When Every Day is a High School Reunion: Social Media Comparisons and Self-Esteem

by

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Abstract

Although past research has shown that social comparisons made through social media contribute to negative outcomes, little is known about the nature of these comparisons (e.g., domains, direction, and extremity), variables that determine the outcomes of these comparisons (e.g., post valence, perceiver's self-esteem), and how these comparisons differ from those made in other contexts (e.g. while texting or interacting face to face). In five studies (N=900), I provide the first comprehensive analysis of how individuals make and respond to social comparisons on two different social media platforms (Facebook and Instagram), using comparisons made in real-time while participants browsed their own social media news feeds (Studies 1 and 3), experimenter-generated social media content (Study 2), and reports of comparisons made in various contexts, including social media (Studies 4 and 5). I found that individuals made frequent upward comparisons on social media. Further, social media comparisons were more likely to be upward than downward, and making more frequent and more extreme upward comparisons on social media resulted in greater declines in self-evaluations, mood, and life satisfaction. In addition, individuals with lower self-esteem made more frequent and extreme upward comparisons while browsing social media, resulting in even steeper declines in self-evaluations. Finally, compared to upward comparisons in other contexts, those made on social media were more often to distant (vs. close) targets, more likely to be image-based, and resulted in greater declines in self-

evaluations. Together, these studies provide the first insights into the cumulative impact of multiple social comparisons, demonstrate the unique nature of social comparisons made on social media, and clarify the role of self-esteem in online social comparison processes.

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Chapter 1
Introduction

Social media has changed how people make social comparisons. Whereas in the past, individuals may have compared themselves to others they would see in person, or in media such as magazines or television, the extraordinary prevalence of the social network has changed the nature of the comparison opportunities that individuals encounter on a daily basis. In this research, I explore these changes, examining how social media has dramatically increased opportunities for comparison, shifted comparison patterns upward, and allowed for rapid-fire comparisons that have a cumulative impact on individuals' satisfaction with themselves and their lives more generally. I also examine the targets of comparison: Before social media, individuals may have been most likely to compare to current friends, colleagues, and acquaintances; they now have vastly increased opportunities to compare to celebrities and public figures they have chosen to follow, as well as a myriad of past friends and professional connections with whom they no longer have direct contact. In addition, I assess how specific social media platforms may differ in the nature of comparisons they elicit, with some creating a particular focus on image-based and appearance-related comparisons. Finally, I examine in detail the relationship between self-esteem and social comparisons on social media, examining self-esteem as a predictor and an outcome of such comparisons on different social media platforms.

1 Social Media Use

This comprehensive analysis of social comparison on social media is timely: In just over a decade, social media use has skyrocketed. In 2005, only 5% of Americans reported using one or more social media platforms; by 2018, 69% of Americans report using social media (Pew Research Center, 2018). Use of these platforms is now part of daily life, with over half of all Pinterest, Twitter, Instagram, and Facebook users logging on at least once per week. Of these sites, Facebook is the most popular by a wide margin, with 75% of users logging in every day. Initial research indicated that Facebook could be a boon to social connection, allowing people to keep in touch with friends and maintain relationships (Ellison, Steinfield, & Lampe, 2007). Indeed, some research has suggested that individuals do reap benefits from using online social technologies, including opportunities for self-disclosure and perceived social support (Davis, 2012; Ko & Kuo, 2009). However, other research indicates that social media use is also associated with negative outcomes, such as jealousy in romantic relationships, decreased self-

esteem and subjective well-being, increased loneliness and social isolation, and depression (Burke, Marlow, & Lento, 2010; Hwang, Cheong, & Feeley, 2009; Kalpidou, Costin, & Morris, 2011; Kross et al., 2013; Muise, Christofides, & Desmarais, 2009; for a review, see Best, Manktelow, & Taylor, 2014). Given the widespread use of social media, it is important to understand when and how social media may exert a negative impact on users, and the role that social comparison may play in such outcomes.

Several researchers (Hanna et al., 2017; Stapleton, Luiz, & Chatwin, 2017; Steers, Wickham, & Acitelli, 2014; Vogel, Rose, Roberts, & Eckles, 2014) have proposed that social networking platforms have a negative impact on the self through upward social comparisons, comparisons to people who appear better off (Festinger, 1954). In some cases, upward comparisons may be inspiring, as when individuals view the superior other's achievements to be attainable (Lockwood & Kunda, 1997), view the superior other as a representation of their future self (Lockwood & Pinkus, 2008), or are otherwise able to assimilate to the superior other (Mussweiler, 2003). When the comparison other is a peer rather than a role model for future achievements, however, the superior other is more likely to threaten individuals' self-views via contrast effects (Lockwood & Kunda, 1997; Mussweiler, 2003). Given that many social media contacts are "friends," and often peers rather than role models (Ellison et al., 2007; Hew, 2011), upward social media comparisons will most likely have a contrast effect, resulting in decreased mood and self-esteem (Buunk, Collins, Taylor, VanYperen, & Dakof, 1990; Gibbons & Gerrard, 1989). Furthermore, even when individuals hope to achieve similar success in the future, the recognition that their present circumstances are less bright may lead to at least a short-term threat to self-esteem (Lockwood, Shaughnessy, Fortune, & Tong, 2012). Indeed, a recent meta-analysis of 60+ years of social comparison research found that individuals' default response to social comparisons is contrast (Gerber, Wheeler, & Suls, 2018).

2 Comparisons on Social Media

Not only are upward comparisons on social media likely to be threatening rather than inspiring, they are more likely to occur than self-esteem boosting downward comparisons. Downward comparisons to worse-off others often result in positive outcomes, such as decreased anxiety, improved mood, and increased overall well-being (Gibbons, 1986; Hakmiller, 1966; Kleinke & Miller, 1998). Some past research suggests that individuals will opt for downward over upward comparisons when given the choice (Wood, Giordano-Beech, Taylor, Michela, & Gaus, 1994).

However, the aforementioned meta-analysis demonstrated that, even when under threat, the predominant tendency is to engage in upward rather than downward comparisons (Gerber et al., 2018). Furthermore, opportunities for downward comparisons, are likely limited when individuals are using social media. Although people do not typically post false information about themselves online (Back et al., 2010), they do engage in selectively positive self-presentation (Walther, 2007; Wilson, Gosling, & Graham, 2012) and are more likely to post positive rather than negative content (e.g., Dorethy, Fiebert, & Warren, 2014). Thus, when browsing their news feeds, individuals are more likely to see posts about friends' fun and exciting social activities, along with attractive photos, than they are to see posts about friends' uneventful or frustrating days at the office, or particularly unflattering photos. Consequently, social media affords numerous opportunities for comparisons to seemingly better-off others but limited opportunities for downward comparisons that could bolster self-evaluations. Consistent with this possibility, one study found that daily Facebook logins were associated with increased upward comparisons but fewer downward comparisons (Steers et al., 2014). The omnipresent availability of superior others on social media may also thwart individuals' attempts to protect their self-esteem by actively avoiding upward comparisons. Past research has shown that individuals not only make downward comparisons to boost their self-evaluations, but also avoid making upward comparisons in order to protect their self-evaluations from further blows (Wood et al., 1994; Wood, Michela, & Giordano, 2000). To the extent that the majority of social media posts are positive, individuals may find it difficult to escape from upward comparisons. To date, research has not directly compared the instances and outcomes of upward and downward comparisons that occur during social media use. I tested this directly.

Social media may also exert a negative impact by prompting individuals to make upward comparisons more frequently than might occur offline. Individuals using social networking sites are especially likely to be exposed to numerous examples of superior others as they engage in "virtual people-watching," a common motivation for using Facebook (Joinson, 2008). In a few short minutes, one social media user could compare her attractiveness after seeing one friend's new profile picture, her popularity after seeing another friend's group photo from a recent night out, and her romantic success to another friend who just announced her engagement. Many social media platforms include features that also allow users to compare themselves on dimensions that do not exist offline. For example, users can compare the number of likes and comments their post receives or the number of friends or followers they have relative to someone

else, adding to the overall number of comparisons they are making online. Indeed, one study found that participants are sensitive to the number of likes and comments attached to Facebook photos and posts (Vogel et al., 2014). Furthermore, number of likes and comments is easily quantifiable and consequently more difficult to construe in a way that is favorable to the self (Collins, 1996). Thus, a casual scroll through one's news feed may offer numerous opportunities to compare oneself to others who appear more fortunate. Indeed, given that social comparisons appear to happen automatically (Mussweiler, Rüter, & Epstude, 2004), it seems unlikely that one could spend time reading one's news feed without making a comparison to a superior other. In sum, I predict that social media use will be associated with engaging in numerous threatening upward comparisons across multiple domains, which in turn will have negative consequences for individuals' mood, self-esteem, and even life satisfaction.

Indeed, several studies point to associations between Facebook use, upward comparisons, and negative outcomes. Compared to less frequent users, heavy users are more likely to agree that others are happier, have better lives, and are doing better (Chou & Edge, 2012; de Vries & Kühne, 2015). Making more upward Facebook comparisons has also been associated with negative self-perceptions of one's own social competence and attractiveness, increased depressive symptoms, and lower overall well-being (Appel, Crusius, & Gerlach, 2015; Fardouly & Vartanian, 2015; Feinstein et al., 2013; Gerson, Plagnol, & Corr, 2016; Tandoc, Ferrucci, & Duffy, 2015). These studies, however, have largely relied on correlational designs and retroactive ratings of comparison tendency; thus, existing negative self-perceptions may lead to making more upward Facebook comparisons or biased recollection of Facebook comparison experiences.

One exception is an experimental study in which participants viewed a bogus Facebook profile, ostensibly of another individual of the same age and gender (Vogel et al., 2014, Study 2). Participants who saw a profile with more likes and comments reported lower subsequent state self-esteem and were more likely to rate the profile's owner as better-off than themselves. This study provides important evidence that upward Facebook comparisons can decrease self-esteem. However, it is unclear whether individuals will have the same response to superior individuals who are actual Facebook "friends." Indeed, individuals may feel that they are boosting their own social capital if they are associated with popular others through Facebook. It also remains unclear whether such effects are limited to comparing number of likes and comments, or instead extend to the content of the posts themselves. Facebook allows one to post about any aspect of

one's life, and in turn provides one with information about many aspects of others' lives. Thus, I expect that online comparison domains will be wide-ranging, consistent with previous research examining social comparison domains in daily life (Wheeler & Miyake, 1992).

Further evidence of the potentially damaging effects of social comparisons on social media comes from a daily-diary study (Steers et al., 2014): On days when participants reported making more comparisons, they also reported more depressive symptoms. However, whether these comparisons caused these symptoms is unclear. Indeed, the authors noted that a third variable (e.g., a negative daily event) may account for both increased social comparisons and depressive symptoms. Furthermore, the authors examined the negative effects of upward comparisons in the achievement and popularity domains only. Consequently, this study may not have captured upward comparisons in other domains (e.g., appearance, leisure activities) or comparisons that would lead to positive outcomes. Finally, comparison frequency was assessed globally; participants indicated the extent to which they agreed with statements such as "I paid a lot of attention to how others do things," making it impossible to determine whether a participant who strongly agrees is recalling multiple comparisons made throughout the day or a single, yet memorable, instance of a strong comparison.

Taken together, these studies provide important evidence that people are likely to encounter positive Facebook posts when browsing their news feeds, which will influence their self-evaluations. Although these studies provide insights into individuals' general Facebook comparison experiences, they do not allow for a fine-grained analysis of individuals' experiences of specific Facebook comparisons. That is, no research has directly assessed the number, direction, extremity, and domain of specific social comparisons people make while using social media, or the immediate consequences that these different comparisons have on self-perceptions. I examined specific comparisons and their outcomes directly. As a result, I was able to assess not only frequency and direction, but also qualitative differences in comparisons that occur on social media. For example, social media posts often include images that can be carefully selected and enhanced by the poster; thus, individuals may be especially likely to make upward comparisons to image-based posts relative to text-based posts. Moreover, because individuals can choose to follow a wide variety of people on social media (e.g., celebrities, acquaintances, past friends), they may also compare themselves to targets that they might have deemed irrelevant in other contexts. To date, no research has examined whether social media comparisons operate according to the same rules as traditional social comparisons (i.e.,

comparisons in more important domains and to more relevant comparison targets are more impactful). I tested this directly. In sum, this research is the first to provide a detailed analysis of the comparisons that occur on social media and how they differ from more traditional social comparisons (e.g., in-person comparisons).

This research also uses the nature of social media comparisons to provide new insights into social comparison behavior more generally. In past research, studies have typically focused on single comparisons or the impact of an upward relative to a downward comparison (e.g., Lockwood & Kunda, 1999; Morse & Gergen, 1970; Vogel et al., 2014). Relatively few studies have examined multiple social comparisons occurring naturally in a single session; a handful have examined social comparisons through daily diaries or experience sampling studies (e.g., Locke, 2003; Locke & Nekich, 2000; Wheeler & Miyake, 1992; Wood et al., 2000), but participants in such studies have typically reported relatively few comparisons. Because social media forces individuals to view information about numerous others in a single browsing session, I was able to test the cumulative impact of multiple comparisons occurring in a short time-frame. This research thus adds to the social comparison literature by allowing for an analysis of the aggregative impact of multiple comparisons on self-esteem, mood, and overall satisfaction with life.

3 Self-Esteem and Social Media Comparisons

I also examined self-esteem as a predictor of the types of comparisons individuals make and their responses. Individuals lower in self-esteem may be more vulnerable to the negative consequences of making upward social media comparisons. Indeed, low self-esteem individuals are especially sensitive to comparison information (Lyubomirsky, 2001) and may be unable to manipulate upward comparison information to benefit their self-esteem (for review, see Wood & Lockwood, 1999). In contrast, higher self-esteem individuals are generally adept at construing their own achievements as similar to those of superior others (Collins, 1996), resulting in either less extreme upward comparisons or fewer of them – and consequently less negative outcomes. I argue that low self-esteem individuals will also experience worse outcomes following upward social media comparisons than will those higher in self-esteem, in part because they will view comparisons to be more upward in direction (i.e., more extreme). That is, a post describing a positive day at work may be interpreted by high self-esteem individuals as a somewhat upward

comparison to a modestly superior other, but as a significantly upward comparison to a highly superior other by low self-esteem individuals.

Low self-esteem individuals may also experience more negative consequences because they are more prone to making upward comparisons. Indeed, experience sampling studies have found that individuals with lower self-esteem tend to make more upward comparisons than those with higher self-esteem (Wheeler & Miyake, 1992; Wood et al., 2000). Correlational studies also indicate that low self-esteem individuals have a greater tendency to make Facebook comparisons (Jang, Park, & Song, 2016). Another study, however, suggests that although low self-esteem individuals perceived more comparisons being made on Facebook, they do not differ from those higher in self-esteem in terms of *actual* Facebook comparison behavior (Cramer, Song, & Drent, 2016). Thus, it is unclear if low self-esteem individuals experience more negative consequences because they actually make more upward comparisons or if they perceive more being made. I examined this directly.

