A Pilot Evaluation of Associations Between Displayed Depression References on Facebook and Self-reported Depression Using a Clinical Scale

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Abstract

The objective of this study was to determine associations between displayed depression symptoms on Facebook and self-reported depression symptoms using a clinical screen. Public Facebook profiles of undergraduates from two universities were examined for displayed depression references. Profiles were

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categorized as depression symptom displayers or non-displayers. Participants completed an online PHQ-9 depression scale. Analyses examined associations between PHQ-9 score and depression symptom displayers versus non-displayers. The mean PHQ-9 score for non-displayers was 4.7 (SD= 4.0), the mean PHQ-9 score for depression symptom displayers was 6.4 (SD= 5.1; p= 0.018). A trend approaching significance was noted that participants who scored into a depression category by their PHQ-9 score were more likely to display depression symptom references. Displayed references to depression symptoms were associated with self-reported depression symptoms.

Introduction

Depression among college students is common and the prevalence of depression diagnoses among college students has increased 56% in the last six years.[1–3] Given that approximately half of young adults attend post-secondary education, colleges are an important setting in which mental health concerns such as depression must be addressed.[4] The most common form of depression within the adolescent and young adult age group is major depressive disorder, which has a yearly incidence of approximately 8%.[1, 5, 6] However, an additional 22% of adolescents and young adults suffer from "sub-diagnostic" levels of depressive symptoms.[7] Both those with a major depression diagnosis and those with depression symptoms experience impaired functioning and morbidity.[8] Adverse outcomes of depression include increased rates of substance use, comorbid psychiatric conditions, and suicide.[5, 9–12]

Despite the prevalence of depression in this population, college students struggling with depression symptoms are frequently undiagnosed as many students do not perceive a need for help or do not seek clinical services.[1, 6, 13] Concerns about the stigma related to mental illness are also associated with less perceived need for help and decreased treatment seeking behavior.[14] While 30% of college students report feeling so depressed in the last 12 months that it was difficult to function, only 10% of college students report seeking any type of mental health care in the past year.[3, 15] Other barriers to help-seeking include lack of knowledge about available services and privacy concerns.[1] Given the frequency and consequences of depression as well as the inadequacy of current help-seeking among college students, innovative methods to identify those at risk and provide them appropriate services are warranted.

Social networking web sites (SNSs) may present new opportunities to investigate depression among college students. Over 90% of college students use Facebook.com, the most popular SNS in this population.[16–18] Previous work illustrates that computers elicit higher levels of self-disclosure and uninhibited personal expression.[19–21] References to personal information or health risk behaviors, such as substance use and sexual behavior, are common on SNS profiles.[22–24] Some college students display depression symptom references on "status updates," personally written text describing the profile owner's current experience or emotion.[25] Examples include "Matt is feeling really depressed this week," or "Diane can't stop the tears." Previous work found that approximately a quarter of publicly available Facebook profiles by undergraduates display depression symptoms, and 2.5% of profiles display depression symptoms in patterns consistent with the Diagnostic and Statistical Manual (DSM-IV) criteria for a major depressive episode (MDE). As the majority of college students' profiles are public, this information is available to students' peers, instructors, health providers as well as others within that university Facebook network.[18] Recent media stories highlight tragic suicides of young adults that were referenced on Facebook prior to being carried out; illustrating the urgent need to better understand the validity of displayed references to depression and other mental health concerns.[26, 27] The objectives of this pilot study were to examine the validity of references to depression symptoms on public Facebook profiles by comparing these references to self-reported depression symptoms using the Patient Health Questionnaire (PHQ-9) depression screening tool.

Methods

This study was conducted between September 1, 2009 and September 15, 2010 and received IRB approval from both the University of Wisconsin and the University of Washington.

Setting and subjects

This study used the SNS Facebook (www.Facebook.com) as it is the most popular SNS among the target population of college students.[28, 29] Publicly available Facebook profiles of undergraduate students who were members of two large state university Facebook networks were investigated. Profile owners were selected for the study if their reported age on the profile was between 18 and 20 years old and the profile showed evidence of activity in the last 30 days. Only profiles for which profile owners could be recruited to the study by calling a phone number listed on either the Facebook profile or the university directories were included.

