

# When perceptions defy reality

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Running head: FACEBOOK SOCIAL SUPPORT AND DEPRESSION

**When Perceptions Defy Reality:**

**The Relationships between Depression and Actual and Perceived Facebook Social Support**

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### Abstract

**Background:** Although the relationship between depression and “offline” social support is well established, numerous questions surround the relationship between “online” social support and depression. We explored this issue by examining the social support dynamics that characterize the way individuals with varying levels of depression (Study 1) and SCID-diagnosed clinically depressed and non-depressed individuals (Study 2) interact with Facebook, the world’s largest online social network.

**Method:** Using a novel methodology, we examined how disclosing positive or negative information on Facebook influences the amount of social support depressed individuals (a) *actually* receive (based on actual social support transactions recorded on Facebook walls) and (b) *think* they receive (based on subjective assessments) from their Facebook network.

**Results:** Contrary to prior research indicating that depression correlates with less actual social support from “offline” networks, across both studies depression was *positively* correlated with social support from Facebook networks when participants disclosed negative information ( $p = .02$  in Study 1 and  $p = .06$  in Study 2). Yet, depression was *negatively* correlated with how much social support participants thought they received from their Facebook networks ( $p = .005$  in Study 1 and  $p = .001$  in Study 2).

**Limitations:** The sample size was relatively small in Study 2, reflecting difficulties of recruiting individuals with Major Depressive Disorder.

**Conclusions:** These results demonstrate that an asymmetry characterizes the relationship between depression and different types of Facebook social support and further identify perceptions of Facebook social support as a potential intervention target. (243 words; 250 max)

**Keywords:** Facebook, depression, emotional disclosure, social support, cognitive bias

## **When Perceptions Defy Reality:**

### **The Relationships between Depression and Actual and Perceived Facebook Social Support**

#### **Introduction**

I am not easily beaten, but this time I can see no way out of the black hole: too often have I had to beg for help from those who love me. I am alone this time and no longer able to find the way out. I have no more than despair and fatigue within me now (Lita Broadhurst, 2010).

Lita Broadhurst posted this message on her Facebook wall shortly before committing suicide. Although declarations such as these are rare, disclosing personal information on Facebook, the world's largest online social network, is not (Forest and Wood, 2012; Manago et al., 2012). This is especially true for people with depression, who share personal information online more frequently than healthy people (Caplan, 2003; Young, 1998).

Despite the frequency with which depressed people share personal information using online social networks, no research has examined how this process influences the amount of social support they receive and the amount of social support they think they receive. Here we addressed this issue to examine the implications of a relatively novel and pervasive form of human social interaction for depression.

#### **Social Support and Depression**

People who are diagnosed with Major Depressive Disorder (MDD) are characterized by persistent episodes of sadness that last at least two weeks. However, they also experience significant social impairments. For example, they receive less social support than healthy

individuals (Flaherty et al., 1983; Leavy, 1983) and also *perceive* themselves as having impoverished social support networks (Fiore et al., 1983; Rook, 1984). Critically, these deficits in *actual* and *perceived* social support are not just consequences of depression; they perpetuate and exacerbate depressive symptoms (Brown and Harris, 2012; Morris et al., 1991).

Why are people with depression characterized by such social support deficits? One explanation concerns inappropriate self-disclosure (Gurtman, 1987; Jacobson and Anderson, 1982). Although disclosing information is essential for eliciting social support (Petronio, 2002; Segrin and Abramson, 1994), disclosing negative information too often or too excessively—as people with depression do (Blumberg and Hokanson, 1983; Kuiper and McCabe, 1985)—can lead members of one’s social network to withdraw from providing support (Coyne, 1990; Joiner et al., 2009).

### **From “Offline” to “Online”: Facebook Social Support**

The foregoing analysis suggests that people with depression suffer from low levels of actual and perceived social support. However, all of the aforementioned findings were observed in the context of offline social network interactions. Thus, whether they translate to online social network interactions is unclear. Addressing this issue is important because online social networks are rapidly changing the way human beings provide and receive support.

Consider Facebook, the world’s largest online social network. Facebook provides people with a platform to instantly disclose information and receive support back in response (Kujath, 2011; Valkenburg and Peter, 2009). It also allows people to do so privately, which may provide depressed individuals, who are often socially withdrawn (Joiner, 1997; Kashani et al., 1989), with a safer context to connect with others. Despite the high prevalence of Facebook use among people with depression (Hong et al., 2014), surprisingly little research has examined how

Facebook influences the amount of social support depressed people *actually* receive and the amount of social support they *think* they receive. We addressed this issue in the current research, guided by three alternative sets of predictions.

On the one hand, we reasoned that the same social support dynamics that characterize depressed people's *offline* social network interactions—low levels of actual and perceived social support (Coryell et al., 1993; Holahan et al., 2004; Leskela et al., 2008)—might also characterize their Facebook interactions. This prediction is based on research indicating that people with depression self-disclose negative information more than healthy individuals do on online networks (Moreno et al., 2011; Park et al., 2012), and that disclosing negative information excessively can strain social networks (Coyne, 1990; Joiner et al., 2009).

