Do Our Facebook Friends Make Us Feel Worse? A Study of Social Comparison and Emotion

Jiangmeng Liu\(^1\), Cong Li\(^1\), Nick Carcioppolo\(^1\), & Michael North\(^2\)

\(^1\) School of Communication, University of Miami, Coral Gables, FL 33146, USA
\(^2\) Department of Communication, Central Connecticut State University, New Britain, CT 06053, USA

People often compare themselves to others to gain a better understanding of the self in a process known as social comparison. The current study discusses how people engage in a social comparison process on Facebook, and how observing content from their Facebook friends may affect their emotions. A 2 (comparison direction) × 2 (relational closeness) × 2 (self-esteem) between-subjects experiment was conducted with 163 adult participants. The results revealed a significant 3-way interaction such that people with high self-esteem would be happier receiving positive information than negative information from their close friends, but the effect would be the opposite if the information was from a distant friend. There was no such difference for people with low self-esteem.

**Keywords:** Social Comparison, Facebook, Relational Closeness, Self-Esteem, Emotion.

doi:10.1111/hcre.12090

“Comparison is the death of joy.”—

Mark Twain

People continually compare themselves to relatives, friends, and even distant acquaintances. From scholastic success, salary level, and life achievements to even health status, people self-reflect through comparisons with others (Mussweiler & Rüter, 2003). If others are perceived as superior to the individual (e.g., achieve a better test score, make more money, have a happier life), this comparison will elicit negative feelings; if others are perceived as inferior, the comparison will enhance self-evaluation and generate positive emotions (Collins, 1996; Emmons & Diener, 1985; Festinger, 1954; Salovey & Rodin, 1984). This process was first illustrated in Festinger’s work on social comparison, and has generated hundreds of studies over the last 50 years (see Blanton & Stapel, 2007). Moreover, this social comparison process usually occurs automatically and inevitably (Bargh, 1997; Gilbert, Giesler, & Morris, 1995; Mettee & Riskind,
so it is conceivable that this process will not only occur in offline interactions but also in computer-mediated communication.

The emergence of social networking sites such as Facebook has dramatically changed the way people connect and communicate with others. In addition to face-to-face communication, people now often view friends’ Facebook posts to learn about the events of others’ lives. The ample information disclosed on Facebook makes it a perfect platform for social comparison. Although social comparison behaviors are pervasive on Facebook, only a few studies have investigated this phenomenon (Chou & Edge, 2012; Feinstein et al., 2013; Haferkamp & Krämer, 2011; Kross et al., 2013; Lin & Utz, 2015; Sagioglou & Greitemeyer, 2014).

Haferkamp and Krämer (2011) were among the first to examine social comparison on social networking sites. Through interviews and lab experiments, their study found that participants who were exposed to superior profile pictures showed fewer positive emotions and were less satisfied with their own bodies than those who were exposed to inferior profile photos. Kross et al. (2013) demonstrated the influence of Facebook usage on people’s subjective well-being outside the lab. Over the course of 2 weeks, participants used Facebook in their own natural way but reported their usage and moment-to-moment feelings through text messages five times per day. The results revealed that Facebook usage negatively affected users’ well-being. Similarly, Chou and Edge (2012) demonstrated that Facebook usage intensity was positively associated with concepts such as “others have better lives than me” and “others are happier than me.”

Instead of general emotions and feelings, a few studies specifically focused on envy as a negative consequence of Facebook use (Krasnova, Wenninger, Widjaja, & Buxmann, 2013; Lim & Yang, 2015; Tandoc, Ferrucci, & Duffy, 2015; Verduyn et al., 2015). For example, Tandoc et al. (2015) found that time spent on Facebook was associated with envy. Verduyn et al. (2015) further differentiated active Facebook use (e.g., posting status updates) and passive Facebook use (e.g., viewing friends’ posts), and revealed that only passive use affected envy. Lin and Utz (2015) further demonstrated the effect of passive Facebook use on two subdimensions of envy, including benign and malicious envy.

The current study adds to this body of literature by examining relationship proximity between the Facebook user and the comparison target. Unlike offline interactions, Facebook connects its users with both close friends and a large number of connections that can be described as weak acquaintances at best (Bond et al., 2012). This study will investigate whether Facebook social comparison differs when examining close friends versus distant friends. Differing from prior studies that used mock-up Facebook posts in a lab setting (e.g., Lin & Utz, 2015), this experiment asked participants to browse through posts from their real group of Facebook friends (close friend or distant friend). It measured and compared emotions including both close-friend-as-target and distant-friend-as-target.

Furthermore, this study contributes to the literature by examining self-esteem as an additional moderator of the Facebook social comparison process. As suggested by
Appel, Gerlach, and Crusius (2016) in a recent review of Facebook social comparison studies, future research in this area should focus on “which processes cause which effects in which populations” rather than the global effect caused by general Facebook use (p. 47). The current research responds to this call by testing how Facebook social comparison affects high-self-esteem and low-self-esteem individuals differently.