Thus far, I have reviewed research suggesting that upward social media comparisons result in decreases in self-esteem (e.g., Hanna et al., 2017) and other research suggesting that low self-esteem individuals make more upward social media comparisons (e.g., Jang et al., 2016); however, to date, no research has examined these two effects simultaneously. Furthermore, no research has examined the role that extremity of online comparisons has on social media users' self-evaluations. Past studies examining social comparisons in offline contexts have typically examined self-esteem as a predictor or outcome of either comparison frequency (e.g., Wheeler & Miyake, 1992; Wayment & Taylor, 1995; Wood et al., 2000), direction (e.g., Aspinwall & Taylor, 1993; Morse & Gergen, 1970; Vohs & Heatherton, 2004), or extremity (e.g., Patrick, Neighbors, & Knee, 2004). Because social media allows for many comparisons in a brief time-span, I was able to test the cumulative effects of such comparisons, examining how the aggregate of these comparisons, would influence subsequent self-evaluations, mood, and satisfaction with life. I argue that, compared to higher self-esteem individuals, those with lower self-esteem may experience a particularly damaging cycle in which they make more frequent *and more extreme* upward comparisons, and consequently experience a more significant threat to their self-perceptions. This in turn may contribute to making even more frequent and extreme upward comparisons. In sum, this is the first set of studies to examine the frequency and extremity of social comparisons, and the degree to which low self-esteem is both a predictor and consequence

of these comparisons. These studies thus provide new insight into the relationship between self-esteem and social comparison, both online and more generally.

4 Present Research

There are four goals of the present research. First, I assessed the nature of specific social media comparisons, including the relative frequency, direction, extremity, domain, and impact of these comparisons. Second, I examined the role of self-esteem in predicting how individuals engage in and experience social media comparisons. Specifically, I assessed whether low self-esteem individuals would be more likely to make more frequent upward comparisons and make more extreme upward comparisons, both of which may lead to more negative outcomes. Third, I examined social comparisons on two platforms, Facebook and Instagram, to assess whether my effects generalized across platforms and whether the unique features of social media exacerbate negative responses to upward comparisons. Specifically, because Instagram is image-based, it may yield comparisons that are more upward in direction, which in turn may have a greater impact on self-esteem. Finally, I compared social comparisons that occur on social media to those that occur in other contexts (e.g., in-person, text messaging), to examine whether social media comparisons are particularly frequent and upward in direction, and thus more likely to result in negative outcomes. Moreover, I tested whether social media comparisons differed from more traditional social comparisons on key dimensions that influence comparison outcomes (i.e., target closeness and domain importance; Tesser, 1988).

In Study 1, I examined low and high self-esteem individuals' actual comparison behavior in real time by assessing their reactions to posts in their own Facebook news feeds; this enabled me to assess the frequency, domain, direction, and extremity of comparisons, as well as the cumulative impact of these comparisons on state self-esteem, affect, and life satisfaction after the session. In Study 2, I assessed low and high self-esteem participants' reactions to individual social media posts designed to resemble posts that individuals may encounter online. This enabled me to examine low and high self-esteem individuals' reactions to posts, while holding post content constant. In Study 3, I used the same methodology as in Study 1 to examine whether my findings would generalize to another social media platform: Instagram. I also used Study 3 to assess whether the features of different platforms, including their focus on image- or text-based posts, would result in different comparisons and outcomes. Further, I assessed the impact of different social media comparisons targets: friends vs. celebrities, and social connections from

the past vs. the present. In Study 4, I asked participants to use their smartphone for 10 minutes, either to access social media or to engage in non-social-media activities (such as texting or watching videos). This allowed me to directly compare the effects of using social media, relative to other online activities, on social comparison behaviour and outcomes. In Study 5, participants reported on comparisons they made each day for two weeks, allowing me to examine social comparisons as they occur in the real-world and to directly compare the frequency, direction, and impact of social media comparisons to those made in a variety of other contexts.

Across studies, I predicted that participants would be especially likely to make upward relative to downward comparisons on social media, and that these upward comparisons would have a negative impact on self-evaluations. Further, I predicted that, compared to higher self-esteem participants, lower self-esteem participants would be more likely to report making an upward (vs. downward or lateral) comparison, their upward comparisons would be more extreme, and they would consequently report greater a negative impact on self-evaluations. Thus, the frequency and extremity of upward comparisons would serve as a double threat to low self-esteem individuals' self-evaluations. In addition, I predicted that compared to other contexts, comparisons on social media would be more frequent, more likely to be upward in direction, and have greater negative effects on self-evaluations. Finally, I predicted that social media would have a negative impact on individuals, and that this negative impact would be due in part to upward comparison behavior. That is, individuals using social media will feel worse about themselves afterwards because of the many examples of superior others they encounter.

Chapter 2
Study 1: Social Comparisons While Using Facebook

In Study 1, participants browsed their Facebook news feeds for 20 minutes. After viewing each post, participants indicated whether they had made a social comparison, and if so, the comparison domain, direction, and impact on their self-evaluations. In addition, to assess the cumulative effects of the posts viewed, I measured participants' mood, state self-esteem, and life satisfaction immediately after the session. By examining comparisons made in real time, I was able to accurately measure the frequency, direction, and extremity of the comparisons individuals make while using Facebook as well as the immediate consequences of these comparisons. Thus, Study 1 provides me with an in-depth analysis of the nature of Facebook comparisons and the factors that contribute to different outcomes associated with Facebook use. Consistent with past research (e.g., Steers et al., 2014; Vogel et al., 2014; see Gerber et al., 2018 for meta-analytic review), I predicted that individuals would make more upward comparisons than downward or lateral comparisons, and these upward comparisons would have an immediate negative impact on their self-evaluations and a cumulative negative impact on their self-evaluations, mood, and life satisfaction as measured at the end of a browsing session.

Study 1 also allowed me to examine the role of self-esteem in determining the frequency and outcomes of comparisons occurring during an actual Facebook session. I predicted that lower self-esteem participants would 1) make more extreme upward comparisons and thus report more negative self-evaluations after upward comparisons, and 2) make a greater number of upward comparisons, which in turn would result in worse outcomes at the end of the session.

5 Method

5.1 Participants

One hundred and two introductory psychology students (84 women and 18 men[1]; M_{age}=18.80 years, *SD*=1.97 years) participated in exchange for course credit. I collected sufficient data (i.e., at least 85 observations) to detect a small effect at both levels of the multilevel models (N_{Level}

[1] I did not predict any gender effects, and indeed, for most analyses, there were no gender effects; where gender effects occur, they are described in footnotes.

$_{1}$=281; $N_{\text{Level 2}}$=102), and post-hoc power analyses revealed that I had at least .93 power for all the multilevel results. For the other analyses, a sensitivity analysis revealed that I had sufficient power to detect a medium effect (r=.27).

5.2 Procedure

Participants were invited to take part in a study on undergraduate Facebook use. At least 48 hours before coming into the lab, participants completed an online pretest. This pretest included the 10-item Rosenberg Self-Esteem Scale (e.g., "I take a positive attitude toward myself"; α=.90; Rosenberg, 1965) using a 7-point scale with endpoints ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The pretest also included questions about frequency of Facebook use; all participants indicated using Facebook at least once per week. Finally, to ensure that participants understood what a social comparison was, and were able to complete the following task successfully, they completed a brief training session in which they were tested on their ability to correctly identify social comparisons. After completing the online pretest, participants completed an in-lab session during which they logged into their own Facebook accounts and answered questions about each successive post in their own Facebook news feed. Participants were instructed to look only at their news feed while logged into Facebook and to refrain from navigating to any other page within Facebook or elsewhere. After 20 minutes, a research assistant directed the participant to another computer, on which the participant completed an exit survey.

5.2.1 Facebook News Feed Questions

Starting with the most recent post, participants were first asked about the source of the post: whether it was from a Facebook friend, a source other than a Facebook friend (e.g., a company), or something they themselves had posted. If the post was from a Facebook friend, participants indicated their agreement with the statement that they had compared themselves to the person who posted the item on a 7-point scale with endpoints ranging from 1 (*not true at all*) to 7 (*completely true*). If participants had made a comparison (i.e., if they answered 2 or above), they answered additional questions about the comparison.

For posts that led to comparisons, participants first indicated in which domain(s) the comparison occurred, with the option of selecting one or multiple domains, or selecting 'other' and providing their own domain label. Participants then indicated whether the comparison was to someone

worse- or better-off than themselves on a 7-point scale with endpoints ranging from -3 (*much worse off than me*) to +3 (*much better off than me*). This item enabled me to assess not only the direction of the comparison, but also the extremity. They then rated themselves on the two self-evaluation items ("After making this Facebook comparison, I felt better about myself" and "After making this Facebook comparison, I felt worse about myself" [reverse-scored]) on a 7-point scale with endpoints ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Responses for the two self-evaluation items (r=-.64, p<.001) were averaged to create a composite score of post-comparison self-evaluations.

5.2.2 Post-Facebook Questionnaire

After 20 minutes of answering questions about posts in their Facebook news feed, participants moved to another room where they completed a series of measures assessing their affect, self-esteem, and life satisfaction.

Participants first completed the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), indicating the extent they felt various feelings or emotions "right now, that is, at the present moment" on a 5-point scale (*1=not at all, 5=extremely*). Ten items tapped positive affect (e.g., proud, inspired), and ten items tapped negative affect (e.g. upset, ashamed) and were reverse-scored; all items were averaged to create state affect scores (α=.82). Participants then completed a state self-esteem measure (Heatherton & Polivy, 1991), indicating how true a series of 20 statements were for them "right now" on a 5-point scale (*1=not at all, 5=extremely*; α=.93). Finally, participants completed the five-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), indicating their agreement with each item on a 7-point scale (*1=strongly disagree to 7=strongly agree;* α=.85).

6 Results

6.1 Comparison Domains

I found that Facebook comparisons occur in a variety of domains and are not limited to the domains of popularity and achievement (see Table 1). Participants were especially likely to make comparisons in domains relevant to their leisure time, suggesting that social media may lead to an increase in comparisons in these domains. Whereas one might encounter relatively little information about friends' vacations, hobbies, or dinners out during face-to-face interactions, one may be bombarded with social media accounts of the vacations and outings of

past and present friends and acquaintances, complete with photographic evidence of what one has missed out on. Furthermore, a large percentage (36.6%) of the comparisons that participants reported occurred in multiple domains. For example, a participant might notice that a friend went on a more fabulous vacation and looks better in a bathing suit. Thus, it appears that exposure to a single Facebook post in one's news feed can trigger comparisons in more than one area.

6.2 Individual Comparisons

As predicted, participants made comparisons that were, on average, upward in direction (M=0.38 [0.22, 0.54], SD=1.39). An intercept-only multilevel model indicated this was significantly greater than the scale mid-point of 0, b=0.35 [0.21, 0.46], SE=0.07, t(108.70)=3.53, p<.001. Individuals who made comparisons that were more upward in direction reported lower self-evaluations following the comparison, b=-0.55 [-0.75, -0.31], SE=0.08, t(79.54)=-6.87, p<.001. Moreover, these effects held when considering the direction of comparison relative to each participant's average comparison direction. Specifically, for any given participant, making a more upward comparison relative to his/her own average comparison direction resulted in lower self-evaluations, b=-0.54 [-0.68, -0.40], SE=0.060, t(187.30)=-9.02, p<.001.

6.3 Total Number of Comparisons

We then examined whether participants' comparison behavior over the 20-minute Facebook session as a whole influenced subsequent reports of mood, state self-esteem, and life satisfaction. During the 20-minute session, participants viewed an average of 14.36 posts (SD=9.10), of which an average of 8.91 (SD=4.86) were posts from Facebook friends rather than from another source (e.g., a company advertising a product) or something they had posted themselves. Of these posts from friends, an average of 2.91 (Mdn=3, SD=1.43) resulted in a social comparison. When comparisons were coded as downward (-3 to -1), lateral (0), or upward (+1 to +3), a one-way repeated-measures ANOVA corrected using Greenhouse-Geisser estimates (ε=.90) revealed that there was a significant effect of comparison type, F(1.79, 180.93)=6.32, p=.003. Participants made more upward (M=1.19, SD=1.38; n_{total}=121) than downward comparisons (M=0.60, SD=0.71; n_{total}=61), t(180.93)=3.56, p<.001. Participants also made more lateral (M=0.97, SD=0.85; n_{total}=99) than downward comparisons, t(180.93)=3.54, p<.001, but the number of lateral and upward comparisons did not differ, t(180.93)=1.18, p=.24.

Next, I tested my hypothesis that number of upward comparisons made during the 20-minute session would predict participants' affect, state self-esteem, and life-satisfaction after the session. To account for correlations between the outcome measures, a multivariate regression was conducted where affect, state self-esteem, and life satisfaction were regressed simultaneously on the number of upward, downward, and lateral comparisons made by participants (controlling for total number of posts and number of posts from friends viewed by participants). The results of the multivariate analyses revealed that, as a whole, participant outcomes were predicted by number of upward comparisons, $F(3,94)=13.22$, $p<.001$, but not by number of lateral, $F(3,94)=1.21$, $p=.31$, or downward comparisons $F(3,94)=0.91$, $p=.44$. Univariate analyses indicated that more upward comparisons were associated with less positive affect, $b=-0.29$ [-0.38, -0.18], $SE=0.054$, $t(96)=-5.31$, $p<.001$, $r=.48$, lower state self-esteem, $b=-0.41$ [-0.56, -0.27], $SE=0.08$, $t(96)=-5.28$, $p<.001$, $r=.47$, and lower life satisfaction, $b=-0.35$ [-0.54, -0.20], $SE=0.10$, $t(96)=-3.65$, $p<.001$, $r=.35$. Thus, regardless of the number of downward and lateral comparisons participants made while browsing their Facebook news feeds, making more upward comparisons was associated with worse mood, more negative state self-esteem, and diminished life satisfaction after the 20-minute session.

6.4 Role of Self-Esteem

6.4.1 Self-Esteem and Individual Comparison Outcomes

I then tested whether Facebook comparisons are especially damaging for individuals lower in self-esteem esteem because individuals with lower self-esteem make Facebook comparisons that are more upward in direction. This hypothesis was tested using a variant of the causal steps approach (Baron & Kenny, 1986) amended for 2-1-1 multilevel mediation (Zhang, Zyphur, & Preacher, 2009). The first model revealed that lower self-esteem was associated with feeling worse about the self after making comparisons on Facebook, $b=0.04$ [0.03, 0.06], $SE=0.007$, $t(66.41)=6.09$, $p<.001$. The second model revealed that lower self-esteem was associated with making comparisons that were more upward in direction, $b=-0.03$ [-0.05, -0.01], $SE=0.009$, $t(85.66)=-3.46$, $p=.001$. The final model revealed a *positive* effect of self-esteem on self-evaluations after a given comparison, $b=0.03$ [0.02, 0.04], $SE=0.007$, $t(66.29)=4.43$, $p<.001$, and *negative* effects of the participants' average comparison direction, $b=-0.44$ [-0.59, -0.29], $SE=0.08$, $t(67.30)=-5.86$, $p<.001$, and any given comparison's deviation from the participant's average, $b=-0.51$ [-0.67, -0.35], $SE=0.08$, $t(48.37)=-6.45$, $p<.001$. This final model reduced prediction error by a large amount, $R^2_1=.45$, and a Sobel test revealed that this indirect effect was

significant, z=2.98, p=.003. Thus, lower self-esteem participants felt worse after Facebook comparisons, at least in part because these comparisons were more upward in direction.