On the other hand, recent work indicates that online social networks allow people to transform *latent* social ties—connections between individuals that are “technically possible but not yet activated” (Haythornthwaite, 2005)—into *strong* social ties (Ellison et al., 2007) that widen social networks and provide people with enhanced opportunities for support. Moreover, when people have large audiences for disclosing their experiences (as they do on Facebook), they tend to perceive such audiences as more supportive (Manago et al., 2012). These features of Facebook could lead individuals with depression, who tend to disclose more often to their Facebook networks than healthy individuals (Moreno et al., 2011; Park et al., 2012), to both receive more support and perceive themselves as receiving more support than healthy individuals.

The aforementioned predictions are grounded on the assumption that people's perceptions of social support *accurately* reflect their actual experience of receiving support. However, it is well established that depressed people are characterized by a negativity bias in

social perception (Beck, 1976; Gotlib et al., 2004). Thus, a third possibility is that this cognitive tendency could lead depressed people to perceive their Facebook social networks as less supportive than they are in reality compared to non-depressed people.

In sum, numerous questions surround the relationship between depression and Facebook social support. How does emotional disclosure on Facebook influence the amount of social support depressed individuals receive? And do depressed individuals' perceptions of Facebook social support accurately reflect reality?

### **Research Overview**

We addressed these questions using two complementary research designs. Study 1 examined the relationships between depression and Facebook social support processes among college students with varying levels of depressive symptoms, while Study 2 examined whether the same relationships emerge among individuals diagnosed with MDD and their age-matched healthy controls. By adopting this research strategy, we aimed to obtain robust and converging evidence for the relationship between depression and Facebook social support.

In both studies, we obtained a record of participants' Facebook "walls," which captured information they shared with their Facebook network over time and comments that participants' Facebook friends generated in response to their posts. We content-analyzed these "walls" to assess (a) the degree to which participants disclosed positive and negative information, and (b) the amount of social support they received from their Facebook network in response to these disclosures. Notably, whereas previous research has almost exclusively relied on self-report measures to assess actual social support (e.g., self-reported network size, number of friends; Coman et al., 2013; Lubben, 1988), this methodology allowed us to examine social support *objectively*, based on recorded social support transactions on participants' walls. We also asked

participants to judge the supportiveness of their Facebook social networks to examine whether depression influences the relationship between actual and perceived social support.

## **Study 1**

### **Method**

#### **Participants**

Seventy-three undergraduate students (42 women;  $M_{\text{age}}=19.88$ ,  $SD_{\text{age}}=1.10$ ; 28.8% Caucasian, 17.8% Asian, 8.2% African American, 1.4% Hispanic, 1.4% Middle Eastern, 1.4% of other, 41.1% missing) participated in the study in exchange for course credit or \$20. They were recruited via flyers posted around Ann Arbor, MI; the flyer stated that this study would examine relationships between Facebook use, personality, and well-being, and only those who have a Facebook account were eligible for the study. All participants who contacted were identified as eligible participants and invited to the lab to complete a two-session study.

#### **Procedure**

After providing informed consent, participants were asked for permission to allow a member of the research team to copy their Facebook wall content corresponding to the one-month period immediately preceding their participation in the study. Next, participants completed one of two survey packets. The first packet included a measure of participants' perceptions of Facebook social support; the second included a measure of depressive symptoms. The second packet was administered approximately one week later ( $M=8.34$  days,  $SD=4.45$ ). Because we included additional measures for exploratory purposes in both packets (see Online Supplementary Materials for the list of additional measures), we administered the surveys across two sessions to ease the burden of having participants complete multiple measures in a single session. Survey order was counterbalanced across participants.

## Measures

**Facebook data: Emotional disclosure & Actual social support.** After collecting participants' Facebook wall data, we de-identified them in preparation for coding by replacing all names with two-digit identification codes (e.g., Participant 01). We then coded participants' walls for (a) positive disclosure, (b) negative disclosure, and (c) actual social support. Participants posted on average 11.89 ( $SD=21.36$ ) "status updates"—i.e., posts that they generated—whereas Facebook friends posted on average 12.38 comments ( $SD=22.02$ ) in response to participants' status updates over the one-month observation period.

**Positive and negative disclosures.** Three coders content analyzed participant's status updates for *positive disclosure* (Intraclass Correlation [ICC]=.83) and *negative disclosure* (ICC=.86) separately using a binary (0=no, 1=yes) coding system.<sup>2</sup> We coded positive- and negative disclosure as separate dimensions because a post without positive disclosure does not necessarily indicate that the post was negative, and vice versa for positive posts (for a similar approach, see Forest and Wood, 2012). Consistent with this view, positive disclosure and negative disclosure were negatively correlated, but still distinct,  $r(644)=-.53, p<.001$ . Examples of positive and negative disclosures include, "*Beautiful pool day with my roomies!*", "*I am totally exhausted. I don't think I can take much more,*" respectively. When one out of the three coders disagreed on how to categorize a post, we used the ratings of the two coders who agreed.

**Actual social support.** We conceptualized the supportiveness of each friend's comment in response to the participant's disclosure as an index of actual social support. Following commonly accepted definitions of emotional support, we conceptualize actual social support as

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<sup>2</sup> We assessed reliability using ICC (see Ridout et al. 1999 for a similar approach) and interpreted ICC coefficients following guidelines suggested by Landis and Koch (1997):  $0 \leq ICC < 0.2$ =slight agreement,  $0.2 \leq ICC < 0.4$ =fair agreement,  $0.4 \leq ICC < 0.6$ =moderate agreement,  $0.6 \leq ICC < 0.8$ =substantial agreement,  $0.8 \leq ICC \leq 1$ =excellent agreement.