**Literature review**

**Social comparison on Facebook**

Social comparison theory was first proposed by Festinger (1954) as an attempt to understand how social activities influence an individual’s self-evaluation. Festinger argued that people are motivated to evaluate themselves to reduce uncertainty. When an objective criterion is absent, people will compare themselves with other people (comparison target) to judge one’s own ability and performance (Festinger, 1954). If other people (comparison target) perform better in general or with a specific attribute (e.g., intelligence, physical attractiveness, athletic ability), the individual (comparer) will feel worse; when others are worse-off than the self, individuals will feel better.

As a result, two directions of social comparison emerged. One is upward social comparison (i.e., comparing with a superior target), and the other is downward comparison (i.e., comparing with an inferior target). Previous research has demonstrated that upward social comparison can negatively influence self-evaluation (Lyubomirsky & Ross, 1997; Morse & Gergen, 1970), as well as elicit dissatisfaction with life (Emmons & Diener, 1985), frustration (Aspinwall & Taylor, 1993), depression and discouragement (Wheeler & Miyake, 1992), jealousy (Salovey & Rodin, 1984), hostility (Testa & Major, 1990), and other negative emotions. On the other hand, downward social comparison usually enhances self-evaluation and generates positive feelings (Collins, 1996; Wills, 1981; Wood, Taylor, & Lichtman, 1985).

Social comparison is an automatic process and is “effectively forced upon the individual by his social environment” (Mettee & Riskind, 1974, p. 348; Mussweiler & Rüter, 2003). As a psychological tendency deeply rooted in the human mind (Festinger, 1954; Haferkamp & Krämer, 2011), such comparisons occur in both offline interactions and computer mediated-communication. For example, Yang and Oliver’s (2010) study revealed that more viewing of TV programs depicting affluent lifestyles encouraged overestimation of others’ wealth and, in turn, generated an upward social comparison and dissatisfaction with the TV viewer’s own life.

Similarly, when Facebook users encounter posts from other people, users will automatically relate themselves to these posts and engage in comparison behaviors. Suls (1977) asserted that people prefer private social comparison and avoid asking others for social comparison information. In this case, Facebook social comparison perhaps requires less effort because friends’ posts provide ample opportunities to compare with others. Furthermore, previous studies have found that people prefer to compare themselves to comparable targets instead of fictitious characters in entertainment (Lubbers, Kuyper, & Van Der Werf, 2009). Because targets of comparison
on Facebook are often friends and family, social comparisons are expected to be more potent on Facebook than other mass media. Therefore, we expect social comparison to occur on Facebook and influence users’ emotions depending on the direction of the comparison.

Similar to Stapel and Koomen (2001), comparison direction was operationalized as the valence of information in this study. In Stapel and Koomen’s (2001) study, participants (comparers) who were exposed to an article describing several positive aspects of the comparison target were considered to compare with a superior target and engage in an upward comparison. Those who viewed a negative article were believed to compare with an inferior target and engage in a downward comparison. Following this logic, in the current study the more positive (negative) a Facebook post is, the more likely the comparer will consider the person who created the post as a superior (inferior) target and engage in an upward (downward) comparison. Therefore, it is expected that after reading relatively positive posts from others, people will more likely engage in an upward social comparison and generate negative emotions. Whereas when reading posts that are relatively negative people will more likely engage in a downward social comparison and enhance their positive feelings. With this in mind, the following hypothesis is proposed:

H1a: When exposed to positive Facebook posts (upward social comparison information), people will exhibit a more negative emotional response than when exposed to negative posts (downward social comparison information).

Although several previous studies adopted social comparison theory to explain the influence of Facebook usage on people’s emotions (Chou & Edge, 2012; Haferkamp & Krämer, 2011; Kross et al., 2013; see Appel et al., 2016 for a review), other research (Kramer, Guillory, & Hancock, 2014; Lin & Utz, 2015) suggested another possibility: A process called emotional contagion, which refers to an emotion transfer within a dyad or group through an individual’s mimicry of “the verbal, physiological, and/or behavioral aspects of another person's emotional experience/expression, and thus to experience/express the same emotions oneself” (Hsee, Hatfield, Carlson, & Chemtob, 1990, p. 328). Prior studies have shown that people can experience the same emotion of others around them as a consequence of mimicking their nonverbal behaviors (e.g., facial expressions, body languages, tones) (Barsade, 2002; Dimberg, 1982; Duclos et al., 1989; Hatfield, Cacioppo, & Rapson, 1993).

Emotional contagion can occur not only through face-to-face communication but also via computer-mediated-communication (Coviello et al., 2014; Hancock, Gee, Ciaccio, & Lin, 2008; Kramer et al., 2014). Hancock and colleagues showed that participants could “catch” the emotional state of the experimental confederate through instant messaging and express the same emotion. Kramer et al. (2014) further demonstrated that emotions could transfer through Facebook posts to users. Based on this empirical evidence, we predict that positive (negative) emotions within a Facebook post will be transferred to its viewers. This accordingly generates a competing hypothesis to H1a:
H1b: When exposed to positive Facebook posts, people will exhibit a more positive emotion than when exposed to negative posts.