Profile selection

Eligible profiles were identified by a random search of the freshmen, sophomore, and junior undergraduate classes at the two selected universities using the Facebook search engine. Because the Facebook search engine is subject to error, all profiles returned in the searches were reviewed manually to confirm inclusion criteria were met. Profiles were excluded if they did not meet search criteria, including those who were not undergraduates ($n=448$), did not meet the age criteria ($n=313$), or did not display their age ($n=49$). Profiles were also excluded due to privacy settings that prevented identification of depression symptoms, including having any one of the following sections set to private: information section, wall, or photographs ($n=1,630$), or if a profile examination revealed that they would not be reachable for recruitment as no contact information (phone number or email) was listed on the profile or in the university directory ($n=303$). A total of 307 profiles met all inclusion criteria and were evaluated.

Codebook and variables

All eligible profiles were evaluated by one of three trained coders using a SNS research codebook, which was developed and used in previous work evaluating displayed depression symptom references on SNS profiles.[23, 25] From each SNS profile that met inclusion criteria, demographic data and displayed depression symptom reference data were recorded, including verbatim text from profiles. If present, identifiable information was removed from text references. References to depression symptoms were defined using the DSM-IV symptom criteria for a MDE.[30] The criteria for MDE included depressed mood, loss of interest/pleasure in activities, appetite changes, sleep problems, psychomotor agitation or retardation, energy loss, feeling worthless or guilty, decreased concentration or suicidal ideation.[30] Status updates were considered a depression symptom reference if they fit one of the described depression criteria by keyword or a synonym. For example, one symptom keyword of major depression is "hopeless," therefore a status update stating "I feel hopeless" would be coded as a reference to depression. The term "giving up" is a synonym of "hopeless," therefore, a status update disclosing "I feel like giving up" would be coded as a reference to depression. Status updates that clearly referenced a person other than the profile owner (i.e."Matt is sitting next to me in class and he looks sad"), or references to the common situational experience of having a bad day (i.e. "I'm having a bummer of a day") were not considered depression references.

Profiles were categorized into one of two groups. Profiles without any depression symptom references were considered "non-displayers." Profiles with one or more references to depression symptoms were considered "Depression Symptom Displayers."

Profile evaluation

First, the investigators viewed the "information section" of the profile to obtain demographic information and descriptive variables describing Facebook use. Second, to evaluate depression symptom disclosures, investigators reviewed each profile's status updates from the date of evaluation through the same date 1 year prior. For each status update that included a depression symptom, coders assessed whether the displayed symptom was a match to one of the DSM-IV criteria for a MDE.[30] If so, they recorded verbatim text and the date of disclosure.

A 20% random subsample of profiles were evaluated by all three coders to test interrater reliability. Cohen's kappa statistic was used to evaluate the extent to which there was overall agreement in the coding of the presence or absence of depression symptom references on a profile. Cohen's kappa was 0.79 for depression symptom references.[31]

Recruitment

All profile owners whose profiles met inclusion criteria were telephoned. After verifying the profile owner's identity, the study was explained to the profile owner and permission was requested to send them an email that contained further information about the study. If the participant consented to receive the email, an email was sent to the profile owner's university email account that provided detailed information about the study as well as a link to the online survey. Two different links to identical surveys were used so as to obtain aggregate results without requiring personal identifiers. Subjects in the depression symptom displayer group were emailed a link to one survey; subjects in the non-displayer group were emailed a link to a separate but identical survey. The survey was administered online via a Catalyst WebQ online survey engine. Survey respondents were provided a $15 iTunes gift card as compensation. A total of 307 profiles met inclusion criteria and from these, 224 eligible profile owners participated in the survey (73% response rate) and 215 participants completed all PHQ-9 questions and received a total score.

Survey

The survey evaluated depression using the Patient Health Questionnaire (PHQ-9) clinical screen for depression. This screen is based on DSM-IV criteria for a MDE and has been validated in adult and adolescent populations.[5, 32] The scale inquires about frequency of depression symptoms experienced in the last two weeks, such as depressed mood and hopelessness. Response categories include: not at all, several days, nearly half the days, and nearly every day. PHQ-9 scores range from 0 to 27; a score of less than 5 suggests no depression, a score of 5 or greater suggests depression. Depression diagnostic categories are differentiated as follows: a score of 5–10 suggests the person has mild depression, a score of 11–15 indicates the person has moderate depression, and a score over 15 suggests moderately severe depression.