6.4.2 Self-Esteem and Post-Facebook Outcomes

Next, I tested whether lower self-esteem individuals have worse state self-esteem, life satisfaction, and mood at the end of the 20-minute Facebook session because they make more upward comparisons during the session. First, I regressed number of upward comparisons on trait self-esteem using a Poisson regression with a log link function to account for the fact that the number of upward comparisons represented frequency counts and thus violated the normality assumption required for traditional regression. Consistent with my hypothesis, participants with lower self-esteem did indeed make more upward comparisons, b=-0.39 [-0.54, -0.21], SE=0.07, $\chi^2(1)$=29.06, p<.001. Because number of upward comparisons is non-normal, I applied a square root transformation to number of upward comparisons (Howell, 2013) and then mean-centered it in order to test the mediational hypotheses.

I then conducted three mediation analyses, one for each outcome, using a bootstrapping procedure (Hayes, 2013) with 5,000 resamples and generating 95% confidence intervals, while controlling for total number of posts and number of posts from friends viewed by participants. Number of upward comparisons mediated the positive association between trait self-esteem and state self-esteem, ab=0.08 [0.02, 0.17], SE=0.04. Although the total effect of trait self-esteem on state self-esteem was significant, c=0.65 [0.50, 0.79], SE=0.07, the direct effect of trait self-esteem on state self-esteem was reduced when the indirect path through number of upward comparisons was taken into account, c'=0.57 [0.42, 0.72], SE=0.08. Number of upward comparisons also mediated the positive association between trait self-esteem and life satisfaction, ab=0.09 [0.02, 0.19], SE=0.04. Although the total effect of trait self-esteem on life satisfaction, c=0.66 [0.48, 0.85], SE=0.09, was significant, the direct effect of self-esteem on life satisfaction was reduced when the indirect path through number of upward comparisons was taken into account, c'=0.58 [0.38, 0.77], SE=0.10. Finally, I tested whether number of comparisons would mediate the positive association between trait self-esteem and affect. This indirect effect, however, was only marginally significant, ab=0.05 [-0.002, 0.12], SE=0.03. In sum, participants with lower self-esteem made more upward comparisons while viewing their Facebook news feeds, resulting in more negative self-views, reduced life satisfaction, and a tendency toward more negative affect at the end of the session.

7 Discussion

Overall, Study 1 provides an in-depth examination of the comparison behaviors and immediate consequences individuals experience during a 20-minute Facebook session. Consistent with past research, I found a greater prevalence of upward comparisons than any other type of comparison. Furthermore, I found that many individuals make multiple Facebook comparisons in a single session, with a median of 3 comparisons in 20 minutes. This number is particularly striking given that previous experience sampling research found that individuals make an average of one comparison *per day* (Wheeler & Miyake, 1992). Moreover, individuals experienced steeper decreases in self-evaluation when they interpreted a particular Facebook post as more upward than usual. I also found that making more upward comparisons during a single Facebook session resulted in more negative mood, reduced state self-esteem, and diminished life satisfaction, regardless of the number of downward and lateral comparisons individuals had also made. Thus, downward and lateral Facebook comparisons may not counteract the negative effects that upward Facebook comparisons have on individuals. Furthermore, I found that comparisons occurred in a wide variety of domains, and more importantly, after being exposed to a single Facebook post, participants reported many comparisons that occurred in multiple domains. That is, there is not a simple one-to-one relationship for number of posts and number of comparisons being made. Instead, a single post on Facebook can trigger multiple comparisons in multiple domains, which may compound the negative effects of Facebook comparisons.

Finally, I found that participants with lower self-esteem reported making more extreme upward comparisons than did participants with higher self-esteem, and the extremity of these upward comparisons was in turn associated with lower self-evaluations after each individual comparison. Furthermore, participants with lower self-esteem reported a greater number of upward comparisons over the entire 20-minute session, which in turn was associated with worse mood, state self-esteem, and life satisfaction at the end of the session compared to their higher self-esteem peers. Thus, I found evidence that lower self-esteem individuals may be susceptible to a particularly damaging cycle in which they make more upward comparisons, both in number and extremity, that result in more negative self-evaluations. More negative self-views, in turn, are associated with making more upward comparisons.

Chapter 3
Study 2: Manipulating Content of Facebook Posts

Although Study 1 provides important evidence that low and high self-esteem individuals differ in their social media comparison behavior, it is possible that low self-esteem individuals are simply viewing different content than are their higher self-esteem peers. For example, it may be that low self-esteem individuals feel bad about themselves because they have many superior friends, in which case the posts they view from those friends on social media may be more positive and threatening, resulting in more extreme and frequent upward comparisons. In Study 2, I assessed participants' responses to a set of Facebook posts I created for the purpose of the study, thus holding the valence of post content constant for low and high self-esteem individuals. This design is similar to that employed by Vogel et al. (2014) in which participants viewed a post with more or fewer likes, a manipulation of popularity. In my study, I instead manipulated the content of the posts to determine the impact of specific content valence on high and low self-esteem individuals.

Participants were a community sample recruited via Amazon's Mechanical Turk (MTurk) and all viewed the same set of six Facebook posts in which individuals described events that varied in valence (two positive, two neutral, and two negative events). Participants were told that posts were real examples taken from the Facebook pages of participants who had taken part in a previous study; in fact, the posts were created by the experimenters for the purposes of the study. After each post, participants indicated whether they made a comparison and how they felt about themselves as a result of the comparison. I predicted that individuals would make upward comparisons when exposed to positive posts and downward comparisons when exposed to negative posts, and that these comparisons would have an impact on self-evaluations: Positive posts would lead individuals to make upward comparisons, which in turn would have a negative impact on self-evaluations; negative posts would lead individuals to make downward comparisons, resulting in more positive self-evaluations.

As in Study 1, I also examined whether self-esteem would predict comparison extremity. By exposing all participants to the same positive, negative, and neutral posts, I aimed to rule out the possibility that low self-esteem individuals report making more upward Facebook comparisons simply because they have friends who post a disproportionate amount positive content online. I predicted that after viewing the same posts as people with higher self-esteem, participants with

lower self-esteem would report making upward comparisons that were more upward in direction (i.e., more extreme), which in turn would lead to more negative self-evaluations.

8 Method

8.1 Participants

Through MTurk, I recruited 103 individuals who were paid $1.00 USD. Participants were eligible for the study if they used Facebook at least once per month and passed two standard attention checks (Maniaci & Rogge, 2014). Nine participants failed one or both attention checks, and three participants indicated they used Facebook less than once per month. My analyses included 91 participants (63 women, 27 men, 1 person of other/undisclosed gender; M_{age}=32.95, *SD*=10.19 years). Because I was interested in within- and between-person effects, I collected sufficient data to detect a small effect (r=.10) at each level (at least 85 observations; Cohen, 1992; Faul, Erdfelder, Lang, & Buchner, 2007); post-hoc power analyses revealed that for all analyses (except one which had .70 power), my final sample sizes (N_{L1}=364; N_{L2}=91) had at least .81 power.

8.2 Procedure

Participants were invited to take part in a study on social perceptions on Facebook. First, participants completed the same self-esteem scale (α=.93) used in Study 1. Participants were then presented with six posts, ostensibly written by past participants. Posts were presented one at a time, in random order. After each one, participants answered a series of questions. Two positive posts described personal achievements or pleasant outcomes (i.e., getting a good job and having a positive relationship experience). Two negative posts described personal negative experiences (i.e., a lay-off and a break-up). Two neutral posts described everyday personal experiences (see Table 2). I used two domains for each condition to ensure that results were not limited to one domain only.

8.2.1 Facebook Post Questions

In line with the study's cover story, participants read each post and answered a series of questions about their perception of the posters' personality. The last question was the comparison direction measure ("To what extent do you feel this person is worse-off or better-off than you?"); participants responded on a 7-point scale with endpoints ranging from -3 (*much*

worse off than me) to +3 (*much better off than me*) with a midpoint of 0 *(neither worse off nor better off than me).* Participants then completed a two-item self-evaluation measure similar to the one used in Study 1; they indicated the extent that they felt worse about themselves and better about themselves on a 7-point scale ranging from -3 (*strongly disagree*) to +3 (*strongly agree*).

9 Results

9.1 Individual Comparisons

9.1.1 Post Valence and Comparison Direction

I first examined whether, overall, participants made different types of comparisons in response to the positive, neutral, and negative posts using a one-way repeated measures ANOVA because post type was nested within person. Because the sphericity assumption had been violated, $\chi^2(2)=34.87$, $p<.001$, I corrected using Greenhouse-Geisser estimates ($\varepsilon=.76$). Overall, comparisons made in response to the positive posts ($M=0.77$, $SE=0.15$) were more upward than those made to the neutral posts ($M=0.16$, $SE=0.08$), which were, in turn, more upward than comparisons made to the negative posts, ($M=-1.46$, $SE=0.12$; $F(1.51, 135.94)=108.80$, $p<.001$, ts>3.80, ps$<.001$, rs$>.31$).[2]

9.1.2 Post Valence and Comparison Outcomes

To test whether participants felt worse after viewing the positive posts as a result of making more extreme upward comparisons, I conducted a variant of the causal steps approach amended for 1-1-1 multilevel mediation. Because I was primarily interested in the occurrence of upward comparisons, and thus the effect of positive posts, I entered post valence as two dummy-coded variables, one that compared positive to negative posts (0=positive, 0=neutral, 1=negative), and one that compared positive to neutral posts (0=positive, 1=neutral, 0=negative). The predictor

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[2] Participants reported making downward comparisons to both the post describing a negative work experience ($M=-1.43$, $SD=1.03$) and negative interpersonal experience ($M=-1.50$, $SD=1.50$) with no significant difference in extremity, $t(89)=0.30$, $p=.77$. For the positive posts, however, participants reported making upward comparisons to the post describing a positive work experience ($M=1.80$, $SD=1.17$), but not to the post describing a positive relationship experience ($M=-0.19$, $SD=0.97$; $t(89)=8.83$, $p<.001$). However, excluding responses to this particular post did not produce different results.

(i.e., post valence) varied within participants only. Thus, I did not enter the person-level average of post valance as a covariate in the final model.

First, self-evaluations were modelled as a function of post valence with a random intercept for each person. This analysis revealed that negative, b=0.87 [0.57, 1.17], SE=0.13, t(271.00)=6.54, p<.001, and neutral posts, b=0.27 [0.03, 0.52], SE=0.12, t(271.00)=2.37, p=.02, resulted in more positive self-evaluations than positive posts. Second, negative, b=-2.23 [-2.54, -1.92], SE=0.18, t(271)=-14.03, p<.001, and neutral posts, b=-0.60 [-0.92, -0.30], SE=0.16, t(271)=-4.39, p<.001, resulted in comparisons that were less upward in direction than positive posts. Finally, self-evaluations were modelled as a function of post valence and grand-mean centered comparison direction. This analysis revealed a *negative* effect of comparison direction on self-evaluations after a given comparison, b=-0.38 [-0.46, -0.32], SE=0.04, t(358.17)=-9.71, p<.001. In this final model, the difference between positive and negative posts, b=0.02 [-0.28, 0.26], SE=0.15, t(311.58)-0.11, p=.91, as well as positive and neutral posts, b=0.04 [-0.16, 0.24], SE=0.10, t(276.20)=0.41, p=.68, were no longer significant. This final model reduced prediction error by a large amount, R^2_l=.26, and a Sobel test revealed that this indirect effect was significant through both the difference between positive and neutral posts, z=4.00, p<.001, and positive and negative posts, z=7.98, p<.001. Thus, consistent with my hypothesis, participants felt worse about themselves after being exposed to positive posts, relative to negative or neutral posts, because they made comparisons to the posters that were more upward in direction.

9.2 Role of Self-Esteem

9.2.1 Self-Esteem and Comparison Extremity

I then examined whether self-esteem influenced comparison extremity for each post type. Comparison direction was modelled as a function of self-esteem (grand-mean centered continuous variable), post valence (two dummy-coded variables), and their interaction. The post valence by self-esteem interaction was marginally significant, $\chi^2(2)=5.03$, p=.08. To examine the effect of self-esteem for each post type, I recoded the post valence variables so that each post valence was the reference group, resulting in three 2-level multilevel models with random intercepts estimated using an unstructured covariance matrix and the Satterthwaite method of estimating degrees of freedom. Self-esteem effect sizes for each type of post is estimated using semi-partial R^2 (Edwards, Muller, Wolfinger, Qaqish, & Schabenberger, 2008).

For positive posts, there was a significant effect of self-esteem, *b*=-0.63 [-1.07, -0.18], *SE*=0.20, *t*(328.00)=-3.20, *p*=.002, *semi-partial* R^2=0.03 (see Figure 3). In contrast, there was no effect of self-esteem for either neutral, *b*=-0.24 [-0.48, 0.002], *SE*=0.15, *t*(193.52)=-1.59, *p*=.11, *semi-partial* R^2=0.01, or negative posts, *b*=-0.09 [-0.43, 0.26], *SE*=0.20, *t*(328.00)=-0.448, *p*=.65, *semi-partial* R^2=0.001. Thus, consistent with my hypothesis, when exposed to the same positive posts, individuals lower in self-esteem tended to make more extreme upward comparisons than individuals higher in self-esteem; however, lower self-esteem individuals did not differ from higher self-esteem individuals in comparison extremity after being exposed to neutral or negative posts.

9.2.2 Self-Esteem and Comparison Outcomes

Next, I examined whether individuals with lower self-esteem would feel disproportionately worse about themselves after viewing individual Facebook posts, at least in part due to making upward comparisons that are more upward in direction than participants with higher self-esteem; I conducted this analysis using the same 2-1-1 multilevel mediation analytic strategy used in Study 1.

First, participants' self-evaluations were modelled as a function of self-esteem with a random intercept for each person, *b*=0.42 [0.24, 0.60], *SE*=0.10, *t*(89)=4.27, *p*<.001: Lower self-esteem was associated with feeling worse about the self after being exposed to the Facebook posts. Second, extremity of comparison direction was modelled as a function of self-esteem with a random intercept for each person. This analysis revealed that lower self-esteem was associated with making comparisons that are more upward in direction, *b*=-0.30 [-0.53, -0.07], *SE*=0.12, *t*(89)=-2.47, *p*=.015. Finally, there was a *positive* effect of self-esteem on self-evaluations after a given comparison, *b*=0.37 [0.27, 0.39], *SE*=0.10, *t*(87.87)=3.91, *p*<.001, and *negative* effects of the participants' average comparison direction, *b*=-0.23 [-0.35, -0.14], *SE*=0.08, *t*(87.73)=-2.84, *p*=.006, and any given comparison's deviation from the participant's average on self-evaluations, *b*=-0.37 [-0.47, -0.22], *SE*=0.04, *t*(56.52)=-8.51, *p*<.001. This final model reduced prediction error by a large amount, R^2_1=.39, and a Sobel test revealed that this indirect effect was significant, *z*=2.37, *p*=.018. Thus, consistent with my hypothesis, lower self-esteem participants felt worse about themselves after viewing Facebook posts at least in part because they made upward comparisons that were more upward in direction than higher self-esteem participants.