**Relational closeness and social comparison**

Facebook is capable of expanding individuals’ social networks while maintaining connections with close friends (bonding capital, strong ties) as well as distant friends (bridging capital, weak ties; Ellison, Steinfield, & Lampe, 2007). Research has empirically demonstrated that social media usage positively correlates with building bridging capital, which has the potential to increase users’ perceived social support (Hampton, Lee, & Her, 2011). However, whether this extension of social networks to distant friends provides any real emotional benefit to Facebook users is unclear.

The conceptual difference between close friends and distant friends is the degree of relationship proximity between the self and the friend. Scholars have developed several definitions of relational closeness. For instance, Kelley et al. (1983) defined it as interdependence in affects, cognition, and behaviors between two people. Heider (1958) referred to relational closeness as feelings of connection and belonging to each other. Similarly, Ledbetter and colleagues (2011, p. 34) defined it as “experience of intimacy, emotional affinity, and psychological bonding with another person.” All these definitions suggested that compared to distant friends, one’s closer friends would more strongly and more frequently influence the self (Kelley et al., 1983; Tesser & Campbell, 1982).

Regarding social comparison, however, studies examining the effect of relational closeness have yielded inconsistent results. For instance, Wheeler and Miyake (1992) used a diary-writing technique and asked participants to record their social comparison behaviors daily for 2 weeks. Results revealed that participants made more upward and downward comparisons with distant friends than with close friends. In a survey with 9,612 middle school students, Lubbers et al. (2009) found that students preferred using close friends as a comparison target over nonfriends. Similarly, Mussweiler and Rüter (2003) found that people are more likely to compare themselves to their best friends because information about their best friends is readily available.

Considering emotions and self-evaluations as dependent variables, various studies found that closeness can intensify the effect of social comparison (especially upward comparison). Zuckerman and Jost (2001) found that individuals felt more threatened when comparing to a close friend than when comparing to an unknown person. Similarly, individuals offer more help to strangers than to friends because they tend to feel more pressure to live up to expectations from friends (Tesser & Smith, 1980). Pahl, Eiser, and White (2009) found that comparisons involving friends as targets could yield a negative self-evaluation whereas comparisons with others can lead to positive self-evaluations.

On the other hand, studies built on Tesser’s Self-Evaluation Maintenance (SEM) model favor the notion that relational closeness diminishes the negative result of upward social comparison (Brewer & Weber, 1994; Tesser, 1991; Tesser & Campbell, 1982). Based on Cialdini’s research concerning “basking in reflected glory”
(Cialdini & Richardson, 1980; Cialdini et al., 1976), which suggested that people have the tendency to associate themselves with “winners” (e.g., students are more likely to wear clothes representing their school after a winning game more than after a losing game), Tesser (1988) developed the SEM model by incorporating a “reflecting process” in the original social comparison theory. He argued that when a close friend (comparison target) performs well, the individual (comparer) can bask in the glory of the friend and enhance self-evaluation. A close friend’s good performance can also inspire an individual by “redefine[ing] the possibilities for the self: if he/she can do it so can I” (Tesser, 1988, p. 189).

Brewer and Weber (1994) referred to this “reflecting” process as assimilation, and extended this assimilation to downward comparison as well by stating that people may also assimilate to worse-off friends and experience a decrease in emotions and self-worth. This concept was empirically tested and supported in Tesser, Millar, and Moore’s (1988) study. An interaction between closeness and comparison regarding emotion was found to be significant (Tesser et al., 1988, Study 2). Specifically, a participant’s emotions were significantly more positive when a close friend outperformed him/her than when a distant friend outperformed him/her. This assimilation (reflecting) process only occurred when the comparison attribute was perceived to be unimportant to the comparer in Tesser et al.’s (1988) study. Brewer and Weber (1994) provided further evidence to support the assimilation process when comparing with close friends, regardless of the comparison attribute’s relevance.

Although no consistent conclusion has been drawn yet in the literature, the aforementioned studies support a moderator role of relational closeness in social comparison. We thus propose two competing hypotheses with the conflicting previous study results in mind:

H2a: Relational closeness will moderate the influence of Facebook social comparison on individuals’ emotions such that when targets are close friends, the social comparison effect will be more salient, generating more negative emotions after exposure to positive posts and more positive emotions after exposure to negative posts, than when targets are distant friends.

H2b: Relational closeness will moderate the influence of Facebook social comparison on individuals’ emotions such that when targets are close friends, the reflecting process will function, generating more positive emotions after exposure to positive posts and more negative emotions after exposure to negative posts. When targets are distant friends, the social comparison effect will occur, generating more negative emotions after exposure to positive posts and more positive emotions after exposure to negative posts.

