score PSMU) with those who endorsed 4 or fewer indicators, and then compared participants who endorsed 2 or more indicators (Low Cut Score PSMU) with those who endorsed 0 or 1 symptoms.

**High Cut Score PSMU.** As seen in Table 4 and consistent with our hypothesis, those who were at risk for High Cut Score PSMU (5 or more symptoms) reported significantly higher levels of total mental health symptoms, depressive symptoms, anxiety symptoms, and problematic eating symptoms than did those who were not at risk for High Cut Score PSMU (4 or fewer symptoms). There were no differences between those at risk for High Cut Score PSMU and those not at risk for High Cut Score PSMU on reported levels of well-being or substance use problems.

**Low Cut Score PSMU.** Table 5 shows the mental health symptom and well-being scores for those categorized as at risk for and not at risk for PSMU when the cut score was dropped down to the more liberal criteria of two or more indicators. Those who were at risk for Low Cut Score PSMU (2 or more symptoms) reported significantly higher levels of total mental health symptoms, depressive symptoms, anxiety symptoms, and problematic eating symptoms than those who were not classified as at risk for Low Cut Score PSMU reported more mental health symptoms than did those who were not at risk for High Cut Score PSMU (4 or fewer symptoms). There were no differences between those at risk for High Cut Score PSMU and those not at risk for High Cut Score PSMU on reported levels of well-being or substance use problems.

**TABLE 2**

<table>
<thead>
<tr>
<th>Problematic Social Media Use Indicators</th>
<th>Percentage of All Participants</th>
<th>Percentage of Men</th>
<th>Percentage of Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly found that you can’t think of anything else but the moment that you will be able to use social media again</td>
<td>7.4</td>
<td>9.1</td>
<td>7.0</td>
</tr>
<tr>
<td>Regularly felt dissatisfied because you wanted to spend more time on social media</td>
<td>8.1</td>
<td>10.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Often felt bad when you could not use social media</td>
<td>18.2</td>
<td>15.2</td>
<td>19.3</td>
</tr>
<tr>
<td>Tried to spend less time on social media, but failed</td>
<td>51.4</td>
<td>34.8</td>
<td>56.6</td>
</tr>
<tr>
<td>Regularly neglected other activities (e.g., hobbies, sports, etc.) because you wanted to use social media</td>
<td>15.9</td>
<td>9.1</td>
<td>17.5</td>
</tr>
<tr>
<td>Regularly had arguments with others because of your social media use</td>
<td>6.4</td>
<td>1.5</td>
<td>7.9</td>
</tr>
<tr>
<td>Regularly lied to your family or friends about the amount of time you spend on social media</td>
<td>11.8</td>
<td>9.1</td>
<td>12.7</td>
</tr>
<tr>
<td>Often use social media to escape from negative feelings</td>
<td>51.4</td>
<td>37.9</td>
<td>54.8</td>
</tr>
<tr>
<td>Had serious conflict with your family, friends, or other people because of your social media use</td>
<td>1.7</td>
<td>0.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

**TABLE 3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Problematic Social Media Use Indicators</td>
<td>–</td>
<td>.33*</td>
<td>.13</td>
<td>.27*</td>
<td>.22*</td>
<td>.34*</td>
<td>.23*</td>
</tr>
<tr>
<td>2. Eating Problems</td>
<td>–</td>
<td>.38*</td>
<td>.41*</td>
<td>.47*</td>
<td>.71*</td>
<td>-.36*</td>
<td></td>
</tr>
<tr>
<td>3. Substance Problems</td>
<td>–</td>
<td>.24*</td>
<td>.40*</td>
<td>.55*</td>
<td>-.21*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Anxiety Symptoms</td>
<td>–</td>
<td>–</td>
<td>.70*</td>
<td>.83*</td>
<td>-.53*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Depressive Symptoms</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>.88*</td>
<td>-.66*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Total Symptoms</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>-.63*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Well-Being</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>-.31*</td>
<td></td>
</tr>
</tbody>
</table>

Note: *$p < .05...p < .001.$
the prevalence of PSMU may range from 8.2% to 51.3% among college students, depending on the cut score used.