“the things that people do that make us feel loved and cared for, that bolsters our sense of self-worth (e.g., talking over a problem, providing encouragement/positive feedback)” (Lackner et al., 2010; see also Walen & Lachman, 2000). Specifically, two coders read each comment and rated whether the friend provided emotional support to the participant (i.e., statements indicating that the friend cared about the participant, understood the way the participant felt, or tried to help the participant feel better; 0=no, 1=yes; ICC=.75). We used the same coding scheme to judge the supportiveness of comments posted in response to positive and negative disclosures. Examples of supportive comments to positive disclosure (“*Best day in Oklahoma with all my bests!*”) and negative disclosure (“*Thought I was gonna feel better by now....ugh....*”) include, “*Welcome Home!!!!!! We love you and are so proud of you. Blessings to you and your beautiful family,*” and “*Call me or text me anytime if you need to talk to somebody*”, respectively. When the two coders disagreed, a third independent coder broke the tie.

**Perceptions of Facebook social support.** Following prior research (Kross et al., 2013; Verduyn et al., 2015), we modified the 12-item abbreviated version of the Social Provision Scale (SPS; Cutrona and Russell, 1987) to measure perceptions of Facebook social support.

Participants rated on a 4-point scale (1=*strongly disagree*, 4=*strongly agree*) the extent to which they perceived themselves to have supportive Facebook friends (e.g., Among my Facebook friends, there are people I can depend on to help me if I really need it;  $\alpha=.90$ ,  $M=3.51$ ,  $SD=.43$ ).

**Individual differences in depressive symptoms.** Participants’ depressive symptoms were assessed with the 12-item depression subscale of the ruminative response scale (RRS; Nolen-Hoeksema and Morrow, 1991). Participants rated on a 4-point scale (1=*almost never*, 4=*almost always*) the extent to which they think about how sad, passive, and unmotivated they feel when they are depressed ( $\alpha=.88$ ,  $M=20.84$ ,  $SD=5.91$ ). Treynor et al. (2003) performed factor

analyses and showed that the items on this subscale overlap highly with symptoms of depression assessed with the Beck Depression Inventory-II (BDI-II; Beck et al., 1996). This scale also correlates highly with other measures of depression such as Children's Depression Inventory (CDI; Kovacs and Staff, 2003) and diagnosis of depression (Johnson et al., 2008). Consistent with this literature, we found in Study 2 that depressive symptoms assessed with the depression subscale of the RRS ( $\alpha=.88$ ,  $M=20.84$ ,  $SD=5.91$ ) and those assessed with the BDI-II ( $\alpha=.98$ ,  $M=18.35$ ,  $SD=17.57$ ) were strongly correlated,  $r(42)=.84$ ,  $p<.001$ , indicating that the depression subscale of the RRS can serve as a reasonable proxy for a measure of depressive symptoms.

## Results

### Data Analyses Overview

Out of 73 participants who were consented and completed the study, we excluded eight participants who did not post any status update during the one-month observation period. We additionally excluded four participants who posted status updates using non-English language because we were unable to code the Facebook wall for these participants. This resulted in 61 participants with analyzable data (37 women;  $M_{age}=19.95$ ,  $SD_{age}=1.13$ ).

Before the main analyses, we examined whether gender, survey order, or overall Facebook activity (i.e., total number of status updates posted during the one-month study period) influenced any of the outcome variables. Survey order and Facebook activity did not influence the data,  $ps>.14$ , but females reported higher levels of supportiveness of their Facebook network,  $F(1,57)=4.41$ ,  $p=.04$ ,  $\eta_p^2=.07$ . Controlling for gender did not, however, influence the results for perceptions of social support. Thus, we present the results without gender controlled. None of the above variables interacted with depressive symptoms to influence the outcome variables,  $ps>.28$ .

### Emotional Disclosure

We first examined whether depressive symptoms correlated with negative- or positive disclosure. Because status updates (level 1) were nested within and unbalanced across participants (level 2) and the dependent variable was a binary response, we performed two-level hierarchical logistic regressions using Generalized Linear Mixed Models (GLMM). Two separate GLMMs were performed with depressive symptoms as a continuous predictor of negative disclosure and positive disclosure on each status update, respectively. Contrary to prior research (Moreno et al., 2011; Park et al., 2012), depressive symptoms were not related to negative disclosure,  $b=.02$ , 95% Confidence Interval (CI) [-0.02, .05],  $t(623)=.97$ ,  $p=.34$ , *Odds Ratio (OR)*=1.02, or positive disclosure,  $b=-.003$ , 95% CI [-0.05, .04],  $t(623)=-.15$ ,  $p=.88$ , *OR*=.98.

### **Actual Facebook Social Support**

Next, we examined whether depressive symptoms correlated with the amount of Facebook social support participants actually received in response to their emotional disclosures. Since the data had a three-level hierarchical structure, with actual social support (i.e., each Facebook friend's comment in response to each status update; level 1) nested within status updates (level 2), in turn nested within participants (level 3), three-level hierarchical logistical regression models were estimated using GLMM. Specifically, we conducted two separate GLMMs with depressive symptoms, emotional disclosure on each status update (negative or positive), and the interaction between the two (Depressive symptoms x Negative disclosure, Depressive symptoms x Positive disclosure) as predictors of actual social support. Participants' depressive symptom scores were mean-centered before computing interaction terms (Aiken and West, 1991).