Applying emotional contagion theory, Lin and Utz (2015) also explored the interaction effect between relational closeness and valence (emotion) of Facebook posts. The influence of positive posts (but not negative posts) on participants’ emotions was found to be more salient when the posts were from a close friend than a distant friend. According to Lin and Utz (2015), these findings were due to the higher similarity and
familiarity between close friends and oneself (people can “catch” a close friend’s emotions better than a distant friend’s). It is worth pointing out that, following this logic, the prediction of an interaction effect between relational closeness and post valence will be the same as described in H2b.

**Self-esteem and social comparison**

Although previous research has demonstrated that outcomes of social comparison were predetermined by its directions (upward comparison produces negative emotions and downward comparison generates positive emotions), a series of subsequent studies focused on potential moderators of upward and downward comparisons (Friend & Gilbert, 1973; Wheeler, 1966; Wills, 1981; Wood et al., 1985). These studies provide examples of upward comparison bolstering self-evaluation and emotions, and downward comparison harming those outcomes. Participants’ personality characteristics were found to play an important role in swaying social comparison consequences. Individuals’ self-esteem is incorporated in the current study because self-esteem is a personal trait which (a) plays an important role in self-evaluation and affective response, and (b) can influence how people process and interpret social comparison information.

Self-esteem refers to both an affective feeling toward the self (e.g., how much people like themselves) and a cognitive judgment of one’s worth (e.g., how competent they believe they are; Brown & Marshall, 2001; Crocker & Wolfe, 2001). High self-esteem implies an overall highly positive view of the self, whereas low self-esteem individuals usually have an uncertain or relatively negative view of the self (Campbell et al., 1996; Zeigler-Hill, 2013). Thus, levels of self-esteem influence an individual’s strategy of processing and interpreting information regarding self-worth (Zeigler-Hill, 2013).

Previous studies of social comparison suggested a self-enhancing tendency of high-self-esteem individuals (Buunk, Collins, Taylor, VanYperen, & Dakof, 1990; Crocker & Schwartz, 1985; Crocker, Thompson, McGraw, & Ingerman, 1987). For example, Crocker et al. (1987) found that participants high in self-esteem made more downward social comparisons to enhance self-evaluation than participants low in self-esteem. Buunk et al. (1990, Study 1) found that high self-esteem participants were less likely to react negatively to social comparison information than low self-esteem participants, regardless of comparison directions. Reis, Gerrard, and Gibbons (1993) study found that after exposure to better-off targets (upward comparison), all participants could experience an increase in mood, and the increase was more salient for high-self-esteem participants.

Nevertheless, recent studies have demonstrated that social comparison information has more negative consequences on high-self-esteem individuals than those with low self-esteem (Haferkamp & Krämer, 2011; Patrick, Neighbors, & Knee, 2004). After exposure to a worse-off target, high-self-esteem participants exhibited a significantly lower self-evaluation than low-self-esteem participants (Haferkamp & Krämer, 2011).

High-self-esteem individuals seemingly do not always produce more positive reactions through social comparison than low-self-esteem individuals. Rather,
high-self-esteem individuals are more willing to process and pay more attention to information related to self-worth. As argued by Baumeister, Tice, and Hutton (1989), high-self-esteem individuals seek self-enhancement by actively focusing on their skills and talents and are willing to take risks to gain self-worth. In contrast, those with low self-esteem tend to engage in a self-protection strategy (Baumeister et al., 1989). These people are cautious and usually avoid challenges “that may bring rewards, but that also carry the risk of revealing their flaws” (Wood, Giordano-Beech, Taylor, Michela, & Gaus, 1994, p. 713). Thus, those with low self-esteem are more likely to pay less attention to social comparison information. According to this logic, the influence of social comparison—either negative or positive—will be stronger for high-self-esteem individuals than for low-self-esteem individuals:

H3: There will be a three-way interaction between relational closeness, self-esteem, and comparison directions. The two-way interaction between relational closeness and comparison directions on emotion will be more prominent for people with high self-esteem than for those with low self-esteem.

Method
Overview
To test the proposed hypotheses, a $2 \times 2 \times 2$ between-subjects lab experiment was conducted. The first factor—relational closeness—was manipulated, whereas the other two factors—comparison direction and self-esteem—were both measured. Participants were adult Facebook users recruited from Craigslist. In total, 163 participants took part in the study and completed the experiment on a voluntary basis. The participants ranged from 18 to 65 in age, with an average age of 32.71 ($SD = 11.41$). This study’s sample was a nonstudent sample with only 17.2% of participants referring to themselves as college or graduate students ($n = 28$). In terms of gender, there were slightly more female participants (53.4%) than male participants (46.6%). Regarding ethnicity, 52.8% of the participants ($n = 86$) identified themselves as Hispanic, 25.8% ($n = 42$) as non-Hispanic Caucasian, 16.6% ($n = 27$) as African American, 1.2% ($n = 2$) as Asian, and 3.7% ($n = 6$) as others.