These findings raise interesting questions about just how successful the behavioral engineering efforts of social media companies are in fostering addictive behavior in users by "exploiting a vulnerability in human psychology" in order to "consume as much user time as possible" as stated by Facebook’s founding president in a recent interview (Anderson, 2018; Deibert, 2019). On the one hand, a prevalence estimate of 51.3% would seem to be quite high for any psychological disorder. However, there is some evidence that the actual prevalence of PSMU may be significantly higher than the estimates of 8.2% generated in this study and the 7.3% and 11.6% found by van den Eijnden and colleagues (2016) using the same conservative high cut score of 5 indicators.

Specifically, previous studies have generated prevalence estimates ranging from 33% to 50% for psychological problems such as depression and anxiety in the college student population (Eisenberg, Gollust, Golberstein, & Hefner, 2007; Garlow, Rosenberg, Moore, Haas, Koestner, Hendin, & Nemeroff, 2008; Hunt & Eisenberg, 2010), and recent surveys from the American College Health Association (2018) found that 31.1% of students reported being diagnosed with or treated for a psychological disorder in the previous 12 months. In other words, it is quite common for college students to meet diagnostic criteria for at least one psychological disorder at any given time. In addition, research has revealed that the primary activity college students are using their cell phones for is to access social media (Barry et al., 2017; Jasso-Medrano & López-Rosales, 2018). Indeed, researchers have found that social media use, rather than gaming or Internet use, is the primary driver of smartphone addiction in college students (Roberts, Petnji Yaya, & Manolis, 2014).

As researchers, clinicians, and diagnostic systems such as the DSM-5 (American Psychiatric Association, 2013) and the International Classification of Diseases (World Health Organization, 2018) increasingly recognize the existence of behavioral addictions such as gambling disorder and Internet gaming disorder, it seems likely that PSMU (or a closely related variant) will likely be recognized as a legitimate behavioral addiction in the future. As such, it will be critically important to determine the exact diagnostic criteria for PSMU, including the proper DSM-5 cut score to be used for diagnostic and research purposes. Doing so will require evaluating the sensitivity and specificity of different cut scores when compared to independent measures of diagnostic status (e.g., clinician report) and clinically significant impairment or distress (e.g., serious problems at work, home, or with social relationships) in order to validate PSMU as a legitimate disorder and to guard against false positives (incorrectly pathologizing normal behavior) and false negatives (failing to diagnose actual pathological behavior).

Alternatively, as clinicians and researchers increasingly conceptualize most forms of psychopathology as dimensional, rather than categorical phenomena (American Psychiatric Association, 2013), it is quite possible that PSMU may be more

### TABLE 4

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating Problems</td>
<td>6.58</td>
<td>(3.34)</td>
<td>4.96</td>
<td>(3.26)</td>
<td>2.33</td>
<td>.021</td>
<td>0.49</td>
</tr>
<tr>
<td>Substance Problems</td>
<td>1.50</td>
<td>(2.40)</td>
<td>1.01</td>
<td>(2.02)</td>
<td>1.11</td>
<td>.269</td>
<td>0.22</td>
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<td>(3.94)</td>
<td>4.72</td>
<td>(3.74)</td>
<td>3.00</td>
<td>.003</td>
<td>0.63</td>
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<tr>
<td>Depressive Symptoms</td>
<td>5.08</td>
<td>(3.88)</td>
<td>3.58</td>
<td>(3.33)</td>
<td>1.98</td>
<td>.048</td>
<td>0.40</td>
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<td>Total Symptoms</td>
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<td>(12.60)</td>
<td>17.95</td>
<td>(11.15)</td>
<td>5.31</td>
<td>.000</td>
<td>0.58</td>
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<tr>
<td>Well-Being</td>
<td>9.29</td>
<td>(3.14)</td>
<td>10.27</td>
<td>(3.11)</td>
<td>1.47</td>
<td>.142</td>
<td>0.31</td>
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### TABLE 5