These analyses revealed a significant Depressive symptoms x Negative disclosure interaction,  $b=.08$ , 95% CI [.03, .14],  $t(673)=2.94$ ,  $p=.003$ ,  $OR=1.08$ . As Figure 1 shows, simple slope analyses revealed that the higher their depressive symptoms were, the more social support they received from their Facebook network when they disclosed negative information,  $b=.05$ , 95% CI [.01, .10],  $t(673)=2.43$ ,  $p=.02$ ,  $OR=1.06$ . In contrast, when they did not disclose negative information, depressive symptoms were not related to actual social support,  $b=-.03$ , 95% CI [-.06, .01],  $t(673)=-1.67$ ,  $p=.10$ ,  $OR=.97$ . Neither the main effect of negative disclosure or depressive symptoms were significant,  $ts(673) < |-1.67|$ ,  $ps > .10$ .

Neither depressive symptoms, positive disclosure, nor the interaction between these variables was correlated with actual social support,  $ts(673) < |.65|$ ,  $ps > .52$ .

### **Perceived Facebook Social Support**

Depressive symptoms were negatively related to perceptions of Facebook social support,  $r(56)=-.37$ ,  $p=.005$ . Thus, the higher their depressive symptoms were, the less supportive participants judged their Facebook network to be.

### **Discrepancy between Actual and Perceived Facebook Social Support**

The aforementioned analyses suggest that depressive symptoms were *positively* associated with actual social support in response to negative disclosure but were *negatively* associated with perceptions of social support. To more directly examine whether depressive symptoms influence the discrepancy between actual and perceived social support, we computed a support discrepancy index by subtracting perceptions of social support scores from actual social support scores after z-score transforming each variable.<sup>3</sup> Thus, higher scores on this index

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<sup>3</sup> We used the proportion of supportive comments that participants received from their Facebook networks (i.e., the number of supportive comments/the number of total comments) as our measure of actual social support for each participant ( $M=.24$ ,  $SD=.22$ ).

indicate that participants perceived their network to be less supportive than it was in reality. As expected, depressive symptoms were positively associated with scores on this index,  $r(56)=.25$ ,  $p=.06$ .

## Study 2

Study 1 indicated that depressive symptoms were positively correlated with the amount of actual social support participants receive on Facebook, but were negatively correlated with how supportive participants perceive their Facebook networks to be. Study 2 aimed to extend Study 1 in two ways.

First, although Study 1 revealed interesting relationships between depressive symptoms and two aspects of Facebook social support, self-reported depressive symptoms are not a surrogate for clinical diagnoses of Major Depression (Coyne, 1994). Thus, goal one of Study 2 was to examine whether our findings generalize to a sample of clinically depressed individuals and their age-matched healthy controls.

The second goal of Study 2 was to examine further the relationship between depression and emotional disclosure. Contradicting prior research (Moreno et al., 2011; Park et al., 2012), we did not observe a relationship between depressive symptoms and positive- or negative disclosure in Study 1. We reasoned that there could be two potential explanations for this null finding. First, it is possible that the relationship between depression and emotional disclosure is unique to Major Depression. If so, then we likely did not have enough participants who were sufficiently depressed to uncover this relationship in Study 1. Study 2's focus on people with MDD allowed us to address this issue. Second, it is possible that the relatively low rate of emotional disclosure in Study 1 ( $M=11.89$ ,  $SD=21.36$ ) made it difficult to observe a relationship

with depression (i.e., a floor effect). To address this issue, we obtained participants' Facebook wall data over a longer time period (two-months instead of one-month) in Study 2.

## Method

### Participants

Twenty-one individuals diagnosed with MDD (19 women;  $M_{age}=26.75$ ,  $SD_{age}=9.25$ ; 66.7% Caucasian, 9.5% Asian, 9.5% African American, 4.8% Middle Eastern, 4.8% of other, and 4.8% missing; 81.0% college students, 14.3% community sample, and 4.8% missing) and 22 healthy control individuals with no DSM-IV axis I diagnosis (18 women;  $M_{age}=23.05$ ,  $SD_{age}=4.66$ ; 77.3% Caucasian, 13.6% Asian, and 9.1% African American; 90.5% college students and 9.5% community sample) participated in the study. They were compensated \$20 and entered into a raffle to receive an iPad for participating. Participants were a subset of those recruited for previous studies in our lab through community advertisements on the web and on campus (see Time 1 procedure below). All participants previously provided written consent to be contacted about participating in future studies. They were told that the study would examine relationships between Facebook use, personality, and well-being, and only those who have a Facebook account were eligible for the study. None of the participants who expressed their interest in participating in this study were screened at this stage because all of them had a Facebook account at the time of study participation (see Time 2 procedure below).

### Procedure and Materials

**Time 1: Diagnosis session.** Participants were screened by phone for exclusion criteria; those with a history of head injury, major medical illnesses, or neurological disorders were excluded during this stage. Those who passed the initial screening were invited to the lab where a Structured Clinical Interview for the DSM-IV, Patient Edition (SCID-I/P; First et al., 2007)

was administered. Under the supervision of one of the study co-authors (PD), clinically trained psychology graduate students who were blind to the group status independently administered the SCID to confirm a current diagnosis of (a) MDD and (b) no current or past DSM-IV Axis I psychiatric diagnosis for healthy controls. The SCID interviews were audio-recorded and a random selection of 40% of these interviews was coded by a second rater to confirm the initial diagnosis, which resulted in 100% inter-rater reliability.