Analysis

All statistical analyses were conducted using STATA version 11.0 (Statacorp, College Station, TX). Displayed depression categories from Facebook data and demographic characteristics were summarized using descriptive statistics. Bivariate comparisons were performed using Fisher's exact test or Chi-squared tests. To examine associations between displayed depression references on

Facebook and PHQ-9 score, two analyses were performed. First, zero-inflated negative binomial regression was used to examine the relationship between Depression Symptom Displayer/Non-Displayer as the predictor variable and PHQ-9 mean score as the outcome variable. Second, in an exploratory analysis, PHQ-9 scores were dichotomized to represent standard clinical categories: scores of 0 to 4 were considered not indicative of depression; any score 5 or above was indicative of depression (including mild, moderate, and moderately severe depression). Logistic regression was used to evaluate the relationship between depression symptom displayer/non-displayer as the predictor variable and the dichotomized PHQ-9 depression category as the outcome variable.

Results

Subjects

A total of 307 profiles met inclusion criteria and from these, 224 eligible profile owners participated in the survey (73% response rate) and 215 participants completed all PHQ-9 questions and received a total score. Participants had an average age of 18.8 (SD=0.7), and were 54% female and 68% Caucasian. Approximately half of participants were from each university. Please see Table 1 for further descriptive information.

Facebook displayed depression disclosures

Of Facebook profiles coded, 33.9% displayed depression symptoms. Depression symptom displayers were slightly younger ($p=0.04$) and earlier in their college careers ($p=0.01$) compared to non-displayers. Approximately 40% of depression symptom displayers were age 18 compared to

Table 1
Participant information

	Number	Percentage (%)	Mean (SD)
Age	224		18.8 (0.7)
18 years	77	34.4	
19 years	118	52.7	
20 years	29	12.9	
Gender			
Male	102	45.5	
Female	122	54.5	
State			
Washington	101	45.1	
Wisconsin	123	54.9	
Race			
Caucasian/White	152	67.9	
Asian	38	17.0	
Other	8	3.6	
Multiracial	17	7.6	
Missing	9	4.0	
Depression symptom display			
Non-displayer	144	64.1	
Depression symptom displayer	74	33.9	

31% of non-displayers. Women were more likely to display depression symptoms on Facebook than men, 40% of women were depression symptom displayers compared to only 25% of men. Table 2 illustrates these bivariate comparisons.

PHQ-9 score

PHQ-9 scores ranged from 0 to 27, with a mean of 5.2 (SD=4.5) and a median of 4 (IQR 2–11). Overall, 63% of participants scored into the "No Depression" category based on PHQ scores. Using the standard cutoff for the PHQ-9, 27% of participants' responses placed them in the mild depression category (scores between 5 and 9), 8% of participants responses placed them in the moderate depression category (scores between 10 and 15), and 3% responses placed them in the moderately severe depression category (scores over 15). Figure 1 illustrates the distribution of subjects across PHQ depression categories and by displayer/non-displayer status.

Table 2
Bivariate comparisons for depression non-displayers and depression symptom displayers

	Depression non-displayer		Depression symptom displayer		
	Number	**Mean (SD)/%**	**Number**	**Mean (SD)/%**	***p* value**
Age	150	18.9 (0.7)	74	18.7 (0.6)	0.04
18 years	47	31.3%	30	40.5%	
19 years	78	52.0%	40	54.1%	
20–21 years	25	16.7%	4	5.4%	
Graduation year					0.01[a]
2011	14	9.3%	1	1.4%	
2012	57	38.0%	24	32.4%	
2013–2014	71	47.3%	49	66.2%	
Gender					0.01[b]
Male	77	51.3%	25	33.8%	
Female	73	48.7%	49	66.2%	
State					0.45[b]
Washington	65	43.3%	36	48.6%	
Wisconsin	85	56.7%	38	51.4%	
Race					0.66[a]
Caucasian/White	101	66.0%	51	68.9%	
Asian	27	17.6%	11	14.9%	
Other	4	2.6%	4	5.4%	
Multiracial	11	7.2%	6	8.1%	
Missing	7	4.6%	2	2.7%	
PHQ-9 score	141	4.7 (4.0)	74	6.2 (5.1)	0.02[c]
No depression	95	62.1%	40	54.1%	0.22[a]
Mild depression	34	22.2%	23	31.1%	
Moderate depression	9	5.9%	8	10.8%	
Serious depression	3	2.0%	3	4.1%	

[a]*p* value from Fisher's exact test
[b]*p* value from Chi-Square test
[c]*p* value from bivariate zero-inflated negative binomial regression

Gender comparisons revealed that women had higher average PHQ-9 scores (mean=6.4, SD=4.7, median=5.0) compared to men (mean=3.8, SD=3.6, median=3.0) (p=0.001).