10 Discussion

In sum, posts that were more positive in valence did lead participants to make upward comparisons and, thus, feel worse about themselves. Moreover, I found that that when any individuals, not only those lower in self-esteem, viewed a post that was more positive than usual, they experienced greater declines in self-evaluation because they made a more extreme upward comparison. This within-person process provides further evidence that making upward comparisons after exposure to positive news feed content is a key mechanism through which social media use may lead to more negative self-evaluations.

Furthermore, I found convincing evidence of one key factor, extremity of upward comparison, that leads low self-esteem individuals to experience more negative outcomes than high self-esteem individuals. That is, although all participants were likely to make an upward comparison in response to the positive posts, lower self-esteem participants interpreted these posts as more upward than did higher self-esteem participants. Thus, low self-esteem individuals do indeed make more extreme upward comparisons while using social media; they do not merely have better memory for upward comparisons than their higher self-esteem peers, or view more positive post content. Moreover, this effect was limited to positive posts only: Low self-esteem participants perceived individuals in negative and neutral posts similarly to higher self-esteem participants; they were not less likely to see the worse-off others as downward comparisons, and were not more likely to see neutral posts as upward comparisons. Therefore, it is not any comparison behavior in general (Steers et al., 2014), but rather positive posts resulting in more extreme upward comparisons that are a key contributor to low self-esteem individuals' more negative outcomes following Facebook use.

Finally, I replicated my mediation model from Study 1: Compared to participants with higher self-esteem, those with lower self-esteem made more extreme upward comparisons and, as a result, experienced greater decreases in their self-evaluations after being exposed to the same content. Taken together, Studies 1 and 2 demonstrate that individuals with lower self-esteem not only recall making more extreme upward Facebook comparisons, but also report making more extreme upward comparisons directly after viewing a positive Facebook post.

Chapter 4
Study 3: Comparisons While Using Facebook and Instagram

Up to this point, I have focused my analysis of social media comparisons on Facebook, which is currently the most popular social media platform worldwide (Statista, 2018). Nevertheless, a number of other platforms are also becoming increasingly popular. Use of Instagram, in particular, has grown among younger adults: In 2016, 59% of Instagram users were between the ages of 18 to 29 (Greenwood, Perrin, & Duggan, 2016). In Study 3, I investigated whether my findings regarding comparisons on Facebook would generalize to Instagram.

I also used Study 3 to further examine the mechanisms through which social media comparisons, in contrast to face-to-face comparisons, may affect individuals. Specifically, social media posts can take the form of either text, images, or both. Whereas Facebook is primarily text-based, with the option for posters to attach images, Instagram is image-based, with an option to include a brief text caption. The findings of Study 2, in which participants were exposed to brief text posts, indicate that text-only posts do have an impact on viewers. I propose that image-based posts have the potential to be even more threatening than text-based posts, especially in contrast to offline comparisons. Online, individuals have the opportunity to select only those images of themselves that are particularly flattering, an option not available in in-person interactions. In addition, it may be that images lead individuals to draw more detailed comparisons than do text-only posts; after all, it is one thing to know that a friend is having a wonderful vacation in a tropical paradise, but a photo of that friend looking happy and attractive on a pristine beach may have a greater impact than would simply learning that the friend is on such a vacation. Finally, Instagram in particular may lead to more extreme upward comparisons because the platform provides a set of filters that posters can use to render their images of themselves more attractive. It may be that attractiveness comparisons are especially frequent on Instagram, and that, due to the fact that posters can ensure that they are revealing only the most appealing images of themselves, these comparisons may be especially upward and especially threatening. In Study 3, I assessed whether participants' social media comparisons were driven primarily by text or by images, and whether the image-based comparisons would be especially likely to yield upward comparisons. I also assessed whether attractiveness comparisons would be more extremely upward and would therefore have an especially negative impact on participants' self-evaluations.

In addition to offering unprecedented exposure to carefully-managed images, social media also provides an exceptionally broad base of individuals with whom one can compare. Whereas in traditional interactions, individuals might be likely to compare themselves to individuals they encounter in the course of their daily life, social media exposes individuals to a wealth of past connections, such as friends from high school, and individuals with whom one has no connection at all, such as celebrities. The self-evaluation maintenance model (Tesser, 1988) predicts that, unless domain relevance is low, individuals feel worse about themselves when they compare upward to close others rather than to acquaintances or strangers. One might therefore expect that comparisons to posts from successful high school friends or superstar celebrities would have less impact on comparison outcomes than posts from friends that one sees regularly. However, it is also possible that routine exposure to posts from past contacts and celebrities makes comparisons to these individuals inescapable or makes these individuals seem like more appropriate targets for social comparison. Thus, we examined how the relationship to the comparison target affects the direction and impact of social media comparisons.

In Study 3, participants browsed either their Facebook or Instagram news feed on their smartphones and answered questions about the first 20 posts on a desktop computer. These questions included those used in Study 1, with additional questions about whether the post was image- or text-based and the identity of the person who posted it. Thus, Study 3 allowed me to examine whether platform, post type, and poster's identity influences the strength and consequences of online comparisons. As in Studies 1 and 2, I examined the role of self-esteem in determining outcomes to social media comparisons. I predicted that lower self-esteem would be associated with making more upward comparisons, which would result a cumulative negative impact on their self-evaluations, mood, and life satisfaction after the social media session was over.

11 Method

11.1 Participants

Two hundred and thirteen introductory psychology students (157 women and 56 men; M_{age}=18.98 years, SD=1.64 years) participated for course credit. As in Studies 1 and 2, I collected sufficient data (i.e., at least 85 observations) to detect a small effect at both levels of the multilevel models (N_{L1}=4260; N_{L2}=213). Post-hoc power analyses revealed that I had at least

81.06% power for the primary multilevel results. For my other analyses, sensitivity analysis revealed that I had sufficient power to detect a small-to-medium effect (r=.19).

11.2 Procedure

Participants who use both Facebook and Instagram were invited to take part in a study on social media use. Upon arrival at the lab, participants first completed a questionnaire that included the same self-esteem scale (α=.87) used in Studies 1 and 2. They were randomly assigned to either the Facebook or Instagram condition and were asked to open the corresponding app on their smartphone. In Study 1, participants were asked to answer questions about each post from a Facebook "friend," for a 20-minute period. In Study 3, to ensure that participants using both platforms were following a similar procedure, I instead asked them to answer questions about the first 20 posts in their news feed, without constraining the time to 20 minutes. As in Study 1, they were asked to complete the questionnaire without navigating away from the news feed. For each post, participants indicated the source, selecting from one of the following options: *family member, friend, past friend, friend of a friend, colleague, past colleague, he/she is a celebrity,* or *he/she is Internet famous*. Then, participants indicated the extent to which they had made a social comparison while viewing the post (1=*not at all*; 7=*completely*). If participants had made a comparison (i.e., answered 2 or above), they answered additional questions about the comparison.

For posts that led to comparisons, participants completed the same measures used in Study 3, indicating the comparison domain, direction and resulting self-evaluations (r=-.71, p<.001). In Study 1, participants were free to indicate multiple domains. In Study 3, participants indicated the one primary domain in which the comparison took place. This enabled me to directly compare the domains that were the principal sources of comparison for the two platforms. Additionally, participants indicated what triggered the comparison by selecting one of four options: *primarily the image*, *primarily the text*, *number of likes,* or *number of comments.* After answering questions about 20 posts, participants were instructed to put down their smartphones. They then completed the same exit measures as in Study 1: state self-esteem (α=.92), life satisfaction (α=.85), and state affect (α=.83).

12 Results

12.1 Comparison Domains

Consistent with Study 1, I found that both Facebook and Instagram comparisons occur in various domains (see Table 1). For both platforms, the top three domains of comparison were looks/attractiveness, popularity/friendship, and vacations/activities/lifestyle. The number of attractiveness comparisons may be especially relevant for Instagram, as will be discussed below.

12.2 Individual Comparisons

As in Study 1, participants made comparisons that were, on average, upward in direction (*M*=1.04 [0.97, 1.11], *SD*=1.54). An intercept-only multilevel model indicated this was significantly greater than the scale midpoint of 0, *b*=1.04 [0.93, 1.15], *SE*=0.06, *t*(193.13)=17.99, *p*<.001. As in Studies 1 and 2, individuals who made comparisons that were more upward in direction reported lower self-evaluations following the comparison, *b*=-0.52 [-0.62, -0.41], *SE*=0.05, *t*(188.50)=-9.87, *p*<.001. Moreover, these effects held when considering each comparison's direction relative to each participant's average comparison direction. Specifically, for any given participant, making a more upward comparison relative to his/her own average comparison direction resulted in lower self-evaluations *b*=-0.44 [-0.48, -0.41], *SE*=0.02, *t*(1572.50)=-25.57, *p*<.001.

Next, I tested whether social media platform moderated any of these effects through model comparison. I compared a full model that included platform, trait self-esteem, person-mean comparison direction, person-centered comparison direction, and their interactions to a model that included main effects only. Platform did not moderate this effect, $\chi^2(2)=1.93$, $p=.38$.

12.2.1 Post Modality (Image vs. Text)

Participants reported 357 (20.01% of all comparisons reported) text-based comparisons and 1340 image-based comparisons (75.11 % of all comparisons reported).[3] Participants were more likely to make image-based comparisons on Instagram than on Facebook, *b*=1.28, *SE*=0.19, *z*=6.66, *p*<.001, *Odds Ratio*=3.60:1. Instagram participants had a 90.14% chance of making an image-

[3] Participants could also indicate whether the comparison was due to number of likes (*n*=76 [4.23%]) or number of comments (*n*=23 [1.28%]); however, due to the small samples of comparisons, I excluded them from our analyses.

based comparison, whereas Facebook participants had a 71.77% chance of making an image-based comparison. Given the high prevalence of image-based comparisons, I tested whether image-based comparisons are more upward and impactful than text-based comparisons using a variant of the causal steps approach amended for 1-1-1 multilevel mediation. I entered post modality as an effects-coded variable (-1=text; 1=image). To account for the between- and within-person effects, I entered each person's mean as well as their deviations from their own mean (person-centered) for both post modality and comparison direction.

First, individuals who made more image-based comparisons, b=-0.23 [-0.46, 0.001], SE=0.12, t(217.40)=-1.90, p=.058, and individuals making more image-based comparisons relative to their own mean, b=-0.22 [-0.29, -0.14], SE=0.04, t(1482.50)=-5.44, p<.001, reported lower self-evaluations. Second, individuals who made more image-based comparisons, b=0.74 [0.50, 0.98], SE=0.12, t(230.30)=6.13, p<.001, and made more image-based comparisons relative to their own mean, b=0.24, [0.15, 0.33], SE= 0.05, t(1503.00)=4.97, p<.001, reported comparisons that were more upward in direction. Finally, the between-person effect of image-based comparisons on self-evaluation was no longer significant, b=0.18 [-0.03, 0.39], SE=0.11, t(217.80)=1.68, p=.09, and the within-person effect on self-evaluations was reduced, b=-0.11 [-0.18, -0.05], SE=0.03, t(1477.20)=-3.23, p=.001, when I accounted for comparison direction, between-person: b=-0.57 [-0.68, -0.45], SE=0.06, t(196.80)=-9.85, p<.001, within-person: b=-0.45 [-0.48, -0.41], SE=0.02, t(1490.90)=-25.08, p<.001. This final model also reduced prediction error by a large amount, R^2_1=.30. A Sobel test revealed that the within-person indirect effect was significant, $z_{\text{within-person}}$=5.34, p<.001, and the between-person indirect effect was marginally significant, $z_{\text{between-person}}$=1.89, p=.06. Thus, participants felt worse after making image-based comparisons, at least in part because these comparisons were more upward than text-based comparisons.

Next, I tested whether platform moderated the effects. Platform was a significant moderator in the first model, $\chi^2(2)$=7.39, p=.02. There was a significant platform by modality (within-person) interaction on self-evaluations, b=-0.10 [-0.18, -0.02], SE=0.04, t(1482.10)=-2.50, p=.01. There was no difference between text- and image-based comparisons on Instagram, b=-0.09 [-0.21, 0.04], SE=0.07, t(1482.20)=-1.35, p=.18; however, image-based comparisons resulted in lower self-evaluations than text-based comparisons on Facebook, b=-0.29 [-0.39, -0.19], SE=0.05, t(1482.10)=-5.84, p<.001. Given that Instagram is an image-based social media platform, it is likely that there were too few comparisons made to text-based posts to detect a difference between these two modalities. Indeed, the results from the multilevel logistic model suggests

that Instagram participants only had a 9.86% chance of making a text-based comparison. In contrast, Facebook participants had a 28.23% chance of making a text-based comparison. Platform did not moderate any other models, χ^2s<7.30, *p*s>.12.

12.2.2 Appearance vs. Other Domains

Given that Instagram is an image-based social media platform, I tested whether appearance-related comparisons were more likely to occur on Instagram than Facebook. A multilevel logistic model revealed this to be the case, *b*=0.52, *SE*=0.15, *z*=3.57, *p*<.001, *Odds Ratio*=1.69:1. Facebook participants had a 17.70% chance of making an appearance-related comparison, whereas Instagram participants had a 26.64% chance of making an appearance-related comparison.

Next, I tested whether appearance-related comparisons are especially upward and impactful compared to comparisons made in other domains. I used a 1-1-1 multilevel mediation analysis to examine whether appearance-related comparisons resulted in more upward comparisons and therefore worse self-evaluations compared to those made in other domains and entered domain as an effects-coded variable (-1=other domains; 1=appearance-related). The first model indicates that appearance-related comparisons were associated lower self-evaluations than comparisons made in other domains, between-person: -0.35 [-0.62, -0.08], *SE*=0.13, *t*(222.90)=-2.58, *p*=.01, within-person: -0.08 [-0.15, -0.007], *SE*=0.03, *t*(1583.90)=-2.19, *p*=.03. The second model found that only individuals who made more appearance-related comparisons than comparisons in other domains made more extreme upward comparisons (i.e., between-person effect), *b*=0.41 [0.13, 0.70], *SE*=0.15, *t*(235.60)=2.84, *p*=.005. In contrast, there was no within-person difference between appearance-related comparisons and comparisons in other domains in terms of comparison extremity, *b*=0.008 [-0.08, 0.09], *SE*=0.04, *t*(1599.00) = 0.20, *p*=.84: Individuals made similarly extreme comparisons regardless of whether the comparison was appearance-related or not. The final model revealed that the between-person effect of appearance-related comparisons relative to comparisons in other domains on self-evaluations was no longer significant, *b*=-0.14 [-0.37, 0.09], *SE*=0.11, *t*(210.90)=-1.23, *p*=.22, and the within-person effect on self-evaluations was reduced, *b*=-0.07 [-0.13, -0.01], *SE*=0.03, *t*(1570.60)=-2.47, *p*=.01, when comparison direction was accounted for, between-person: *b*=-0.51 [-0.61, -0.40], *SE*=0.05, *t*(189.60)=-9.44, *p*<.001, within-person: *b*=-0.44 [-0.48, -0.41], *SE*=0.02, *t*(1570.70)=-25.57, *p*<.001. This final model also reduced prediction error by a large

amount, R^2_1=.31. A Sobel test revealed that the between-person indirect effect was significant, z=3.31, p< .001. Thus, individuals who tended to make more appearance-related comparisons felt worse than those who made fewer appearance-related comparisons, at least in part because they tend to make more extreme upward comparisons. Platform did not moderate the effect of appearance-related domain on self-evaluation, $\chi^2(2)=3.36$, p=.19.