Procedure
The experiment was conducted in a computer lab located on the campus of a mid-sized university in the southeastern United States. Multiple experimental sessions were scheduled based on each participant’s availability. Upon arrival at the lab, participants first viewed the study’s consent form. They were then asked to complete a pre-experiment questionnaire measuring self-esteem and general Facebook usage. Afterwards, each participant was randomly assigned to one of the two experimental conditions by logging onto Facebook and selecting either a distant friend or a close friend from his/her own Facebook friend list. Participants answered questions relevant to this chosen friend such as name, age, and gender. For manipulation purposes,
years of knowing this friend, contact frequency, and relational closeness between the participant and the chosen friend were measured.

Next, participants were asked to browse the most recent 10 original posts from the chosen friend’s Facebook timeline. For this study, original posts refer to texts, photos, videos, or other activities created and posted by this friend. Shared posts from other users, tagged photos uploaded by others, and being mentioned in posts created by others were not counted as original posts. Participants were asked to browse the posts as they would normally do and to rate the valence of each post (from −3 to +3). No direction or hint was given in the experiment to remind participants to make a social comparison with their friends. Therefore, if the results demonstrated the existence of social comparison, this comparison likely occurred subconsciously.

Average valence of the 10 posts was calculated in the data analysis indicating the direction of the social comparison. It is conceptually logical to do this averaging because all posts were written by a participant’s comparison target. The higher the average valence, the more likely the comparison was upward. The lower the average valence, the more likely the comparison was downward. Immediately after browsing Facebook posts, each participant finished a questionnaire that assessed their emotions postexperiment. Upon completion of the postexperiment questionnaire, participants were thanked and given a small amount of cash as a compensation for their participation.

Measures
Self-esteem
The Rosenberg Self-Esteem Scale was used to measure participants’ self-esteem (Rosenberg, 1965). Participants indicated their level of agreement with 10 statements on a 5-point Likert scale. Examples of statements included: “On the whole, I am satisfied with myself” and “At times I think that I am no good at all” (reverse coded). The scale was reliable, with $\alpha = .85$.

Facebook usage
To understand how participants used Facebook in their daily lives, questions concerning general usage (e.g., hours spent on Facebook per day, times logged onto Facebook per day) and detailed usage style (e.g., the proportion of close friends among Facebook friends, the frequency of profile updates) were asked (adapted from Ellison et al., 2007).

Contact frequency and relationship closeness
For manipulation purposes, participants indicated their contact frequency with their chosen friend in face-to-face offline contact, telephone conversations, text-messaging contact, and social media contact (1 = very rare, 5 = very frequently; $\alpha = .89$). To assess the relational closeness, the Unidimensional Relationship Closeness Scale (URCS) was used (Dibble, Levine, & Park, 2012). The inventory includes 11 statements, such as “When we are apart, I miss this person a great deal,” “This person is a priority in
my life,” and “My relationship with this person is important in my life.” Participants indicated their agreement with each statement on a 5-point Likert scale ($\alpha = .98$). A confirmatory factor analysis revealed that both scales were unidimensional. Thus, items were averaged into a single score for each scale in further data analysis.

**Emotion**

To assess participants’ emotional state after browsing the posts, an implicit measure of emotion was offered first, followed by two explicit measures (positive and negative). In the implicit emotion measure, participants were asked to rate the pleasantness of five Chinese pictographs using their own instincts on a 7-point semantic differential scale (adapted from Payne, Cheng, Govorun, & Stewart, 2005). These Chinese pictographs were neutral in meaning and visually divergent. One pictograph was dropped from further analysis because it significantly influenced the reliability. The final 4-item scale was considered reliable ($\alpha = .70$). Participants were then asked explicitly to indicate their current feelings through the positive and negative affect schedule (PANAS) scale (Watson, Clark, & Tellegen, 1988). The PANAS scale consists of 20 affective words: 10 words for positive affect (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active) and 10 for negative affect (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, afraid). Participants indicated their degrees of feelings for each affect word at the present moment on a 5-point scale (1 = “very slightly or not at all”; 3 = “moderately”; and 5 = “extremely”). Following the instruction from Watson et al. (1988), participants’ positive affect (PA) was calculated by averaging his/her ratings on 10 positive affect words ($\alpha = .89$), and his/her negative affect (NA) was based on the average rating on 10 negative affect words ($\alpha = .88$).

**Results**

**Manipulation check**

A series of independent samples t-tests were conducted to check the manipulation of relational closeness. The results demonstrated that friends chosen as close friends were indeed perceived as closer ($M = 3.70$, $SD = .85$) than friends chosen as distant friends ($M = 1.71$, $SD = .83$), $t(157) = 14.90$, $p < .001$. Participants have known their close friends ($M = 12.29$, $SD = 10.10$) for a longer period of time than known their distant friends ($M = 6.03$, $SD = 7.50$), $t(149.51) = 4.50$, $p < .001$. Participants also were in contact with close friends ($M = 3.39$, $SD = 1.00$) more frequently than with distant friends ($M = 1.62$, $SD = .76$), $t(147.48) = 12.70$, $p < .001$. No significant difference was found in self-esteem between participants in the close friend condition and the distant friend condition, $t(161) = 1.26$, ns.