In addition to the SCID interviews, participants completed the BDI-II ( $\alpha=.98$ ,  $M=18.36$ ,  $SD=17.78$ ) as a self-report measure of depression symptomatology. Confirming the SCID diagnoses, all participants with MDD scored above the clinical cutoff score ( $\geq 20$ ;  $M=34.19$ ,  $SD=10.08$ ); all healthy controls scored below the cutoff ( $< 20$ ;  $M=2.52$ ,  $SD=4.50$ ).

Among participants with MDD, eleven (52.4%) were taking at least one psychotropic medication ( $M=1.00$ ,  $SD=1.05$ ), including antidepressants (57.1%), mood stabilizers (14.3%), antipsychotics (9.5%), benzodiazepine (9.5%), stimulants (4.8%), and lithium (4.8%). Ten (47.6%) had at least one additional current comorbid Axis I disorder ( $M=.71$ ,  $SD=.90$ ), including post-traumatic stress disorder (14.3%), panic disorder (9.52%), general anxiety disorder (9.52%), social phobia (9.52%), specific phobia (9.52%), agoraphobia (4.76%), obsessive-compulsive disorder (4.76%), somatoform (4.76%), and attention deficit-hyperactivity disorder (4.76%), but for these participants, the primary diagnosis was confirmed as MDD, meaning that the presence of other mental illness was evaluated as secondary in the SCID interviewer's judgment.

**Time 2: Study session.** Approximately 9.69 months ( $SD=6.61$ ) after their diagnosis, participants were emailed a consent form to allow us to access their Facebook wall data. They were told that the research team would copy their Facebook walls corresponding to the month

preceding and the month following their diagnosis session.<sup>4</sup> They were then asked to complete an online survey, which included the measures of perceptions of Facebook social support and depressive symptoms.

**Facebook data: Emotional disclosure & Actual social support.** After participants consented to release their Facebook wall data, we visited their Facebook profile and saved the Facebook wall data corresponding to the two-month period surrounding their diagnosis session (Time 1) onto a lab computer and de-identified the contents of their walls following the protocol outlined in Study 1.

During the two-month period, participants posted on average 38.14 ( $SD=54.16$ ) status updates and their Facebook friends made on average 65.52 comments ( $SD=125.44$ ) in response to participants' status updates. We coded these wall data using the same procedures described in Study 1. Specifically, de-identified status updates were coded for positive disclosure ( $ICC=.83$ ) and negative disclosure ( $ICC=.84$ ) by two coders who were blind to participants' diagnoses. A third, independent coder broke the tie. As in Study 1, these two types of emotional disclosure were negatively correlated across all participants, but still distinctive,  $r(1435)=-.40, p<.001$ .

Two coders who were blind to participants' diagnoses originally coded the supportiveness of each comment. This did not yield a satisfactory level of reliability ( $ICC$  among

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<sup>4</sup> We elected to obtain Facebook wall data corresponding to the two-month period surrounding participants' diagnosis session to examine whether participants used Facebook differently before and after their diagnosis. A series of analyses using the wall data confirmed that participants displayed similar profiles of Facebook activity before and after their diagnosis. They posted similar numbers of status updates (before:  $M = 18.83, SE = 3.88, 95\% CI [10.99, 26.68]$ ; after:  $M = 19.31, SE = 4.57, 95\% CI [10.08, 28.54]$ ), positive status updates (before:  $M = 6.95, SE = 1.39, 95\% CI [4.14, 9.77]$ ; after:  $M = 7.05, SE = 1.61, 95\% CI [3.80, 10.29]$ ), and negative status updates (before:  $M = 3.88, SE = 1.00, 95\% CI [1.86, 5.91]$ ; after:  $M = 3.67, SE = .95, 95\% CI [1.76, 5.57]$ ),  $F_s < .09, p_s > .76$ . Diagnostic status (non-depressed vs. depressed) did not interact with time (before diagnosis vs. after diagnosis) to influence any of these outcomes,  $F_s < .44, p_s > .51$ .

the original two coders=.58), so we trained a separate group of two coders to code the data again (ICC among the new two coders=.67) and assessed the reliability across the total four coders (ICC=.77). When three out of the four coders agreed, we used their responses as a final index of actual social support. When the two of them disagreed with the other two, these discrepancies were resolved by a fifth, independent coder. Analyzing the data coded by the first coding group and the second coding group separately did not substantively alter the results.

*Perceptions of Facebook social support.* As in Study 1, perceptions of Facebook social support were assessed using the modified SPS ( $\alpha=.92$ ,  $M=3.27$ ,  $SD=.53$ ).

*Depressive symptoms.* As during the diagnosis session (Time 1), participants' depressive symptoms were assessed with the BDI-II ( $\alpha=.96$ ,  $M=14.20$ ,  $SD=15.08$ ), with the suicidal ideation item excluded (see Cavanagh et al., 2014; Wisco and Nolen-Hoeksema, 2009 for a similar approach).

## Results

### Data Analyses Overview

Out of 43 participants who were consented and completed the study, we excluded one healthy control participant who reported at Time 2 that she recently consulted with a professional clinician about her concern for depression. In addition, we applied the same criteria of excluding (a) participants who did not post any status update during the observation period and (b) participants who used non-English language in their Facebook profiles, although none was excluded on these bases because all participants generated more than one status update and all used English. The final sample included 42 participants (36 women;  $M_{\text{age}}=24.95$ ,  $SD_{\text{age}}=7.40$ ).