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<th>Variable</th>
<th>M</th>
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<th>SD</th>
<th>t</th>
<th>p</th>
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<td>Eating Problems</td>
<td>5.97</td>
<td>(3.45)</td>
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<td>4.70</td>
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<td>(2.53)</td>
<td>0.85</td>
<td>(1.37)</td>
<td>1.64</td>
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<td>(3.80)</td>
<td>4.08</td>
<td>(3.65)</td>
<td>3.74</td>
<td>.000</td>
<td>0.44</td>
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<td>(3.96)</td>
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<td>(2.94)</td>
<td>3.68</td>
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<tr>
<td>Total Symptoms</td>
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<td>(12.27)</td>
<td>15.06</td>
<td>(9.31)</td>
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<td>Well-Being</td>
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<td>10.90</td>
<td>(2.09)</td>
<td>3.89</td>
<td>.000</td>
<td>0.40</td>
</tr>
</tbody>
</table>
Problematic Social Media Use | Tanega and Downs

appropriately conceptualized as dimensional, thus potentially negating the need to identify a single specific cut score for diagnostic purposes. Rather, any person who displays one or more indicators could potentially be considered to be displaying PSMU, depending on the extent to which their social media use causes clinically significant impairment and/or distress. The results of this study provide some support for a dimensional conceptualization of PSMU as all of the mental health problems assessed were significantly correlated with the number of PSMU indicators reported by participants. Further, even those who reported relatively mild levels of PSMU (i.e., two or more indicators) appeared to be at risk for experiencing distress or impairment, as they reported significantly higher levels of overall psychological distress, anxiety symptoms, depressive symptoms, and disordered eating symptoms, as well as lower well-being, than did those who reported one or zero indicators of PSMU. A third possibility is that a combined approach may emerge as most appropriate for assessing PSMU with cut scores denoting different levels of severity. Such a system would be analogous to how the DSM-5 currently classifies substance use disorders as mild, moderate, or severe, depending on the number of symptoms present (American Psychiatric Association, 2013).

Of course, our study cannot prove that PSMU caused the mental health symptoms participants were experiencing because one could reasonably hypothesize that individuals who experience more mental health problems may subsequently be at risk for developing PSMU. However, there is accumulating evidence that problematic (or even “normal”) social media use may indeed cause impairment and/or distress. Using prospective experimental designs, researchers have demonstrated that active Facebook users show worsening mental health and well-being over time (Shakya & Christakis, 2017) and that Facebook users who abstain for a period of time as short as a week experience improvements in well-being (Tromholt, 2016). Individuals exposed to images on Instagram show immediate increases in a host of negative mental health variables such as body dissatisfaction, anxiety, depressive symptoms, and immediate decreases in self-esteem and self-compassion (Brown & Tiggemann, 2016; Hendrickse et al., 2017; Kleemans et al., 2018; Sherlock & Wagstaff, 2018; Slater, Varsani, & Diedrichs, 2017; Tiggemann & Barbato, 2018; Tiggemann et al., 2018). These experimental studies are consistent with our findings and provide support for the notion that PSMU may have significant negative impacts on individuals’ mental health and well-being.

Such findings raise questions about why social media, which is purportedly designed to increase social connections, may paradoxically have negative effects on users. Researchers have pointed to the social comparisons that social media platforms foster such that, as users scroll their social media feeds and see others apparently doing well, they often try to boost their own self-image, which perpetuates a “self-enhancement envy spiral” (Krasnova et al., 2015). In other words, an ongoing competition may arise on social media sites as individuals compare themselves to the content they consume, with subsequent negative feelings arising if they perceive themselves as doing less well than others. Consistent with such an interpretation, studies have found that social comparison is an important variable that mediates the negative effects that exposure to Instagram has on body dissatisfaction and drive for thinness (Hendrickse et al., 2017; Kleemans et al., 2018). Similarly, Hanna and colleagues (2017) found that social comparison and self-objectification mediated the relationship between Facebook use and body shame, symptoms of depression and anxiety, and low self-esteem. Other researchers have noted that the pressure to appear as perfect offline as a person appears online may further increase an individual’s social comparison and anxiety levels even when not engaging with social media (Rauch, Strobel, Bella, Odachowski, & Bloom, 2014).