12.2.3 Relationship to Comparison Target

Next, I tested whether comparisons to people known in the past (e.g., high school friends with whom one is no longer in direct contact) differed from comparisons made to people known in the present in terms of comparison extremity and impact. For this analysis, I excluded comparisons to celebrities and examined comparisons to individuals that participants had met in person. Posts that participants indicated were from *past friend* or *past colleague* were coded as posts from past contacts (-1) and all other non-celebrity posts (e.g., family, friends, colleagues, etc.) were coded as posts from current contacts (+1). Participants reported making more comparisons to current contacts (n=792) than past contacts (n=360). Self-evaluations after comparisons, however, did not differ between people known in the past and people known in the present, between-person, b=0.02, [-0.24, 0.28], SE=0.13, $t(176.90)$=0.16, p=.88, or within-person, b=-0.05, [-0.14, 0.03], SE=0.04, $t(1037.10)$=-1.23, p=.21. Thus, comparisons to past and present friends have similar effects on individuals' self-evaluations following comparisons[4].

In addition, I tested whether comparisons to people not known personally to participants (i.e., celebrities and Internet celebrities) differ in extremity and impact compared to those made to non-celebrities (i.e., family, friends, and colleagues). Participants reported making more comparisons to non-celebrities (i.e., family, friends, colleagues, past friends; n=1152) than celebrities (n=485). However, Instagram participants were more likely to make comparisons to celebrities than were Facebook participants, b=1.38, SE=0.23, z=5.87, p<.001, *Odds Ratio*=3.97:1. Instagram participants had a 34.21% chance of making a comparison to a celebrity, whereas Facebook participants had only an 11.58% chance of making a comparison to a celebrity. Thus, platform is an important variable in determining with whom one compares on social media.

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[4] Platform did not moderate this effect, $\chi^2(2)$s<2.16, ps>33.

We used a 1-1-1 multilevel mediation analysis to examine whether posts from celebrities resulted in more upward comparisons and therefore worse self-evaluations compared to those made to non-celebrities and entered target category as an effects-coded variable (-1=non-celebrities; 1=celebrities). First, posts from celebrities were associated with lower self-evaluations, between-person: b=-0.24 [-0.44, -0.05], SE=0.10, t(193.40)=-2.42, p=.02, within-person: b=-0.20 [-0.28, -0.13], SE=0.04, t(1521.40)=-5.41, p<.001. Second, posts from celebrities predicted making more extreme upward comparisons, between-person: b=0.57 [0.37, 0.77], SE=0.10, t(204.70)=5.68, p<.001, within-person: b=0.60 [0.51, 0.69], SE=0.04, t(1553.00)=13.64, p<.001. Finally, the between-person effect of target category on self-evaluation was no longer significant, b=0.06 [-0.12, 0.23], SE=0.09, t(183.60)=0.67, p=.50, and the within-person effect on self-evaluations became positive, b=0.08 [0.008, 0.14], SE=0.03, t(1514.90)=2.26, p=.02[5], when I accounted for comparison direction, between-person: b=-0.54 [-0.65, -0.43], SE=0.06, t(188.60)=-9.48, p<.001, within-person: b=-0.47 [-0.51, -0.43], SE=0.02, t(1436.90)=-24.70, p<.001. This final model also reduced prediction error by a large amount, R^2_l=.32. A Sobel test revealed that the between-person, $z_{\text{between-person}}$=2.32, p=.02, and within-person, $z_{\text{within-person}}$=4.89, p<.001, indirect effects were significant. Thus, participants felt worse after making comparisons to a post from a celebrity, at least in part because these comparisons were more upward than comparisons made to posts from non-celebrities.[6]

12.3 Total Number of Comparisons

I then examined whether comparison behavior over all 20 posts influenced subsequent reports of mood, state self-esteem, and life satisfaction. Of these posts, an average of 8.43 (Mdn=8.00, SD=5.05) resulted in a social comparison. Consistent with Study 1, participants reported more upward comparisons (n=1138) than either lateral (n=402) or downward (n=256) comparisons. A one-way repeated-measures ANOVA corrected using Greenhouse-Geisser estimates (ε=.78) revealed that there was a significant effect of comparison type, F(2, 211) = 111.64, p<.001. Participants made more upward (M=5.34, SD=3.85) than downward (M=1.20, SD=1.54; t(212)=14.90, p<.001) or lateral (M=1.89, SD=2.45; t(212)=11.15, p<.001) comparisons. They

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[5] Because the zero-order correlation between within-person effect of target category and self-evaluation is negative, r=-0.12, p<.001, it suggests that the change in sign for the within-person effect of target category in the final model is a suppression effect.

[6] Platform did not moderate the effect of poster status on self-evaluations, χ^2(2)=1.17, ps=.56.

also made more lateral than downward comparisons, $t(212)=3.72$, $p<.001$. A Poisson regression indicated that platforms did not differ in terms of number of comparisons reported, $b=0.05$, [-0.04, 0.14], $SE=0.05$, $\chi^2(1)=1.07$, $p=.30$. However, relative to participants using Facebook, participants using Instagram were especially likely to make upward comparisons relative to any other type of comparison, $b=0.28$ [0.17, 0.40], $SE=0.06$, $\chi^2(1)=21.89$, $p<.001$. For participants who used Instagram, 68.44% of comparisons they made were upward; for participants who used Facebook, 57.78% of the comparisons were upward.

Next, I tested whether number of upward comparisons made during the session would predict participants' affect, state self-esteem, and life-satisfaction after the session, while controlling for number of lateral and downward comparisons. To account for correlations between the outcomes, I regressed affect, state self-esteem, and life satisfaction simultaneously (i.e., multivariate regression) on the number of upward, downward, and lateral comparisons made by participants. As a whole, number of upward comparisons predicted outcomes, $F(3, 207)=8.94$, $p<.001$, but number of lateral, $F(3,207)=1.83$, $p=.14$, or downward comparisons did not, $F(3,207)=0.86$, $p=.47$. Univariate analyses indicated that more upward comparisons were associated with less positive affect, $b=-0.02$ [-1.79, -0.70], $SE=0.009$, $t(207)=-2.16$, $p=.027$, $r=.15$, lower state self-esteem, $b=-1.25$ [-1.79,-0.70], $SE=0.29$, $t(207)=-4.95$, $p<.001$, $r=.33$, and lower life satisfaction, $b=-0.10$ [-0.14,-0.05], $SE=0.02$, $t(207)=-4.22$, $p<.001$, $r=.28$. Thus, as in Study 1, regardless of the number of downward and lateral comparisons participants made while viewing their news feeds, making more upward comparisons predicted worse mood, lower state self-esteem, and diminished life satisfaction after the 20 posts.[7]

12.4 Role of Self-Esteem

12.4.1 Self-esteem and Individual Comparison Outcomes

I first tested whether, as in Studies 1 and 2, comparisons were especially damaging for individuals lower in self-esteem.[8] As in Study 1, I used a 2-1-1 multilevel mediation analysis to examine whether low self-esteem individuals would make comparisons that were more upward

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[7] Platform did not moderate any of these effects, $Fs<2.19$, $ps>.09$.

[8] Self-esteem did not predict greater likelihood of making an image-based comparison, $z=-0.003$, $p=.89$, making a comparison to a celebrity, $z=-0.01$, $p=.70$, or making appearance-related comparisons, $z=-0.007$, $p=.66$.

and thus feel worse about themselves afterwards. First, lower self-esteem was associated with feeling worse about the self after making comparisons on social media, b=0.06 [0.04, 0.08], SE=0.01, t(175.28)=5.41, p<.001. Second, lower self-esteem was associated with making comparisons that were more upward in direction, b=-0.03 [-0.05, -0.006], SE=0.01, t(178.57)=-2.39, p=.018. Finally, there was a *positive* effect of self-esteem on self-evaluations after a given comparison, b=0.044 [0.03, 0.06], SE=.009, t(165.50)=4.89, p<.001, and *negative* effects of the participants' average comparison direction, b=-0.48 [-0.58, -0.38], SE=0.05, t(192.60)=-9.43, p<.001, and any given comparison's deviation from the participant's average, b=-0.44 [-0.48, -0.41], SE=0.02, t(1578.20)=-25.59, p<.001. This final model reduced prediction error by a large amount, R^2_l=.33, and a Sobel test revealed that this between-person indirect effect, z=-4.34, p<.001, and within-person indirect effect were both significant, z=-4.80, p<.001. Thus, consistent with Studies 1-2, individuals with lower self-esteem felt worse after social media comparisons, at least in part because these comparisons were more upward. The social media platform interactions were not significant across all three models, χ^2s<0.76, ps>.38.

12.4.2 Self-Esteem and Post-Social Media Session Outcomes

Next, I tested whether individuals lower in trait self-esteem would have lower state self-esteem, life satisfaction, and mood after browsing their news feeds as a result of making more upward comparisons during the session. First, I regressed number of upward comparisons on trait self-esteem using a Poisson regression. Consistent with my hypothesis, low self-esteem individuals made more upward comparisons, b=-0.04 [-0.06, -0.02], SE=0.006, $\chi^2(1)$=45.24, p<.001. Next, I tested whether platform moderated this effect. There was a main effect of platform, b=-0.10, SE=0.03, z=-3.21, p=.001: Participants made more upward comparisons on Instagram than on Facebook; this effect was qualified by a significant trait self-esteem by platform interaction, b=0.02, SE=0.006, z=3.12, p=.002. Although lower self-esteem predicted making more upward comparisons on both Facebook, b=-0.02, SE=0.009, z=-2.42, p=.02, and Instagram, b=-0.06, SE=0.008, z=-7.21, p<.001, this effect was much larger on Instagram than on Facebook. Thus, low self-esteem individuals' tendency to make upward comparisons is exacerbated when they browse Instagram relative to when they browse Facebook.[9]

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[9] There was a significant gender by trait self-esteem interaction for number of upward comparisons, b=0.02, SE=0.007, z=2.62, p=.009. For women, self-esteem predicted number of upward comparisons, b=-0.05, SE=0.007,

As in Study 1, I applied a square root transformation and then mean-centered it to test the mediational hypotheses. I conducted three mediation analyses, one for each outcome, using the same bootstrapping procedure as Study 1. All of the mediation models were consistent with Study 1. Number of upward comparisons mediated the positive association between trait self-esteem and state self-esteem, *ab*=0.12 [0.04, 0.25], *SE*=0.05. Although the total effect of trait self-esteem on state self-esteem was significant, *c*=2.23 [1.92, 2.54], *SE*=0.16, the direct effect of trait self-esteem on state self-esteem was reduced when the indirect path through number of upward comparisons was taken into account, *c'*=2.11 [1.80, 2.43], *SE*=0.16. Number of upward comparisons also mediated the positive association between trait self-esteem and life satisfaction, *ab*=0.01 [0.001, 0.02], *SE*=0.006. Although the total effect of trait self-esteem on life satisfaction, *c*=0.16 [0.12, 0.19], *SE*=0.02, was significant, the direct effect of self-esteem on life satisfaction was reduced when the indirect path through number of upward comparisons was taken into account, *c'*=0.15 [0.11, 0.18], *SE*=0.02. Finally, I tested whether number of comparisons would mediate the positive association between trait self-esteem and affect. This indirect effect, however, was only marginally significant, *ab*=0.0005 [-0.003, 0.004], *SE*=0.002.

Next, I tested whether there was a self-esteem by social media platform effect for any of the post-session outcomes measured. There were no platform effects for affect or life satisfaction, *t*s<.66, *p*s>.51; however, there was a significant trait self-esteem by platform interaction for state self-esteem, *b*=-0.42 [-0.73, -0.11], *SE*=0.15, *t*(208) =-2.70, *p*=.008, *r*=.18: This effect was much larger for participants using Instagram, *b*=2.67 [2.34, 3.04], *SE*=0.22, *t*(208)=11.90, *p*<.001, *r*=.51, than for those using Facebook, *b*=1.84 [1.28, 2.29], *SE*=0.21, *t*(208)=8.63, *p*<.001, *r*=.64. Thus, low self-esteem individuals feel worse about themselves after browsing Instagram than after browsing Facebook.

13 Discussion

In sum, Study 3 provides further evidence regarding the comparison behaviors and immediate consequences individuals experience when browsing social media. Consistent with Study 1, there was a greater prevalence of upward comparisons than any other type of comparison, and many individuals made multiple comparisons in a single session, with a median of 8

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z=-7.15, *p*<.001: Lower self-esteem among women predicted making more upward comparisons. In contrast, trait self-esteem did not predict number of upward comparisons for men, *b*=-0.01, *SE*=0.01, *z*=-1.15, *p*=.25.

comparisons in 20 posts. This increase in number of comparisons relative to Study 1 may have arisen from the increased number of opportunities to make comparisons in Study 3: In Study 1, participants browsed their feed for 20 minutes and viewed an average of 14.36 posts (*Mdn*=12; *SD*=9.10), whereas all participants in Study 3 viewed 20 posts. Moreover, I replicated the key findings from Studies 1 and 2. First, any individual, not only those low in self-esteem, experienced steeper self-evaluation declines if a particular post in their news feed was interpreted as more upward than usual. Second, making more upward comparisons while viewing posts from others resulted in lowered state self-esteem and life satisfaction following the social media session, regardless of the number of downward and lateral comparisons individuals had also made. Third, consistent with past research examining comparisons offline (Wheeler & Miyake, 1992) and Study 1, I found that comparisons occurred in wide-ranging domains. Whereas past research examining offline comparisons found that individuals tended to make the most comparisons about academics and personality followed by physical appearance and lifestyle (Wheeler & Miyake, 1992), I found that individuals made more comparisons about attractiveness, popularity, and vacations and leisure activities when using social media. Indeed, only 10% of comparisons made on social media were in the domains of personality and academics. Thus, it appears that, with the rise of social media, the domains in which individuals make comparisons have shifted, with a greater focus on physical appearance and free time activities. Because I examined only comparisons on social media in the present study, it is unclear whether this shift in domains is specific to social media; in Studies 4 and 5, I compared the domain of social media comparisons with those made in other contexts.

In Study 3, I also replicated my self-esteem findings from Studies 1 and 2. Low self-esteem individuals reported making more extreme upward comparisons than those higher in self-esteem, and the extremity of these upward comparisons predicted lower self-evaluations after each comparison. Furthermore, individuals lower in self-esteem reported a greater number of upward comparisons, which predicted worse mood, state self-esteem, and life satisfaction after the session compared to those higher in self-esteem. This provides further evidence that low self-esteem individuals may be susceptible to a particularly damaging cycle in which they make more upward comparisons, both in number and extremity, which in turn are associated with more negative outcomes. As a result of making more extreme and more frequent upward comparisons, low self-esteem individuals leave their social media sessions in a more negative mood, and feeling worse about themselves and their lives, than do high self-esteem individuals. Moreover,

I found that low self-esteem individuals' tendency to make upward comparisons was exacerbated when using Instagram relative to when using Facebook. This increased rate of upward comparisons resulted in much lower state self-esteem after logging out of social media. Thus, Instagram may be a more damaging social media platform than Facebook for individuals lower in self-esteem.