Preliminary analyses revealed that neither gender nor overall Facebook activity influenced any of the outcome variables,  $ps>.54$ . They also did not interact with diagnostic status

to influence any group differences we observed,  $ps > .16$ . The analyses also confirmed that two diagnostic groups did not differ in sample characteristics such as age, gender, race, and whether they were current college students or not,  $ps > .13$ .

### **Emotional Disclosure**

We first examined whether diagnostic status influenced emotional disclosures. We conducted two separate GLMM analyses on negative disclosure and positive disclosure with diagnostic status (non-depressed=0, depressed=1) as a predictor. These analyses indicated that depressed participants disclosed negative information more,  $b = .85$ , 95% CI [.13, 1.58],  $t(1433) = 2.23$ ,  $p = .02$ ,  $OR = 2.34$ , and positive information less,  $b = -.57$ , 95% CI [-1.15, .01],  $t(1433) = -1.95$ ,  $p = .05$ ,  $OR = .56$ , than non-depressed participants (see Figure 2).

### **Actual Facebook Social Support**

Next, we examined how much social support depressed and non-depressed participants received when they self-disclosed by performing two GLMMs with diagnostic status, emotional disclosure on each status update (negative or positive), and the interaction between the two (Diagnostic status x Negative disclosure, Diagnostic status x Positive disclosure) as predictors of actual social support.

Conceptually replicating the Study 1 results, diagnostic status interacted with negative disclosure to influence actual social support,  $b = 1.28$ , 95% CI [.19, 2.37],  $t(2596) = 2.30$ ,  $p = .02$ ,  $OR = 3.60$ , indicating that depressed participants received more social support than non-depressed participants when they disclosed negative information,  $b = 1.28$ , 95% CI [-.08, 2.64],  $t(2596) = 1.84$ ,  $p = .06$ ,  $OR = 3.59$  (see Figure 3). In contrast, the diagnostic groups did not differ in the amount of actual social support when they did not disclose negative information,  $b = -.001$ ,

95% CI [-1.03, 1.02],  $t(2596)=-.002$ ,  $p=.99$ ,  $OR=1.00$ . The main effects of diagnostic status and negative disclosure were not significant,  $t(2596)<|-1.62|$ ,  $ps>.11$ .

Neither diagnostic status nor the interaction between diagnostic status and positive disclosure were correlated with actual social support,  $t(2596)<|.73|$ ,  $ps<.47$ . We did, however, observe a marginal main effect of positive disclosure,  $b=.68$ , 95% CI [-.05, 1.40],  $t(2596)=1.84$ ,  $p=.07$ ,  $OR=1.97$ , indicating that regardless of diagnostic status, participants received more support when they disclosed positive information compared to when they did not disclose such information.

### ***Perceived Facebook Social Support***

Replicating the Study 1 results, depressed participants perceived themselves as receiving less Facebook social support ( $M=3.00$ ,  $SE=.10$ , 95% CI [2.79, 3.20]) than their non-depressed counterparts ( $M=3.54$ ,  $SE=.10$ , 95% CI [3.33, 3.74]),  $F(1,39)=14.16$ ,  $p=.001$ ,  $\eta_p^2=.27$ .

### **Discrepancy between Actual and Perceived Facebook Social Support**

We next examined whether diagnostic status influenced the discrepancy between actual and perceived Facebook social support. As in Study 1, we computed the support discrepancy index by subtracting perceived social support ratings from the actual support index (i.e., the proportion of supportive comments;  $M=.14$ ,  $SD=.20$ ) after standardizing both scores. The discrepancy index was significantly higher for depressed participants ( $M=.57$ ,  $SE=.29$ , 95% CI [-.01, 1.15]) than non-depressed participants ( $M=-.58$ ,  $SE=.28$ , 95% CI [-1.15, -.02]),  $F(1,39)=8.25$ ,  $p=.01$ ,  $\eta_p^2=.18$ , suggesting that a perceptual bias characterized depressed participants.

### **Alternative Explanations**

In Study 1, we assessed actual and perceived Facebook social support during the same time period. However, these variables were assessed at different times in Study 2—i.e., actual social support was assessed at Time 1 whereas perceptions of social support were assessed at Time 2. Thus, one might argue that the reason why depressed participants showed a discrepancy between actual and perceived social support in Study 2 was because they were assessed at different time points rather than depression producing this discrepancy. We performed two additional sets of analyses to rule out this alternative explanation.

First, we reasoned that it was possible that participants' perceptions of Facebook social support were distorted at Time 2 (compared to Time 1), possibly due to an increase in their depressive symptoms over time that could have resulted in a negativity bias in social perception. However, depressive symptoms did not increase among depressed participants. They decreased (Time 1:  $M=1.64$ ,  $SE=.11$ , 95% CI [1.41, 1.87] vs. Time 2:  $M=1.29$ ,  $SE=.15$ , 95% CI [.98, 1.60]),  $F(1,19)=7.24$ ,  $p=.01$ ,  $\eta_p^2=.28$ .<sup>5</sup> Second, diagnostic status continued to be associated with perceptions of social support in the predicted direction when controlling for change in depressive symptoms over time,  $F(1,38)=14.36$ ,  $p=.001$ ,  $\eta_p^2=.27$ .