PHQ-9 score and Facebook displayed depression

Displayed depression symptom references on Facebook were positively associated with PHQ-9 scores. The mean PHQ-9 score non-displayers was 4.7 (SD=4.0, median=3.0); the mean PHQ-9 score for depression symptom displayers was 6.4 (SD=5.1, median=9.0) (exp(B)=1.31, SE=0.11, p=0.018).

Though it did not reach statistical significance (p=0.056), there was a trend that suggested depression symptom displayers were more likely than non-displayers to score into one of the depression categories (mild, moderate, or severe) based on the PHQ-9 (OR=1.75, 95% CI=0.99–3.13).

Discussion

This is the first study to demonstrate an association between specific content of displayed depression symptom references on Facebook and self-reported depression symptoms using a clinical scale. Findings suggest that depression symptom disclosures on SNSs may be representative of mild depression symptoms. Despite the potential for stigma surrounding mental health symptoms or diagnoses, a third of profiles in this study publicly displayed depression symptom references.

Findings are similar to previous work in which 30% of college students reported that in the last 12 months they have felt so depressed that it was difficult to function; a related study found that 33% of college students reported symptoms of depression.[33] Findings in this study demonstrated that approximately 33% of participants displayed depression symptom references on Facebook.

This pilot evaluation suggests validity for these displayed depression symptom references. However, the mean score for displayers fell within the category of mild depression, rather than moderate or severe depression. Thus, results suggest that students may be using Facebook to
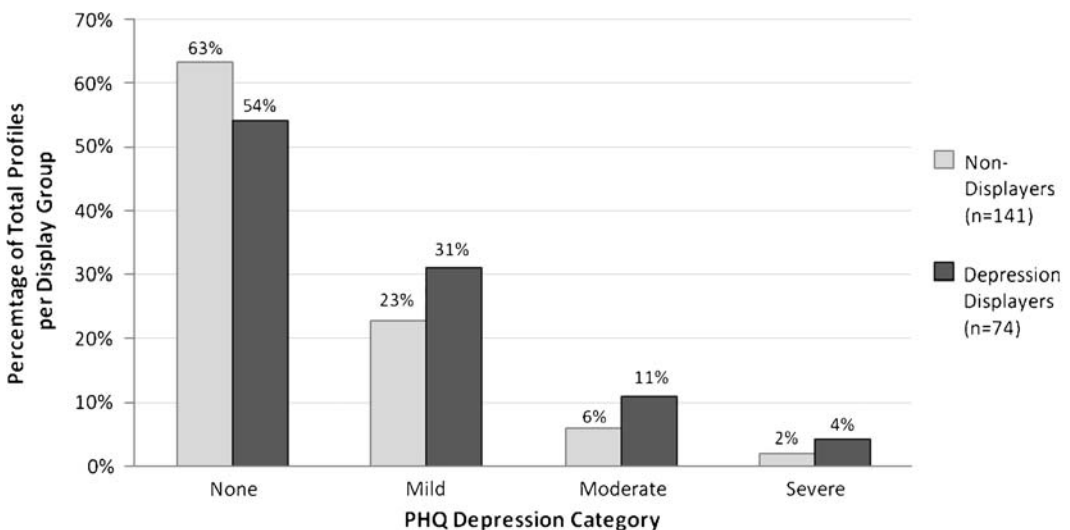

Figure 1

PHQ-9 depression diagnostic category and Facebook profile evaluation

express and potentially receive support for mild depressive symptoms rather than a method to identify students at significant risk for severe depression. Alternative explanations are also possible. Since depression is more recognized as a common condition compared to generations ago, it may be more common for young adults to use these terms without embodying the true diagnostic meaning.