Finally, I demonstrated that comparisons on social media may operate somewhat differently than those in other contexts: Contrary to what might be expected from past research, in which upward comparisons were found to be less threatening when the target was less relevant (e.g. Tesser, 1988), participants felt relatively *worse* about themselves after making a comparison to a celebrity than a non-celebrity. Given that most individuals do not move in celebrity spheres, one might expect such famous individuals to be less relevant, and thus have a weaker comparison impact, than friends. It may be, however, that because many celebrities are more attractive and successful than the average person, they elicit exceptionally extreme upward comparisons, which in turn result in a powerful negative impact on the self. It is also possible that the sheer volume of posts on social media leads to a rather indiscriminate comparison strategy; as one scrolls through posts, one does not engage in the effort needed to undo a relatively automatic comparison process (Gilbert, Giesler & Morris, 1995).

As in Study 1, participants in Study 3 were asked to report on comparisons throughout the time they spent on social media in the lab. Although this provided information about participants' responses to each post they viewed, I note that this procedure may also have created demand characteristics, in that participants may have been especially likely to notice and report on social comparisons. It may be that participants make fewer actual social comparisons when they are not prompted to think about them in this way. Accordingly, in Study 4, instead of asking to report on each comparison as it occurred, I instead asked them to report on comparisons at the end of the session, without alerting them in advance to the focus on comparison behavior.

Chapter 5
Study 4: Comparisons on Social Media vs. Other Online Contexts

In Studies 1-3, I argue that social media may be especially likely to elicit upward comparisons, and these comparisons have a negative impact, particularly among individuals low in self-esteem. Up to this point, however, I have not directly compared social media comparisons to those that occur in other contexts. In Study 4, I experimentally manipulated context to examine whether social media would indeed be especially likely to elicit threatening upward comparisons. Specifically, participants were randomly assigned to use their smartphone either to access social media or for any other purposes (e.g., surf the net, text, watch videos). This allowed me to 1) examine whether social media comparisons differ from other online comparisons in terms of domain, direction, and frequency; and 2) examine whether people feel worse after using social media relative to engaging in other online activities as a result of the type of social comparisons they make.

Finally, in Study 3, I assessed relationship type and demonstrated that participants felt worse after comparisons to celebrities than non-celebrities, indicating that social comparisons on social media may not play by the same rules as those in other contexts. However, another possibility is that following people on social media makes them feel like more relevant comparison targets, or psychologically closer. To test this possibility, I assessed psychological closeness to comparison targets in Study 4.

14 Method

14.1 Participants

Participants were MTurk workers (245 women, 168 men, and 2 persons of other/undisclosed gender; M_{age}=38.06 years, *SD*=12.80 years) who were current users of either Facebook, Instagram, or both. Participants were paid $1.50 USD.

14.2 Procedure

14.2.1 Pre-Screen Survey

I invited MTurk workers to complete a 5-minute pre-screen eligibility survey that included questions about their technology and social media use. To be eligible for the study, participants had to indicate they owned a smartphone and a second device they could complete MTurk

surveys on (i.e. laptop, or desktop computer) and that they used either Facebook, Instagram, or both platforms. Additionally, in this pre-screen survey, participants completed the same self-esteem measure used in Studies 1-3 (α=.93).

14.2.2 Study Questionnaire

I asked participants to use their smartphones for 10 minutes, specifying that they either refrain from using social media or spend the entire 10 minutes using Facebook and/or Instagram. After 10 minutes (during which participants were not able to advance the questionnaire), participants were asked to indicate all activities they had engaged in on their phones, even those that went against the instructions they had been given earlier.[10] Thirty-five individuals indicated they had engaged in activities that they had been instructed to avoid, and so were excluded prior to any analyses. Participants in both groups were then asked whether they had made any comparisons during the session. If they reported making at least one comparison, they were asked to list the targets to whom they compared themselves. For each target they listed, participants were asked additional questions about the comparison, identical to those in Study 3 (i.e., the context of the comparison, whether the comparison was triggered by words or an image, and the comparison direction). In Study 4, however, instead of asking participants to categorize the relationship to their comparison targets (i.e., friend or acquaintance), I asked them to indicate how close they felt to them on a 7-point scale with endpoints ranging from 0 (*not at all*) to 6 (*extremely*). Participants also rated the comparison domain importance on a 7-point scale with endpoints ranging from 0 (*not at all important*) to 6 (*extremely important*). Finally, participants reported their state self-evaluations using a one-item measure ("Right now, how do you feel about yourself?") rated on a 7-point scale with endpoints ranging from -*3*(*much worse about myself than usual*) to +3 (*much better about myself than usual*).

[10] To encourage honesty, participants were also informed that indicating activities that went against instructions would not affect their compensation at the end of the study.

15 Results

15.1 Comparison Characteristics

15.1.1 Comparison Domains

Consistent with Studies 1 and 3, I found that social media comparisons occur in various domains (see Table 1), and the most common domains of comparison in this context again included looks/attractiveness and vacations/activities/lifestyle. In contrast, the most common comparison domains in other contexts were health/physical fitness, personality/morality, and skills/abilities. A series of chi-square tests of independence were performed to examine the relation between comparison context and comparison domain. Relative to those made in other online contexts, comparisons made on social media were less likely to be about health/fitness, X^2 (2, N = 217)=4.26, p=.039, personality/morality, X^2 (2, N = 229)=4.78, p=.029, or skills/abilities, X^2 (2, N = 224)=3.62, p=.057, and more likely to be about vacations/activities/lifestyle, X^2 (2, N = 217)=6.023, p=.014. Social media comparisons were not significantly more likely to be about looks/attractiveness, X^2 (2, N = 217)=1.76, p=.19.

15.1.2 Domain Importance

I next examined whether domain importance ratings differed depending on the context in which a comparison was made using a multilevel model. I modeled domain importance ratings as a function of comparison context. Experimental conditions did not differ in terms of comparisons domain importance, b=-0.01 [-0.28, 0.26], SE=0.14, t(112.79)=-0.10, p=.92. Domains of comparisons made on social media (M=3.88, SE=0.16) and in other online contexts (M=3.91, SE=0.22) were both rated as moderately important. Thus, I found no evidence that social media comparisons involve domains that are more (or less) personally relevant than comparisons in other online contexts.

15.1.3 Post Modality (Image vs. Text)

A logistic multilevel model revealed that relative to those made in other online contexts, comparisons made on social media were 5.89 times more likely to be triggered by an image rather than by text, b=1.77, SE=0.46, z=3.81, p<.001, *Odds Ratio*=5.89:1.

15.1.4 Closeness to Comparison Target

Relative to participants who made comparisons in other contexts, those in the social media condition made comparisons to targets who were less close to the self, b=-1.55, SE=0.64, t(102.62)=-2.44, p=.016.

15.2 Individual Comparisons

Next, participants' self-evaluations after comparisons were modelled as a function of comparison context with a random intercept for each person, b=-0.21 [-0.41, -0.02], SE=0.10, t(210.27)=-2.62, p=.033: Compared to other contexts, comparisons made while using social media were associated with feeling worse about the self after the comparison. Next, extremity of comparison direction was modelled as a function of comparison context with a random intercept for each person. This analysis revealed that social media comparisons were not more upward in direction than those in other online contexts, b=0.13 [-0.09, 0.40], SE=0.15, t(189.32)=1.16, p=.247, although the effect was in the expected direction.

15.3 Total Number of Comparisons

Participants assigned to the social media condition made more comparisons (Mdn=2) than those assigned to the no social media condition (Mdn=1), b=0.42, SE=0.12, $Wald\ \chi^2$=12.03, p=.001. Furthermore, participants in the social media condition made more upward, b=0.42, SE=0.13, $Wald\ \chi^2$=9.64, p=.002, and lateral comparisons, b=0.60, SE=0.23, $Wald\ \chi^2$=6.76, p=.009, than those in the no social media condition. There was no difference between the two conditions for number of downward comparisons, b=0.28, SE=0.26, $Wald\ \chi^2$=1.13, p=.29. Thus, individuals using social media made more comparisons than those simply browsing the Internet without using Facebook or Instagram. Moreover, social media use increases the number of upward and lateral comparisons, but not the number of downward comparisons.

Participants assigned to the social media condition (M=0.34, SE=0.08) reported lower self-evaluations at the end of the study than those in the no social media condition (M=0.60, SE=0.07), b=-0.13, SE=0.06, t(411)=-2.36, p=.02. Next, I tested whether number of upward comparisons mediated this difference between the two experimental conditions, while controlling for number of downward and lateral comparisons. Consistent with my hypothesis, the indirect effect through number of upward comparisons was significant, b=-0.06, SE=0.04, 95% CI [-0.15, -0.008], and the direct effect became nonsignificant, b=-0.16, SE=0.11, t(410)=-

1.40, p=.16, 95% CI [-0.38, 0.06], once this indirect effect was included. Taken together, these findings suggest that individuals feel worse after using social media, relative to those who browse the Internet without using social media, because they make more upward comparisons.

15.4 Role of Self-Esteem

I also tested a moderated mediation model in which the association between dispositional self-esteem and self-evaluation at the end of the study was mediated by number of upward comparisons, while controlling for number of downward and lateral comparisons. Moreover, I expected this indirect effect to be larger in the social media condition than in the no social media condition. Consistent with my hypothesis, the direct effect, c'=0.13, SE=0.06, t=2.37, p=.02, was reduced once I accounted for the indirect effect through number of upward comparisons. Furthermore, the indirect effect was larger in the social media condition, ab=0.06, SE=0.03, 95% CI [0.01, 0.14], than in the no social media condition, ab=0.03, SE=0.01, 95% CI [0.007, 0.07]. The index of moderated mediation, 0.03, SE=0.02, 95% [0.0001, 0.10], indicated that these two indirect effects were significantly different. Taken together, these findings suggest that individuals lower in dispositional self-esteem tend to make more upward comparisons than those higher in self-esteem, which in turn leads them to feel worse about themselves. Moreover, this effect is exacerbated when individuals lower in self-esteem use social media, relative to when they browse the Internet without using social media.

16 Discussion

In sum, Study 4 demonstrates that browsing social media, relative to other online activities, has a unique association with comparison behavior. First, individuals using social media, relative to those engaging in other online activities, make more frequent upward comparisons and thus experience more negative outcomes. Thus, I show that social media use, rather than online activities in general, has a unique influence on individuals' comparison behavior. I also provide evidence that this increase in upward comparisons mediates the link between social media use and lowered self-evaluations: Individuals using social media feel worse about themselves because they make more upward comparisons.

Second, this effect occurs despite the fact that social media comparisons involve targets less close to the self and are in domains that are no more personally important than comparisons made in other online contexts. This finding is theoretically significant, because it suggests that

social media comparisons do not play by the same rules as other comparisons. A significant body of evidence, including the influential Self-Evaluation Maintenance model (SEM), indicates that comparisons to less close others are less likely to result either threatening contrast effect or positive basking in reflected glory (e.g., Tesser, 1988). My findings indicate that some of the more distant comparison others now available through social media – the high school friends, celebrities, and past romantic flames – may lead to comparisons no less distressing than those to close others currently in one's more immediate social circle.

Third, these comparisons are more image-based and in domains that differ from those in other contexts and those examined in previous studies. Past research has not examined whether comparisons that are driven by visual, auditory, or textual information differ in their content and impact; in an age of social media, it is important to understand what kind of information is driving comparisons, and the relative impact of this information. In a world where people self-present polished and filtered images of themselves multiple times each day, social media may be changing the domains in which people are comparing and the type of information that triggers comparisons, with image-based information exerting a particularly potent effect. For example, in Wheeler & Miyake (1992), the second most frequent comparison domain was personality; participants in this study also reported personality comparisons, but they were less common on social media than in other online contexts. Although past research has shown that that individuals can accurately perceive personality traits (e.g., conscientiousness, extraversion) from others' online social network profiles and text-based posts (for meta-analytic review see Tskhay & Rule, 2014), it is possible this information is less likely to elicit comparisons than more attention-grabbing vacation photos. Indeed, I found that individuals made more frequent comparisons about vacations and lifestyle than about personality.

In addition to directly comparing social media comparisons to those made in other online contexts, I also demonstrated that individuals with lower self-esteem are particularly vulnerable when using social media, relative to engaging in other online activities. Consistent with Studies 1 and 3, lower self-esteem predicted making more upward comparisons, which in turn resulted in lower self-evaluations; moreover, this effect was exacerbated when individuals lower in self-esteem were using social media. Thus, individuals lower in self-esteem are particularly vulnerable to the negative consequences of social media use.

Finally, although I reduced the browsing session to 10 minutes (i.e., half the length of Study 1), I found that, on average, participants made only one fewer comparison than in Study 1, suggesting that comparison behavior occurs quickly when individuals browse their Facebook or Instagram news feed. Additionally, because I asked about social comparisons at the end of the session, rather than after participants viewed each post (as in Study 3), I can be more confident that the frequent social comparisons reported are not simply the result of demand characteristics. It remains unclear, however, how social media comparisons influence self-evaluations minutes or even hours after they occur and how they compare to comparisons made in offline contexts. Thus, in Study 5, I conducted an experience sampling study that allowed me to examine the impact of social media comparisons in a more naturalistic context.

Chapter 6
Study 5: Comparisons on Social Media in Daily Life

Study 4 provides important evidence that social media comparisons differ for those made in other online or other technology-based contexts. It did not, however, examine comparisons that occur in offline contexts, such as face-to-face interactions. Furthermore, in Studies 3 and 4, I examined social media comparisons that occurred directly after I had instructed participants to spend time in that particular context. It is possible that asking participants to use social media and then immediately report on any social comparisons made during that time resulted in participants guessing the purpose of the study and possibly even making comparisons that they would not otherwise have made. Thus, in Study 5, I conducted an experience sampling study to examine participants' social comparison behavior across all contexts, which enabled me to 1) assess whether minutes spent on social media predicts upward comparison frequency, 2) compare social comparisons made on social media with those in all other contexts, and 3) examine the direction, frequency, and outcomes of social media comparisons as they occur in daily life. Undergraduate students installed an app on their smartphone for two weeks that prompted them six times a day to complete a short survey about any comparisons they had made since the previous report. I was then able to compare the frequency, direction, and impact of social media comparisons to those in a wide variety of other contexts, including those made in person.

17 Method

17.1 Participants

Participants were undergraduate students at the University of Toronto (51 women, 26 men, and 1 person of other/undisclosed gender; M_{age}=20.15 years, *SD*=2.40 years); participants were invited to take part only if they owned a smartphone and reported that they used social media. Participants were compensated up to $60 for participation ($16 for the intake session, $2 per day that they completed 4 or more surveys, $3 for each completed week, and $10 for the exit session).

17.2 Procedure

Participants first came to the lab for an intake session, in which they were asked to install the experience sampling app (Experience Sampler, Thai & Page-Gould, 2017); a research assistant

then instructed them on how to use the app and how to recognize and accurately report on social comparisons. For the following two weeks, the app randomly prompted participants to complete a short survey six times per day, in which they indicated the time since the previous survey they had spent on various activities (e.g., face-to-face interactions, texting, social media), whether they had made a comparison since the previous survey, and, if so, what context that comparison was in (i.e. in person/face-to-face, video call, voice-only phone call, other voice chat, email, texting/SMS, social media, dating app/website, other media/online context, or in a thought/daydream). If participants indicated the comparison was made while using social media, they then indicated the platform and aspect of that platform (i.e. public feed, private chat/message, or group chat/message). Participants then indicated the direction and outcomes of that comparison, using the same questions as in Studies 1-4. Additionally, at the end of the survey, regardless of comparison behavior, participants reported their current self-evaluations on a 7-point scale with endpoints ranging from -3 (*Much worse about myself than usual*) to +3 (*Much better about myself than usual*). At the end of the two-week experience sampling period, participants returned to the lab for compensation and debriefing.