**Descriptive results**

The implicit measure of emotion had a mean of 4.69 on a 7-point scale ($SD = 1.22$), which was somewhat similar to the explicit measure of positive emotions (PA) with
a mean of 3.47 on a 5-point scale (SD = .86). The explicit measure of negative emotions (NA), however, had a low mean of 1.47 (SD = .63), which indicted that people might be reluctant to report their negative emotions when measured explicitly. A similar self-positivity tendency was also observed in the self-esteem measure (M = 4.05, SD = .62). In terms of the average valence of 10 posts (M = 5.65, SD = 1.07), the fact that it was positively skewed was in line with previous research suggesting that people tend to release positive information on Facebook (Forest & Wood, 2012; Qiu, Lin, Leung, & Tov, 2012). Both self-esteem and valence of posts were standardized in further data analysis.

In terms of general Facebook usage, the participants logged onto their Facebook accounts 5.71 times (SD = 3.91) per day on average. The frequency of their updating Facebook profiles had a mean of 2.04 (SD = 1.07) on a 5-point scale (1 = very rarely, 5 = very frequently). On average, participants considered 18.80% of their Facebook friends to be close friends.

Hypotheses testing
Three multiple regression analyses were conducted on the implicit measure and the explicit measures of emotion. Demographic variables (gender and age) as well as Facebook usage variables (times logged onto Facebook per day, proportion of close friends among Facebook friends, and frequency of updating ones’ profile) were added as control variables. Categorical variables – gender and relational closeness (distant friend vs. close friend) – were reference group coded. As mentioned earlier, self-esteem and valence were standardized. The standardized valence score, standardized self-esteem, and relational closeness (reference group coded, 0 = close friend, 1 = distant friend) as well as their interaction terms were added as predictors. All three regression models were significant: on the implicit measure of emotion: F(12, 128) = 2.41, p = .008, R² = .184; on the explicit measure of positive emotion: F(12, 124) = 4.82, p < .001, R² = .318; on the explicit measure of negative emotion: F(12, 124) = 2.87, p = .002, R² = .217. Frequency of updating profiles on Facebook was found to be positively correlated with the implicit emotion measure (β = .21, p = .018). Gender, age, proportion of close friends, and times logged onto Facebook per day were not significant in either model (all ps > .05). Detailed results of the regression models are presented in Table 1.

The first hypothesis was about the influence of comparison direction on participants’ emotions, with H1a suggesting that upward comparison (reading relatively positive posts) would be ego deflating and downward comparison (reading relatively negative posts) would be self-enhancing. H1b predicted the opposite direction. Results demonstrated a significant and positive influence of comparison direction (valence) on the implicit emotion measure after controlling for other predictors (β = .46, p = .006). However, coefficient of comparison direction (valence) was not significant on the explicit emotion measures (positive emotion: β = .03, p = .850; negative emotion: β = −.22, p = .182). H1a was thus rejected, whereas H1b was partially supported. Moreover, a significant effect of self-esteem was found on the explicit measures of positive (β = .40, p = .004) and negative emotion (β = −.51,
Table 1  Results of Multiple Regressions on the Implicit and Explicit Measures of Emotion

<table>
<thead>
<tr>
<th>Predictors</th>
<th>DV1: Implicit Measure of Emotion</th>
<th>DV2: Explicit Measure of Positive Emotion</th>
<th>DV3: Explicit Measure of Negative Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>β = 3.43  SD = .44</td>
<td>β = 2.71  SD = .28</td>
<td>β = 1.56  SD = .22</td>
</tr>
<tr>
<td>Gender</td>
<td>β = .07  .16  .22</td>
<td>β = .00  .00  .14</td>
<td>β = .04  .05  .11</td>
</tr>
<tr>
<td>Age</td>
<td>β = .07  .01  .01</td>
<td>β = .11  .01  .01</td>
<td>β = −.13  −.01  .01</td>
</tr>
<tr>
<td>Proportion of close friends</td>
<td>.13  .01  .01</td>
<td>.15  .01  .01</td>
<td>.11  .00  .00</td>
</tr>
<tr>
<td>Times log onto Facebook per day</td>
<td>.00  .00  .03</td>
<td>−.07  −.01  .02</td>
<td>−.04  −.01  .01</td>
</tr>
<tr>
<td>Frequency of updating profile</td>
<td>.21*  .24*  .10</td>
<td>.23  .19  .07</td>
<td>.11  .06  .05</td>
</tr>
<tr>
<td>Relational Closeness (0 = distant, 1 = close)</td>
<td>.12  .31  .22</td>
<td>.13  .22  .14</td>
<td>−.08  −.10  .11</td>
</tr>
<tr>
<td>Self-esteem (SE)</td>
<td>−.10  −.12  .18</td>
<td>.40**  .34**  .11</td>
<td>−.51** −.31**  .09</td>
</tr>
<tr>
<td>Valence</td>
<td>.46**  .55**  .20</td>
<td>.03  .02  .13</td>
<td>−.22  −.13  .10</td>
</tr>
<tr>
<td>Closeness × SE</td>
<td>.17  .27  .23</td>
<td>−.10  −.12  .15</td>
<td>.24  .20  .11</td>
</tr>
<tr>
<td>Valence × Closeness</td>
<td>−.37*  −.54*  .23</td>
<td>.18  .18  .15</td>
<td>.06  .04  .11</td>
</tr>
<tr>
<td>Valence × SE</td>
<td>.33*  .40*  .19</td>
<td>−.14  −.11  .12</td>
<td>.14  .08  .09</td>
</tr>
<tr>
<td>Closeness × Valence</td>
<td>−.34*  −.51*  .23</td>
<td>−.01  −.01  .15</td>
<td>−.08  −.06  .11</td>
</tr>
<tr>
<td>Valence × SE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.18</td>
<td>.32</td>
<td>.22</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01.