These preliminary findings do not suggest that Facebook should be used to formally diagnose depression; a diagnosis of depression is comprised of symptom patterns over time. Without clinical context including duration, severity, and frequency of the displayed symptoms, formal diagnosis cannot be without clinical evaluation. However, as Facebook displays are marked with a date, it would be possible to observe not only individual references but patterns over time. A previous study applied adapted DSM diagnostic criteria for a major depressive episode to Facebook using symptom and time criteria, and found that 2.5% of Facebook profile disclosures met criteria for a major depressive episode in the past year.[34]

There are several potential limitations of this study. First, this study evaluated Web profiles from only one SNS. The extent to which findings could be generalized to other SNSs is not known; however, Facebook is by far the most common SNS used by college students. Second, because this study focused on college students, generalizing results to other young adult populations may not be warranted. Given that college students are a key population in which mental health problems are common, consequential, and often undiagnosed, this was the population of choice for this evaluation. Third, this study focused on publicly available profiles, it is unclear whether increased privacy settings would increase or decrease the likelihood of disclosing depression symptoms. Although approximately half of the screened profiles were excluded due to privacy settings, at present a minority of college students report undergoing depression screening using a standardized instrument.[3] The goal in assessing publicly available profiles was to examine profiles that could be accessed by any peer, parent, or college health provider. Finally, the PHQ-9 was not administered concurrently to when the depression symptom disclosure was displayed on Facebook, which may have weakened the strength of association between displayed depression symptoms and self-reported depression symptoms using the PHQ-9.

An important point to emphasize is that a lack of depression symptoms displayed on Facebook should not be reassuring that depression is not present. Findings do not suggest that Facebook displays of depression symptoms are an effective method to rule out depression, as many of the non-displayers PHQ-9 scores suggested depression. However, these findings are suggestive that displayed depression symptoms on Facebook are worthy of further investigation.

Implications for Behavioral Health

This study serves as a starting point to investigate displayed depression references on Facebook. There are several ways in which these findings could be used towards improving mental health care for college students. First, since Facebook is primarily a peer communication tool it is possible that peers may be both able and motivated to identify at-risk students using Facebook. While peers may not be uniformly knowledgeable about DSM-IV criteria for depression, many peers may be aware of or responsive to disclosures of distress and willing to learn more about how to better identify peers who are suffering from depression. It may be that this process is already taking place when college students display status updates and receive supportive comments from other online friends. Previous work has shown that adolescents often disclose more about themselves on SNSs than they do in person.[35] In the future, campuses could consider educating resident advisors or peer leaders to encourage students whose Facebook profiles include repeated references to depression symptoms to seek further evaluation. Students often report willingness to refer their peers for help and over half of college students report interest in learning how to help a student in distress. [3, 36, 37]

Second, SNSs may provide new opportunities to increase student help-seeking behavior. It is possible that such screening could be triggered by the content of a SNS profile. When Facebook users view their profile, advertisements triggered by keywords present on the profile are displayed at the side of the profile. It is possible that university counseling centers could link messages about counseling services or links to online screening to keywords such as "depressed" or "hopeless." A recent study evaluated an interactive web-based program designed to screen students for depression and suicide risk. After the initial online screening, 24% of students entered into an online dialog with a counselor, 19% later attended an in-person session with the counselor, and 14% entered a treatment program.[38] SNSs may provide an innovative venue to provide access to online screening and follow-up resources.

All of these intervention ideas hinge on designing programs that are acceptable to students and respect their privacy and confidentiality.[39, 40] Mental health disclosures are potentially stigmatizing, thus, proper attention to privacy will be essential. However, there are reasons to be optimistic that today's college students may welcome online mental health programs. A study assessing a web-based intervention program found that among students with an unmet need for mental health care, over 90% reported interest in or intention to use the program.[41] Given the difficulty in identifying students at risk for depression, and the potential negative consequences of untreated depression, providers cannot afford to ignore potential public health opportunities to reduce the burden of mental illness in this population.

This is the first study to illustrate an association between depression symptom disclosures on a publicly accessible SNS and self-reported depression symptoms. Findings illustrate that Facebook profile owners who chose to display one or more text references to depression symptoms on publicly available Facebook profiles had higher PHQ-9 scores. Further, results illustrate a trend that participants who were depressed, those who scored into the PHQ-9 category of depression, were more likely to display depression symptom disclosures on Facebook. Further studies should refine and expand these methods, as well as evaluate how to effectively communicate with older adolescents regarding health information displayed on SNSs. Further study could explore how students perceive depression disclosures by other students, and whether Facebook is providing an innovative source of support for students with depression symptoms.

Acknowledgments

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