Another possibility is that depressed participants received *less* social support than their non-depressed counterparts at Time 2, and their perceptions were accurate reflections of their experience. To address this issue, we compared the diagnostic groups on their levels of actual Facebook social support at Time 2 by re-contacting participants to obtain their Facebook wall data corresponding to the two-month period preceding the second study session. Twenty-seven participants (17 non-depressed and 10 depressed) consented to release their wall data. When

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<sup>5</sup> Since we administered a 20-item version of the BDI-II during the second session (at Time 2), but the 21-item version during the first session (at Time 1), we used mean scores in this analysis.

these data were coded to yield an index of actual social support ( $ICC=.71$ ), the diagnostic groups did not differ on this variable,  $F(1,25)=.30, p=.59$ . Importantly, even within this subsample of participants, diagnostic status still significantly influenced perceptions of social support in the expected direction,  $F(1,25)=9.69, p=.005, \eta_p^2=.28$ , indicating that depressed participants' perceptions were still negatively skewed at Time 2.

### Discussion

Online social networks such as Facebook are rapidly changing the way human beings provide and receive social support. Here we explored the social support implications that this technology has for people with naturally varying levels of depressive symptoms (Study 1) and people with MDD and their age-matched healthy controls (Study 2). Our results generated two key findings.

First, contrary to prior research demonstrating that people with depression are characterized by *actual* social support deficits in their offline social relationships (Holahan et al., 2004; Leskela et al., 2008), the current research suggests that the opposite may be true in their Facebook social relationships. Across two studies, we found that the more depressed people were, the more actual social support they received in response to negative disclosure on their Facebook walls. Importantly, our analyses adjusted for participants' total amount of negative disclosure. Thus, these findings were not an artifact of people with depression posting more negative information than non-depressed people.

These findings suggest that different social support dynamics may characterize depressed individuals' Facebook vs. offline social interactions. Specifically, Facebook allows people to develop a wider spectrum of relationships by activating their *latent* social ties—weak connections between individuals that are not yet socially activated (e.g., friends of friends,

classmates, acquaintances; Haythornthwaite, 2005)—by offering easily accessible personal information about others. Once activated, these social ties may provide additional sources of social support that are not available in offline social contexts. While often dysfunctional in offline contexts (Coyne, 1990; Joiner et al., 2009), self-disclosure in this online context may be more adaptive. Consistent with this view, our findings suggest that online negative disclosure can be an effective means of eliciting social support among people with depression. Another explanation for the potential differences between online and offline social support is that Facebook provides a more convenient platform to provide social support than do face-to-face interactions. For example, people can provide support online with relative ease and minimal effort by generating a quick supportive remark whereas social support in offline interactions typically requires increased effort and time commitment (e.g., visits or phone calls). Future research is necessary to examine how this variable as well as other differences between online and offline interaction patterns contribute to the potential discrepancies characterizing the relationships between depression and online vs. offline social support.

Although depressed individuals consistently received more social support when they disclosed negative information, they paradoxically perceived themselves as receiving *less* social support than their non-depressed counterparts. Thus, their perceptions were negatively skewed. This asymmetry is consistent with research documenting a negative relationship between depression and perceptions of social support in offline social contexts (Holahan et al., 2004; Rook, 1984), and a large body of work linking depression with a negativity bias in social perception (Beck, 1976; Gotlib et al., 2004). This pattern of results is also consistent with recent findings indicating that depressed individuals perceive themselves to have more negative

experiences during online social networking interactions compared to non-depressed individuals (e.g., Davila et al., 2012).

An important question raised by this work concerns the role that actual and perceived Facebook social support play in predicting the course of depression. Previous research on offline social support suggests that perceived (rather than actual) social support more strongly predict health outcomes (e.g., Russell and Cutrona, 1991; Steffens et al., 1996). However, whether this finding generalizes to Facebook social support processes is unknown. Due to the cross-sectional design of the current research, we were unable to examine the causal relations between depression and Facebook social support processes. Future research should address this issue by prospectively examining how Facebook social support predicts changes in depressive symptoms. Although we examined the relationships between depression and Facebook social support across two studies that cover a broad range of age (from 18 to 49), future research should also consider examining the role that these processes play in the development of depression among other age groups such as children and adolescents (Madden et al., 2013; O'Keeffe and Clarke-Pearson, 2011) as well as middle-aged and older adults (Bell et al., 2013), as these groups may use Facebook for different purposes.

Before concluding, it is important to acknowledge that our sample size in Study 2 was relatively small, reflecting the difficulty of recruiting and maintaining participation of people with MDD. This limitation notwithstanding, the fact that Study 2 directly replicated the key findings concerning the relationships between depression and actual vs. perceived social support that we observed in Study 1 with a larger sample partly offsets concerns regarding this issue.

### **Concluding Comment**

The current research examined the social support dynamics that characterize the way people with depression interact with Facebook. Our findings demonstrate that an asymmetry characterizes the relationship between depression and actual vs. perceived Facebook social support, highlighting the need for future research to examine the implications that these social support processes have for predicting depressive symptoms over time. Finally, by demonstrating that higher perceptions of Facebook social support are linked to lower levels of depression across two studies, our findings suggest that targeting perceptions of Facebook social support in the context of interventions to combat depression may be a worthwhile endeavor.