$p = .001$). This suggests that high-self-esteem individuals claimed to have more positive emotions and less negative emotions when measured explicitly. This effect was not significant on the implicit emotion measure ($β = −.10, p = .490$).

The second set of hypotheses proposed a two-way interaction between relational closeness and comparison direction on emotions. This interaction term was found to be significant on the implicit emotion measure ($β = −.37, p = .019$) but not on the explicit emotion measures (positive emotion: $β = .18, p = .210$; negative emotion: $β = .06, p = .695$). Figure 1 illustrates this two-way interaction. When reading posts from close friends, participants showed an assimilation tendency. They felt happier when their close friends were superior in posts and exhibited more negative emotions if their close friends were inferior. This result supports the reflection process suggested by Tesser’s Self Evaluation Maintenance model (1988). However, when reading posts from distant friends, participants seemed to be uninfluenced regardless of whether the post was positive or negative. Based on these results, H2a was rejected and H2b was partially supported. Moreover, a significant two-way interaction between self-esteem and comparison direction emerged on the implicit emotion measure ($β = .33, p = .038$). The influence of Facebook posts on emotions was more salient for high-self-esteem individuals than low-self-esteem individuals (see Figure 2).
A three-way interaction between comparison direction, relational closeness, and self-esteem concerning emotions was expected in the third hypothesis. Results demonstrated that this proposed three-way interaction was statistically significant on the implicit emotion measure ($\beta = -0.34$, $p = .026$) but not on the explicit emotion measures (positive emotion: $\beta = -0.01$, $p = .966$; negative emotion: $\beta = -0.08$, $p = .609$). Following the suggestions of Fitzsimons (2008), a spot-light analysis was used to explain this three-way interaction. Illustrated in Figure 3, the pattern of two-way interaction between relational closeness and comparison direction was significantly
Figure 3 Three-way interaction between relational closeness, self-esteem and comparison direction on the implicit measure of emotion.

different depending on the level of self-esteem. The two-way interaction was more salient for high-self-esteem participants than for low-self-esteem participants. If participants were high in self-esteem, message valence positively correlated with emotion when reading posts from close friends. Participants felt better if their friends were doing well, whereas they exhibited negative emotions if their friends were struggling. The pattern was reversed when high-self-esteem participants read posts from distant friends. When posts were positive, participants generated negative emotions through an upward social comparison process and when posts were negative, positive emotions were exhibited through a downward comparison process.
However, the two-way interaction was not noticeable for low-self-esteem participants. Those participants were less impacted by Facebook posts no matter whether the posts originated from close friends or distant friends. This result supports the notion that low-self-esteem individuals tend to protect their well-being by avoiding comparison information, whereas high-self-esteem individuals tend to seek self-enhancement even at the risk of negative outcomes. Due to these results, H3 was supported.

Discussion

Theoretical implications

This study investigated the influence of Facebook posts on users’ emotions under the theoretical framework of social comparison theory. Although extensive research investigating social comparison through face-to-face communication exists, less attention has been given to Facebook-mediated social comparison. Prior empirical studies on this subject generated mixed results: Some discovered a negative relationship between Facebook use, emotion, and subjective well-being (Chou & Edge, 2012; Kross et al., 2013; Sagioglou & Greitemeyer, 2014), whereas others found a positive relationship (Ellison et al., 2007; Valenzuela, Park, & Kee, 2009). As most of these studies were based on a correlational study design, more experimental research establishing a causal effect is needed (Appel et al., 2016).

The current study helps fill this gap in the literature. The findings based on a lab experiment showed that participants’ emotions were indeed influenced by Facebook posts. Although the proposed negative effect of information valence on emotion based on social comparison theory (in H1a) was not supported, similar results (upward comparison yields positive influence and downward comparison yields negative influence) were not atypical when compared to previous literature (for a review, see Collins, 1996). For example, in Haferkamp and Krämer (2011, Study 2), participants showed an assimilation effect with the comparison target during the social comparison process. Also, as highlighted in H1b, the positive effect of post valence on emotion may be due to an emotional contagion process, in which emotion displayed in the Facebook post is transferred to its viewers (Hatfield et al., 1993; Hsee et al., 1990).