18 Results

18.1 Comparison Characteristics

18.1.1 Comparison Domains

Consistent with Studies 1, 3, and 4, the three most common domains of comparisons on social media were looks/attractiveness, vacations/activities/lifestyle, and health/physical fitness, whereas common comparison domains in other contexts included personality/morality and skills/abilities (see Table 1). In contrast to Study 4, however, the two most common comparison domains in contexts other than social media were academics/career and looks/attractiveness. This difference, however, may be due to differences in samples: Study 4 consisted of primarily middle-aged adults, whereas Study 5 consisted of primarily undergraduate students. Middle-aged adults are more likely than undergraduate students to have established careers and be in long-term relationships, both of which may decrease their interest in making comparisons in the academics/careers and looks/attractiveness domains.

18.1.2 Domain Importance

Relative to comparisons in other contexts, comparisons made while using social media were in domains that participants rated as less personally important, b=-0.34 [-0.01, 0.68], t(997.06)=1.93, SE=.17, p=.054.

18.1.3 Post Modality (Image vs. Text)

Paired t-tests indicated that when reporting on comparisons made while using social media, participants reported more comparisons that were triggered by an image rather than text, t(78)=2.45, p=.017. In contrast, when reporting on comparisons made in other contexts, participants reported fewer comparisons that were triggered by images than text t(78)=-3.19, p=.002. Finally, of the image-based comparisons reported by participants, more of them occurred on social media than in other contexts, t(78)=2.14, p=.035, whereas fewer text-based comparisons occurred on social media than in other contexts, t(78)=-3.54, p=.001.

18.1.4 Closeness to Comparison Target

Relative to comparisons in other contexts, comparisons made while using social media involved targets that participants rated as less close to the self, b=-1.21 [-1.69, -0.73], t(1158.89)=4.93, SE=.25, p<.001. Thus, consistent with Study 4, social media comparisons involve targets lower in closeness to the self.

18.2 Individual Comparisons

Next, I tested whether comparison extremity (i.e., how upward a comparison is) mediated the association between comparison context and post-comparison self-evaluations. First, participants' self-evaluations after comparisons were modelled as a function of comparison context with a random intercept for each person, b=-0.39 [-0.69, -0.10], SE=0.15, t(1154)=2.62, p=.009: Compared to other contexts, comparisons made while browsing social media news feeds[11] were associated with feeling worse about the self after the comparison. Second, extremity of comparison direction was modelled as a function of comparison context with a random intercept for each person. This analysis revealed that social media comparisons were

[11] This includes comparisons that participants made on social media in the context of a public news feed, but not those made in a private or group chat.

more upward in direction than those in other contexts, *b*=0.69 [0.29, 1.10], *SE*=0.21, *t*(1165.12)=3.34, *p*=.005. Finally, self-evaluations were modeled as a function of comparison context, participants' average comparison direction, and person-centered comparison direction, which was also modeled as a random slope. This analysis revealed a non-significant effect of context on self-evaluations after a given comparison, *b*=-0.10 [-0.36, 0.16], *SE*=0.13, *t*(149.18)=-0.79, *p*=.43, and a *negative* effect of any given comparison's deviation from the participant's average on comparison direction, *b*=-0.41 [-0.47, -0.36], *SE*=0.03, *t*(78.29)=-14.81, *p*<.001. A Sobel test revealed that this indirect effect was significant, *z*=-3.19, *p*=.001. Thus, consistent with my hypothesis, participants felt worse about themselves after making comparisons on their social media news feeds compared to comparisons in other contexts, at least in part because these comparisons were more upward in direction.

18.3 Total Number of Comparisons

Across the full time period of the study, participants reported an average of 15.96 comparisons (*Mdn=14, SD* =13.67). Participants reported making fewer comparisons while viewing their Facebook and Instagram newsfeeds (*M*=2.23, *Mdn*=1, *SD*=4.53) than in other contexts (*M*=14.12, *Mdn*=11, *SD*=12.23). However, total minutes spent on social media during the two-week experience sampling study was positively associated with total number of comparisons, *b*=0.008, *SE*=0.002, *t*(69)=3.38, *p*=.001. Time spent on other activities was not associated with number of comparisons, including face-to-face minutes, *b*=0.000, *SE*=0.001, *t*(69)=-0.96, *p*=.34, and texting/SMS minutes, *b*=-0.001, *SE*=0.005, *t*(69)=-0.11, *p*=.91. Furthermore, number of social media minutes were associated with greater number of upward, *b*=0.004, *SE*=0.002, *t*(69)=2.28, *p*=.026, lateral, *b*=0.001, *SE*=0.001, *t*(69)=2.53, *p*=.014, and downward comparisons, *b*=0.002, *SE*=0.001, *t*(69)=2.60, *p*=.011. Paired t-tests indicated that upward comparisons were, however, more common than both lateral, *t*(78)=3.14, *p*=.002, and downward comparisons, *t*(78)=3.03, *p*=.003. In other words, spending more time on social media was associated with making more social comparisons, and these social comparisons were most likely to be upward.

18.4 Role of Self-Esteem

I next tested whether, as in Studies 1-3, comparisons were especially damaging for individuals lower in self-esteem. As in Study 1, I used a 2-1-1 multilevel mediation analysis to examine whether low self-esteem individuals would make comparisons that were more upward and thus feel worse about themselves afterwards. The first model revealed a medium effect of self-esteem

on self-evaluations after a comparison, b=0.08 [0.003, 0.17], SE=0.04, t(362.66)=2.04, p=.042: Lower self-esteem was associated with feeling worse about the self after making comparisons on social media. The second model, however, revealed a non-significant effect of self-esteem on comparison direction, b=-0.056 [-0.17, 0.06], SE=0.06, t(551.50)=-0.993, p=.312. Thus, lower self-esteem was not significantly associated with making comparisons that were more upward in direction. Given that self-esteem was a level 2 variable and there were only 79 participants, it is likely that I did not have enough power to detect the effect of self-esteem on comparison direction.

19 Discussion

In sum, Study 5 demonstrates how social media comparisons differ from comparisons made in other contexts. First, consistent with the results of Study 4, social media comparisons were more likely to be triggered by an image and to a less close target than those in other contexts. Second, also consistent with Study 4, relative to comparisons in other contexts, those made on social media were more likely to be upward and therefore result in more negative self-evaluations. Thus, in Study 5, I again find evidence that comparisons on social media are more threatening than those in other contexts, *despite* being to less close others. Moreover, I found that comparison domains were rated as less important when comparisons were made while using social media relative to those made in other contexts. Although it is possible that individuals defended against the threat of an upward comparison by devaluing the domain (Tesser & Paulhus, 1983; Tesser, 1988), these comparisons should *not* elicit a defensive response because they were made to less close, and thus less relevant, comparison targets. Taken together, these findings provide further evidence that influential theoretical models (i.e., the SEM model; Tesser, 1988) used to describe traditional social comparisons do not apply to social media comparisons.

Finally, I demonstrated that, for any given individual, spending more time on social media was associated with making more social comparisons, particularly those that are upward. This finding is significant because although previous studies have demonstrated associations between time spent on social media and upward comparison frequency (e.g. de Vries & Kühne, 2015), it was unclear whether people who tend to make more upward comparisons also tend to spend more time on social media. In this study, I show that, regardless of whether an individual spends

more or less time on social media compared to other people, when that individual does spend more time on social media, upward comparisons are more likely.

I note that the total number of social media comparisons made by each participant in this study was, on average, relatively small. It may be the participants underestimated the number of comparisons they made, both on social media and overall, as the study design often relied on participants remembering comparisons they had made a few hours earlier. Indeed, results from my lab studies indicate that comparisons on social media are frequent. In future research, it will be important to use an event contingent design in which participants report each social comparison instance as it occurs, rather than relying on their recall when they receive intermittent notifications. Despite the methodological limitations of this study, however, the results do provide strong evidence consistent with my hypotheses: Time spent on social media was associated with an increase in social comparison activity, and this social comparison activity had negative outcomes.

Chapter 7
General Discussion

Taken together, these studies provide the first comprehensive analysis of how individuals make and respond to social comparisons on social media and how these comparisons are different from those made in other contexts. Indeed, this research provides compelling evidence that social media has changed the ways in which individuals compare themselves to other people. First, I found that social comparisons on social media are remarkably frequent, occurring multiple times in a single brief browsing session (Studies 1 and 3). This is particularly striking when compared to lower daily rates reported in pre-social-media experience sampling studies, in which individuals indicated they made comparisons once a day (e.g., Wheeler & Miyake, 1992). Study 4 indicates that individuals are more likely to make comparisons on social media than in other online contexts. Further, time spent on social media in Study 5 was positively associated with making more upward comparisons, and these social media comparisons were more extreme and resulted in more negative self-evaluations than those in made in other contexts.

Second, social media comparisons are more likely to be upward than downward. Although past research has identified this upward direction as a significant feature of comparisons on Facebook, this research did not separately assess the relative frequency of upward and downward comparisons, instead focusing only on upward comparison frequency (e.g., de Vries & Kühne, 2015; Hanna et al., 2017; Vogel et al., 2014;) or general comparison frequency (e.g., Cramer et al., 2016; Feinstein et al., 2013; Gerson et al., 2016; Jang et al., 2016; Lee, 2014; Steers et al., 2014). The present studies directly compared the frequency of upward and downward comparisons made by individuals while browsing their own social media news feeds (Studies 1 and 3), directly after using social media (Study 4), and at random intervals during a two-week period (Study 5), confirming that upward comparisons far outnumber downward comparisons on social media. Some past research has indicated that individuals prefer making downward to upward comparisons (Wheeler & Miyake, 1992; Wood et al., 2000), at least sometimes resulting in more frequent comparisons to worse- rather than better-off others (Wheeler & Miyake, 1992; Wood et al., 2000). The present studies suggest that social media may thwart such attempts to focus on inferior others. Instead, individuals are faced with a steady stream of upward comparisons, and suffer negative outcomes as a result.

Third, these studies are the first to demonstrate that more frequent upward comparisons while browsing one's social media news feed lead to worse mood, lower self-esteem, and decreased life-satisfaction. Although past studies have suggested that frequent Facebook upward comparisons may have negative outcomes (de Vries & Kühne, 2015; Hanna et al., 2017; Vogel et al., 2014), the present research is the first to clearly outline the steps in this process, using ecologically valid designs in which individuals browsed their news feeds in real time (Studies 1, 3, and 4). These studies demonstrated that the upward comparisons that individuals make while using social media have both an immediate negative impact on their self-evaluations, and also post-session negative effects on their self-esteem, mood, and life-satisfaction.

Fourth, this research clarifies the role of self-esteem in social comparisons made on social media. Across multiple studies, individuals lower in self-esteem made more frequent and more extreme upward comparisons, and thus reported greater declines in self-evaluations than individuals with higher self-esteem. Even when presented with the same content (Study 2), individuals lower in self-esteem were particularly vulnerable to a negative cycle of making more frequent and more extreme upward comparisons, which in turn threatened their already-lower self-evaluations (Studies 1-4). This suggests that social media is an especially threatening context for these individuals.

Fifth, this research is the first to show that the image-based nature of social media may pose a particular social comparison threat: In Studies 3-5, individuals using social media made more image-based than text-based comparisons, suggesting that they are responding to what they *see* people doing rather than what other people *say* they are doing. The specific features of social media platforms, including the emphasis on filtered photos, may be changing the domains in which people compare themselves on a daily basis. Indeed, across all five studies, attractiveness was one of the top two most common comparison domains on social media, suggesting that attractiveness has become a particularly prevalent and threatening comparison domain among individuals using social media. When one considers that individuals are, on average, spending more than two hours per day on social media (Mandler, 2017), the potential for threats to appearance-related self-esteem is enormous.

Sixth, social media has opened up a vast array of individuals with whom one can compare, and this broad pool of comparison targets does not appear to dilute the outcome of comparisons. Individuals compared themselves not only to current friends, but also to people from their past

and to celebrities, and the outcome of these primarily upward comparisons was no less negative than their comparisons to people they knew in the present (Study 3). Instead of making occasional comparisons to people from one's past, at a reunion, wedding or other event, one is forced to view the achievements of less close contacts, carefully presented for maximum impact, whenever browsing social media (Studies 4 and 5). Every day has become like a high school reunion, in which one is forced to confront the apparently more successful lives of one's former friends and acquaintances, and comparisons to these distant contacts are as threatening as those made to closer, current friends.

Seventh, these findings suggest that social media comparisons operate differently from more traditional social comparisons. Indeed, the aforementioned closeness findings contradict the predictions put forth by Tesser's (1988) influential self-evaluative maintenance (SEM) model: Comparisons to less close others and less similar others should be dismissed as irrelevant and have less of an impact on one's self-evaluation. Instead, I found that comparisons to these more distant others are as impactful, if not more so (Studies 3-5). Moreover, this model postulates that comparisons made in domains that are highly self-relevant should be more impactful. Contrary to this prediction, I found that social media comparisons had a greater effect on individuals' self-evaluations even though domain importance did not differ from comparisons made in other contexts (Study 4) or were even less important (Study 5). It is possible that when faced with more threatening upward social media comparisons, individuals were more likely to engage in the protective strategy of downplaying comparison domains (Tesser, 1988; Tesser & Paulhus, 1986), resulting in lower importance ratings for social media comparisons observed in Study 5. The SEM model, however, would not predict using this self-protective strategy when making a social media comparison because targets are less close. Instead, this self-protective strategy should only be elicited when individuals are outperformed in a self-relevant domain by a close other. Taken together, these studies provide strong and consistent evidence that classic models of social comparisons may not fully describe or predict the impact of social media comparisons.

Finally, compared to other activities, spending time on social media increases the likelihood of making upward comparisons (Studies 4 and 5), which helps explain the negative outcomes that have been associated with increased social media use (Best et al., 2014) and the associations between smartphone use and lower well-being, especially among young adults (Boumosleh & Jaalouk, 2017; Twenge, 2017; Valkenburg, Peter, & Schouten, 2006). When using social media,

individuals are especially likely to compare themselves to superior others, and they subsequently feel worse about themselves and less satisfied with their lives.

In sum, these studies provide important evidence that social media has changed social comparison behavior. Individuals now make more image-based comparisons that, despite involving less close targets, are more strongly upward and more threatening to the self. Previous social comparison theory would predict that social media comparisons to distant acquaintances and celebrities would be less meaningful and upsetting than those made in "real life"; however, I demonstrate that a few minutes spent browsing one's news feed presents a minefield of very real and meaningful upward comparison threats.