If some users experience negative emotions as a result of using social media platforms, it may be fair to ask why those users do not simply spend less time using social media. Continued use despite negative consequences is a pattern consistent with the behavior of many individuals with substance use disorders who continue to use substances despite negative consequences is a pattern consistent with the behavior of many individuals with substance use disorders who continue to use substances despite negative impacts on their health, relationships, and ability to function at school and/or work. Recent research has suggested that these similarities may be due, at least in part, to neurobiological factors such as reduced gray matter in the posterior insula that may cause increases in delay discounting (Turel et al., 2018; Wood & Bechara, 2014), in which individuals show a stronger preference for immediate rewards despite the potential negative long-term consequences of their behavior. In other words, just as cues and the high associated with substance abuse are known to trigger the brain’s impulsive reward seeking system (e.g., dopamine pathways in the ventral striatum) and reduce activity in
inhibitory systems (e.g., prefrontal and orbitofrontal cortex; He et al., 2018), the cues and immediate rewards engineered into social media platforms may have a similar effect, causing some individuals to compulsively pick up their smartphone and get on social media even if doing so may have the long-term effect of worsening their quality of life. Given that research on social media addiction is relatively new, it is not currently known whether PSMU leads to the neurobiological differences reported by Turel and colleagues, or if pre-existing differences in brain structure and function may predispose certain individuals to be at higher risk for developing problematic social media use.

Limitations, Conclusions, and Recommendations
This study was limited by a cross-sectional design and a reliance on an online self-report survey that introduced the possibility of biased responding and did not allow for causal explanations. It is also important to note that our categorization of participants as being at risk for or not at risk for PSMU was based solely on participant report on a single checklist, which is not at all analogous to a valid psycho-diagnostic evaluation. Ideally, future studies would include a multimethod, multiinfomrant evaluation of PSMU symptoms in order to more accurately categorize participants and determine proper cut scores, and to evaluate whether a dimensional or combined approach to understanding PSMU may be more appropriate than a categorical approach.

Another limitation was the disproportionately high percentage of women and younger college students in the sample and low percentage of African American participants, which limits the generalizability of the findings. Although women make up more than 60% of the student population where this study was conducted, women comprised 77% of the sample, and the average participant age of the sample was 18.9 years old, a reflection of the students enrolled in Introductory Psychology when the study was conducted. We considered analyzing our data separately by gender, however, it was not feasible to do so because of the small number of men (n = 3) who were at risk for High Cut Score PSMU. Future studies should seek to address whether there are gender differences in the extent to which PSMU is associated with psychological distress and/or impairment, as our results suggested that women may be at higher risk for PSMU than are men. Finally, our study did not ask participants to report their time using social media, which would have allowed us to examine how time spent on social media related to indicators of PSMU.

Despite those limitations, this study generated some interesting results that raise legitimate concerns that the behavioral engineering efforts of social media companies may be fostering addictive behavior in a significant proportion of users. Thus, it is critically important that researchers, clinicians, and those interested in public health continue to determine exactly how PSMU can be accurately assessed, diagnosed, and treated. However PSMU may come to be defined in the future, our results suggest that those who display even mild levels of PSMU may be at risk for a range of negative mental health effects including increased symptoms of depression, anxiety, eating problems, and overall psychological distress.

Moving forward, it will be important for researchers to examine both the short-term and long-term impacts of PSMU to determine the level of risk associated with social media use problems. Future studies should also seek to elucidate the specific mechanisms by which PSMU may impact mental health. Finally, it will be necessary to conduct longitudinal studies to examine the effects of PSMU on brain structure and function because such research is currently in its infancy. These are especially vital questions to answer because the current generation of young people will never know a world without social media, and the long-term effects of social media use have yet to be investigated.

References
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