From a theoretical perspective, the current study provided important contributions to social comparison research in a computer-mediated communication context. In their recent review of Facebook social comparison studies, Appel et al. (2016) argued that future research in this area should test under what conditions Facebook use will influence people’s emotions (instead of focus on whether Facebook use will lead to generally positive or negative consequences). This research addressed this call by incorporating two moderators in the experimental design: relational closeness and self-esteem.

First, relational closeness was carefully examined to explain how close friends and distant friends generate different reactions through the Facebook social comparison process. A two-way interaction between relational closeness and comparison direction was found in this study, which supported Tesser’s (1988) SEM model and was
consistent with Lin and Utz’s (2015) findings. We found that individuals not only aligned themselves with close friends by reflecting their glories but also by sharing in their pain when individuals were in a relatively inferior status. These results demonstrated that the original definition of social comparison process (upward comparison leads to negative feelings and downward comparison leads to positive feelings) may more likely occur between a person and his/her distant friends.

Besides, due to the asynchronous nature of online communication, people can release self-related information selectively on Facebook (Toma, 2013; Walther, Van Der Heide, Kim, Westerman, & Tong, 2008). To impress others and build up a good image, posts on Facebook tend to be positive (Forest & Wood, 2012; Qui et al., 2012). For this reason, users are more likely to engage in an upward assimilation with close friends (generating positive emotions) and an upward social comparison with distant friends (generating negative emotions). Expanding one’s social network by adding a number of distant friends through Facebook may be detrimental by stimulating negative emotions for users.

Second, this study provided additional empirical evidence for a proposed self-protection strategy usually employed by low-self-esteem individuals in the social comparison process (Baumeister et al., 1989). Without external threats or other forces at work during the experiment, low-self-esteem individuals in general attempted to avoid social comparison information when processing Facebook posts, thereby shielding themselves from the impact of these posts. On the contrary, high-self-esteem individuals automatically and actively engaged in the social comparison process. Thus, the reflecting process with close friends and the social comparison process with distant friends were more salient for those with high self-esteem.

We would note that the proposed hypotheses were only supported concerning the implicit measure of emotion but not on the explicit measures. This discrepancy was exhibited in Tesser et al.’s (1988, study 2) research as well. When emotions were assessed explicitly, participants usually have a positive bias toward the self and want to display themselves in a positive manner to others due to social desire, even if it means hiding true feelings. The significant and positive associations between self-esteem and the explicit measures of emotion found in this study can also support this explanation since high-self-esteem individuals tend to have a higher positive bias (Zeigler-Hill, 2013). Also, this can explain why in several social comparison studies, high-self-esteem participants tend to display a higher self-evaluation and more positive emotions when using a self-report technique.

**Limitations and future research**

The current study had a few shortcomings that need to be disclosed. First, this study demonstrated the Facebook social comparison effect on momentary emotions measured immediately after viewing Facebook posts. Whether this effect can endure for long, and if it can eventually influence one’s health status is unclear. A future study using a longitudinal design is needed to reveal the potential long-term effect of Facebook social comparison. Second, although this study adopted both implicit
and explicit measures of emotion, there were biases rooted in the self-report method. Thus, in the future, scholars may want to consider using other objective and direct emotional measurement techniques (e.g., facial expression analysis) to examine the Facebook social comparison effect.

Finally, the current study focused on positive or negative emotion as a consequence of Facebook social comparison. However, whether these emotions elicited from reading posts would further influence people's attitudes toward their friends (e.g., whether they will dislike their friends if most posts are positive) is unknown. Investigating how much of an impact the Facebook social comparison effect has on real relationships among friends and connections online would be interesting.

**Conclusion**

The current study contributed to the literature by revealing that engaging in the social comparison process while using Facebook can affect emotions both positively and negatively. This conclusion has important implications for future research and theorizing in this area, as well as practical implications relevant for Facebook users. Studies have already shown that offline social comparisons could impact subjective well-being and health status (Pham-Kanter, 2009; Yngwe, Fritzell, Lundberg, Diderichsen, & Burström, 2003). This experiment showed that such social comparisons occur on social media as well, likely at a subconscious level. Given the fact that the average user spends more than 40 minutes on Facebook each day (Bennett, 2014), this Facebook-mediated social comparison can have an enormous impact on users.

**Supporting Information**

Additional supporting information may be found in the online version of this article: Appendix S1: The implicit measures of emotion.

**References**


Bennett, S. (2014, November 18). This is how much time we spend on social networks every day. *AdWeek*. Retrieved from http://www.adweek.com/socialtimes/social-media-minutes-day/503160


Lim, M., & Yang, Y. (2015). Effects of users’ envy and shame on social comparison that occurs on social network services. *Computers in Human Behavior, 51*(A), 300–311. doi:10.1016/j.chb.2015.05.013