These studies not only provide key evidence regarding social media comparisons, but also provide significant new insights into social comparison processes more generally. In past research, investigators typically have examined the outcome of a single comparison, or have compared an upward to a downward comparison on various outcomes such as self-evaluation (e.g., Gibbons & Gerrard, 1989; Lockwood & Kunda, 1999; Morse & Gergen, 1970), motivation (e.g., Lockwood & Kunda, 1997; Lockwood, Marshall, & Sadler, 2005; Lockwood & Pinkus, 2008) and affect (e.g., Buunk et al., 1990; Salovey & Rodin, 1984). In the present studies, I was able to test the cumulative effects of a series of comparisons, examining the relative impact of multiple upward and downward comparisons on self-evaluations, life satisfaction, and mood. My studies suggest that upward rather than downward comparisons have the greatest impact on individuals, and that this impact is overwhelmingly negative. Indeed, any downward or lateral comparisons did little to mitigate the sting of the more prevalent upward comparisons. These studies also allowed me to assess, for the first time, the impact of upward comparison extremity within each individual, evaluating the degree to which the "upwardness" of the comparison would affect the impact of that comparison. I found that, for any given individual, a comparison that was more extremely upward resulted in a more negative effect on their self-views immediately following the comparison; further, extremity of upward comparisons, like frequency, exerted a cumulative effect, such that individuals who made multiple comparisons that were more extreme in their upwardness also suffered a greater subsequent blow to their self-esteem, mood, and life satisfaction. In sum, the sheer number of comparisons that individuals make on social media has provided me with a valuable opportunity to assess the collective effects of social comparisons, including the aggregate impact of their direction and extremity. In future research, it will be important to examine these effects over the longer-term.

These studies also provide new insights into the role of self-esteem in determining social comparison outcomes. Past research on self-esteem and comparisons has yielded mixed results: Some research indicates that lower self-esteem individuals are especially prone to making upward comparisons (e.g., Vohs & Heatherton, 2004; Wayment & Taylor, 1995; Wood et al., 2000), whereas other theory and research suggests that low self-esteem individuals may be especially likely to take advantage of downward comparisons opportunities as a means of repairing their self-views (e.g., Aspinwall & Taylor, 1993; Gibbons & Gerrard, 1991; Taylor, Wood, & Lichtman, 1983; Wills, 1981; see Wood & Lockwood, 1999 for review). Furthermore, other research indicates that more upward comparisons lead to lower self-esteem (e.g., de Vries & Kühne, 2015; Hanna et al., 2017; Leahey, Crowther, & Mickelson, 2007; Myers & Crowther, 2009; Vogel et al., 2014; Wood, 1989). The present studies provide a comprehensive analysis of self-esteem, both as a predictor and outcome of comparison frequency and direction. Because I was able to assess multiple comparisons in a single session (Studies 1 and 3), I was able to show that low self-esteem predicts an especially high ratio of upward relative to downward or lateral comparisons, a greater degree of "upwardness" in those comparisons, and a subsequent blow to their already-lower self-esteem. That is, lower self-esteem individuals make comparisons in a way that not only perpetuates, but also further exacerbates, the negativity of their self-views. Moreover, lower self-esteem individuals actually interpret information in a way that is more likely to yield an upward comparison: Even when information in a social media post was held constant (Study 2), lower self-esteem individuals were more likely to see the poster as superior, and as more extremely superior, than were higher self-esteem individuals. Finally, I found no evidence that low self-esteem individuals are able to take advantage of downward comparisons to reverse this negative cycle (Studies 1-4). Low self-esteem individuals are thus particularly vulnerable to social comparison threats and particularly ill-equipped to recover from those threats. Because social media has dramatically increased opportunities for social comparison, and upward comparison in particular, a browse through a news feed poses a particular challenge for individuals lower in self-esteem. It will be important to assess the longer term impact on health and well-being that may arise from social media use among such vulnerable groups.

The present studies focused on social media comparisons in the context of Facebook (Studies 1-5) and Instagram (Studies 3-5). Facebook and Instagram are currently the most popular social media platforms worldwide (Pew Research Center, 2017) and Facebook in particular is used by individuals of all ages for both social contact and business (Greenwood et al., 2016). In recent

years, however, a number of other social media platforms have increased in popularity (Pew Research Center, 2017), and it will be important to examine the nature and impact of comparisons made on these other platforms. Given that all social media platforms afford individuals an opportunity to carefully manage the self-image they present to the world, I would expect to find a similar preponderance of upward social comparisons. Indeed, the results of Study 3 suggest that platforms that provide posters with the opportunity to use image-enhancing filters on a routine basis (e.g., Instagram, Snapchat), may result in especially extreme upward comparisons, and thus lead to more extreme negative outcomes. In future research, it will be important to identify in greater detail the features of different social media platforms that affect comparison frequency, direction, and outcomes.

Finally, to the extent that different platforms are popular among different age groups, it will be important to examine how social media use may lead to different comparison experiences and consequences among younger and older individuals. Studies 1, 3, and 5 focused on young adult participants, and it is possible that the type of posts that young adults see and their reactions to them differ systematically from other populations, such as older adults or those in a different stage of life. In particular, I might see differences in terms of the domains in which people tend to make comparisons. Younger adults may be more inclined to post about and compare in domains such as popularity, whereas middle-aged adults may make more comparisons about their children or romantic relationships. Furthermore, first-year undergraduates may be more likely to compare on social media in general. They are in a period of transition (i.e., from high school to university and often from one city to another) and thus may be more interested in how well they are adjusting to their new life by comparing themselves to others (Lockwood et al., 2012), evaluating what they need to do to succeed (Suls, Martin, & Wheeler, 2002; Wheeler, Martin, & Suls, 1997). Future studies should compare both overall frequency and specific domain frequency of social media comparisons across age groups and life stages.

The present research focused primarily on the impact of comparisons on self-evaluations. Recent reports in the media (Denizet-Lewis, 2017; Griffin, 2017; Heid, 2017) and from researchers in the area (Boumosleh & Jaalouk, 2017; Twenge, 2017) have tied smartphone use to increased anxiety, particularly among young adults. Smartphones allow for frequent and ready access to social media sites, and consequently, provide significant opportunities for social comparisons. Moving forward, it will be important to examine how social media comparisons may contribute to the anxiety that children and adolescents experience as they negotiate the

complicated social worlds of elementary, middle and high school, and that young adults face as they move into higher education or career settings. Social media may in part cause anxiety because individuals worry about being excluded from social circles or events. These anxieties may also, however, be tied to very specific comparisons, as individuals evaluate the degree to which they are "liked" or "tagged," or compare the views that their posts receive. More generally, the sheer number of upward comparisons that children and young adults face as they engage with social media may well be contributing to anxiety, resulting in long-term effects on their well-being.

Social media platforms offer individuals unprecedented opportunities to connect with friends, stay in touch with family, share accomplishments, and feel part of a community. Indeed, past research suggests that Facebook can have positive outcomes such as helping maintain relationships (Ellison et al., 2007). The benefits of these platforms, however, also come with hidden costs. The present studies reveal that upward comparisons on social media are commonplace and have both immediate and cumulative negative outcomes, especially for individuals with low self-esteem. As the use of social media sites continues to grow, continued research on how these platforms affect their users – especially those at vulnerable ages or life stages – is essential.

Table 1

Comparison Domains (Studies 1, 3-5)

Comparison Domain	Study 1 (*N*=287)	Study 3 (*N*=1795)		Study 4 (*N*=250)		Study 5 (*N*=1221)	
	Facebook	Instagram (*n*=941)	Facebook (*n*=854)	Social Media (*n*=140)	Other Contexts (*n*=110)	Social media (*n*=124)	Other Contexts (*n*=1087)
Looks / Attractiveness	76	263 (27.9%)	163 (19.1%)	22 (15.7%)	11 (10%)	41 (33.1%)	167 (15.4%)
Academics / Career	84	54 (5.7%)	89 (10.4%)	11 (7.9%)	8 (7.2%)	11 (8.9%)	254 (23.4%)
Dating / Relationships	14	48 (5.1%)	47 (5.5%)	5 (3.6%)	6 (5.5%)	7 (5.6%)	65 (6.0%)
Popularity / Friendships	57	98 (10.4%)	119 (13.9%)	13 (9.3%)	7 (6.4%)	3 (2.4%)	46 (4.2%)
Vacations / Activities Lifestyle	170	219 (23.3%)	162 (19.0%)	25 (17.9%)	8 (7.3%)	16 (12.9%)	83 (7.6%)
Personality / Morality	36	38 (4.0%)	86 (10.1%)	7 (5.0%)	14 (12.7%)	3 (2.4%)	112 (10.3%)
Skills / Abilities		75 (8.0%)	63 (7.4%)	10 (14.0%)	16 (14.5%)	12 (10.0%)	126 (11.6%)
Health / Physical Fitness	-	65 (6.9%)	62 (7.3%)	13 (9.3%)	20 (18.2%)	16 (12.9%)	80 (7.4%)
Wealth / Finances	-	31 (3.3%)	22 (2.6%)	9 (6.4%)	3 (2.7%)	1 (0.8%)	19 (1.7%)
Family	-	21 (2.2%)	19 (2.2%)	8 (5.7%)	8 (7.3%)	0 (0%)	17 (1.6%)
Other	84	29 (3.1%)	22 (2.6%)	8 (5.7%)	8 (7.3%)	1 (0.8%)	16 (1.5%)
Multiple domains	-	-	-	9 (6.4%)	1 (0.1%)	13 (10.5%)	102 (9.4%)

Note. Based on written answers given by participants in Study 1, the following changes were made for Studies 3-5: work/career achievement and school/academic achievement were merged into one category, academics/career; vacation/activities and clothing/possessions/lifestyle were merged into vacations/activities/lifestyle; and the personality/morality and skills/abilities categories were created from the single category, abilities/personality traits.

Table 2

Content of Facebook Posts Viewed by Participants (Study 2)

Post ID	Post Content
Neutral 1	Any suggestions for good lunch spots? In the mood to try something new :P
Neutral 2	OMGGG to the season finale of Walking Dead! Who else was shocked?!?
Negative 1	got some bad news, I'm unexpectedly out of a job… but I guess I've got to pick myself up and move forward.. would really appreciate anyone that knows someone who is hiring!
Negative 2	Heartbroken – trust me everyone, never fall in love… even when you think you know someone, it's impossible to actually know what is in their head – it is SUCH a myth that two people can become one…
Positive 1	Finally got my dream job at John Hopkins Hospital!! Thank you to everyone who helped me get here…this is PROOF that hard work, tirelessness, and determination does pay off – you can all reach your dreams :)
Positive 2	So thankful to be celebrating 1 year with my babe today…you make me smile like no one else can& make my life so much better. I can't wait for what is next for us.. love you xxxooo

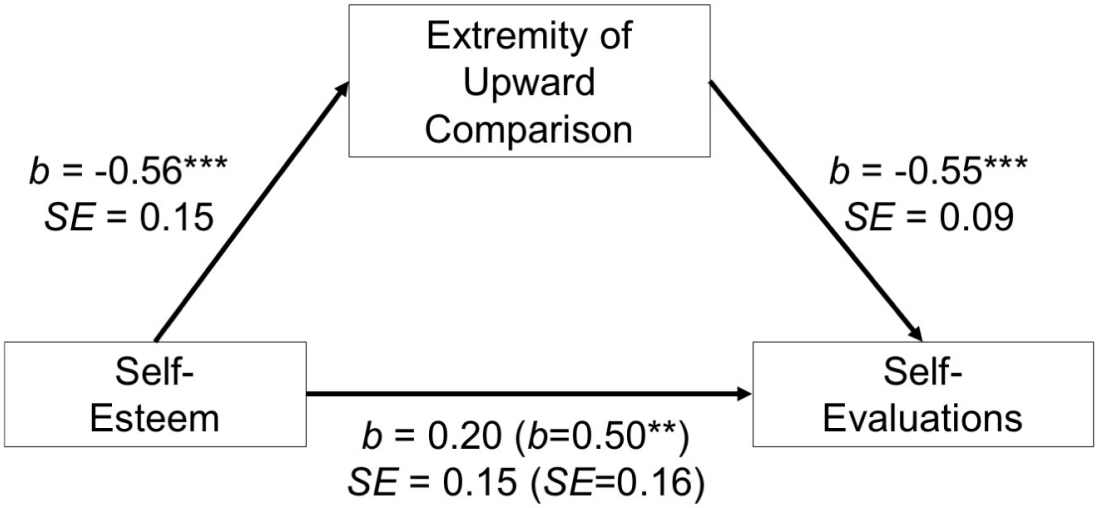

Figure 1. Mediational model of the role of extremity of upward comparison in the relationship between self-esteem and self-evaluations after Facebook comparisons (Study 1). Unstandardized regression coefficients and standard errors are reported along the paths they model. Statistics reported within parentheses represent the total effect. *p<.05, **p<.01, ***p<.001.

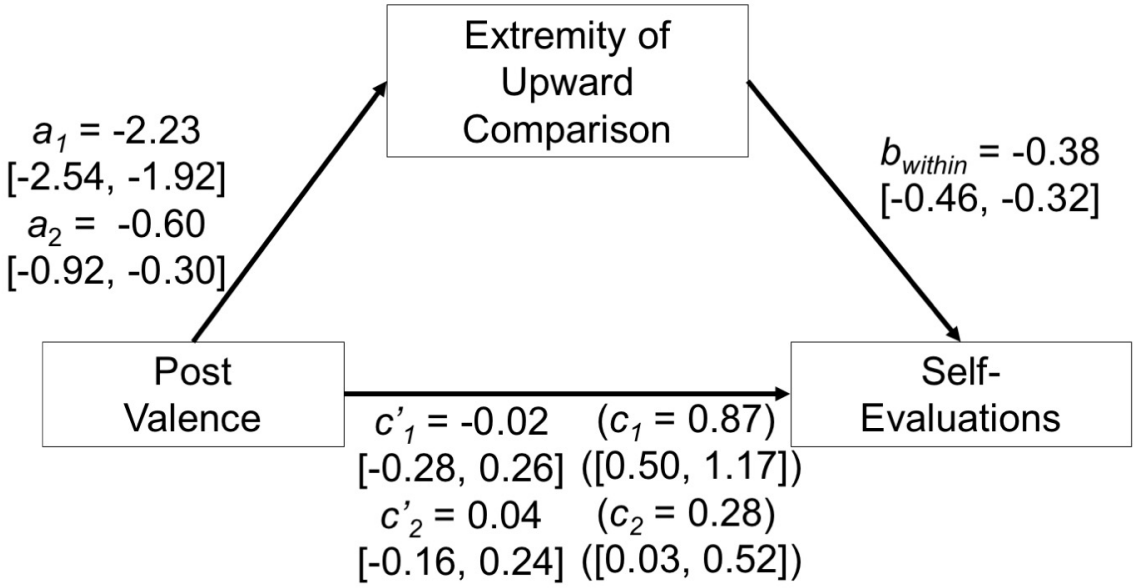

Figure 2. Mediational model of the role of extremity of upward comparison in the relationship between Facebook post valence and subsequent self-evaluations (Study 2). Unstandardized regression coefficients and 95% confidence intervals are reported along the paths they model. Statistics reported within parentheses represent the total effect. Values with the subscript of 1 represent the difference between positive and negative posts. Values with the subscript of 2 represent the difference between positive and neutral posts. Values with the subscript within represent the within-subject effects, and values with the subscript between represent between-subject effects.

Figure 3. The effect of self-esteem on comparison direction strength for each post type (Study 2). Errors bars represent standard errors. Greater scores on the y-axis indicate a more extreme upward comparison.

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