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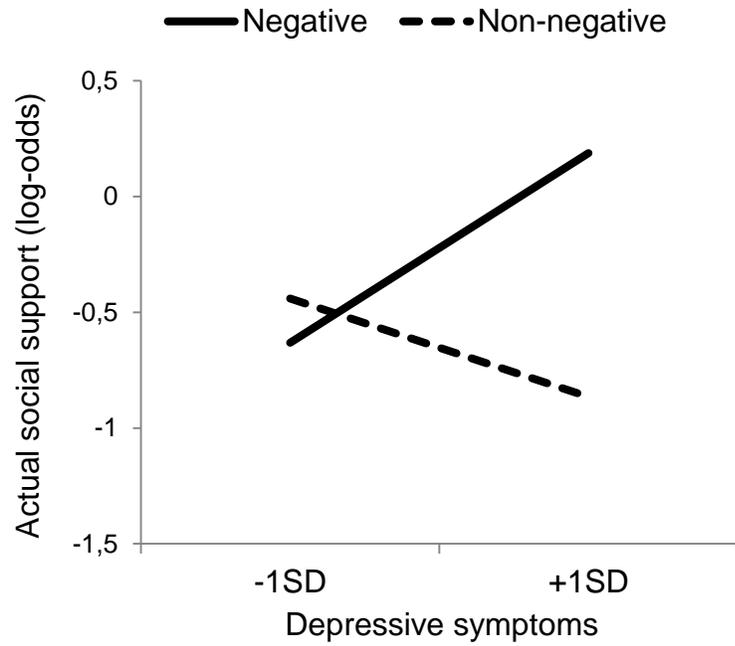
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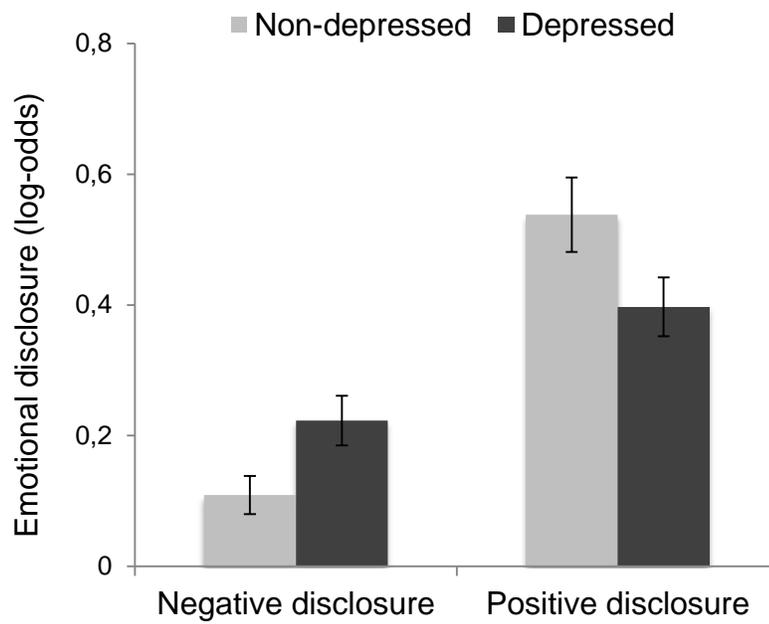
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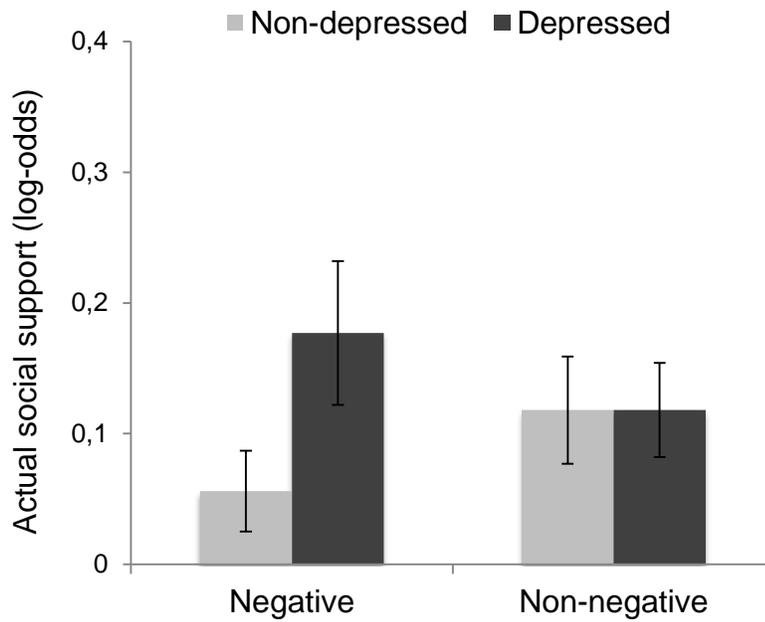
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*Figure 1.* Actual Facebook social support (log-odds) as a function of depressive symptoms and type of status updates (negative vs. non-negative) in Study 1.



*Figure 2.* Negative (left) and positive (right) disclosures (log-odds) as a function of diagnostic status (non-depressed vs. depressed) in Study 2. Error bars indicate standard errors.



*Figure 3.* Actual Facebook social support (log-odds) as a function of diagnostic status (non-depressed vs. depressed) and type of status updates (negative vs. non-negative) in Study 2. Error bars indicate standard errors.