Body Image 34 (2020) 38–45

Contents lists available at ScienceDirect

Body Image

journal homepage: www.elsevier.com/locate/bodyimage

Compared to Facebook, Instagram use causes more appearance comparison and lower body satisfaction in college women

Renee Engeln[a,*], Ryan Loach[a], Megan N. Imundo[b], Anne Zola[c]

[a] Department of Psychology, Northwestern University, United States
[b] Department of Psychology, University of California, Los Angeles, United States
[c] Oxford Internet Institute, University of Oxford, United Kingdom

ARTICLE INFO

Article history:
Received 3 September 2019
Received in revised form 26 April 2020
Accepted 26 April 2020

Keywords:
Instagram
Facebook
Social media
Body satisfaction
Social comparison

ABSTRACT

The current experiment tested the effect of social media use on college women's appearance comparisons, mood, and body satisfaction. We randomly assigned 308 undergraduate women (aged 18–26) to use Facebook, use Instagram, or play a matching game (the control condition) on an iPad for seven minutes. Compared to the Facebook condition, Instagram users retrospectively reported spending more time viewing images or videos containing people. Participants in both the Facebook and Instagram conditions also retrospectively reported engaging in more appearance comparisons relative to those in the control condition, but Instagram users reported significantly more appearance comparisons than those in the Facebook condition. Those who used Instagram, but not Facebook, showed decreased body satisfaction, decreased positive affect, and increased negative affect. Results are consistent with previous research suggesting social media use influences body satisfaction and social comparison, and that Instagram may be a particularly harmful platform when it comes to body image because of its focus on photos over text.

1. Introduction

Over the past 20 years, social media has become a prominent force in the day-to-day lives of individuals across the world. One 2019 report estimated that 3.725 billion people are active social media users – approximately 48 % of the worldwide population (Hootsuite & We Are Social, 2019). Social media use has been linked with positive outcomes, for example, allowing individuals to connect across distance barriers. However, research has suggested that social media use can also have undesirable psychological effects. For example, social media use has been linked with decreases in self-esteem (e.g., Bessenoff, 2006) and increases in depression (e.g., Lin et al., 2016; Twenge, Joiner, Rogers, & Martin, 2017; though see Orben & Przybylski, 2019, for an alternative perspective). In general, exposure to appearance-related Internet content is positively correlated with body dissatisfaction, drive for thinness, and internalization of the thin ideal depicted in media (Tiggemann & Miller, 2010); social media platforms are a significant source of this type of content. A variety of studies have demonstrated positive associations between social media use and body dissatisfaction, primarily in samples of young women (e.g., de Vries, Vossen, & van der Kolk – van der Boom, 2019; Hendrickse, Arpan, Clayton, & Ridgway, 2017; Hogue & Mills, 2019; Kelly, Zilanawala, Booker, & Sacker, 2018; Stronge et al., 2015; Tiggemann & Miller, 2010).

Researchers continue to explore the specific elements of social media activity that may drive negative body image outcomes, with social comparison processes being a key area of concern (de Vries, Möller, Wieringa, Eigenraam, & Hamelink, 2017; Haferkamp & Krämer, 2011; Meier & Gray, 2013). Social media feeds tend to be populated by carefully curated, posed, filtered, and edited photos of attractive celebrities and peers, providing ample opportunities for upward social comparisons (i.e., comparisons to others who appear to have *more* of a desirable attribute, in this case, physical attractiveness). Because appearance-based social comparisons can drive body dissatisfaction (Myers & Crowther, 2009), some researchers have proposed that more visually focused social media platforms (e.g., Instagram) could be particularly influential when it comes to users' body image (e.g., Marengo, Longobardi, Fabris, & Settanni, 2018). The current study experimentally tested the effect of using two popular social media platforms (Facebook and Instagram) on college women's mood and body dissatisfaction. Additionally, we examined participants' self-reported appearance-based social comparisons and appearance-focused thoughts when using these platforms.

* Corresponding author at: Department of Psychology, Northwestern University, 2029 Sheridan Road, Evanston, IL 60201, United States.
E-mail address: rengeln@northwestern.edu (R. Engeln).

https://doi.org/10.1016/j.bodyim.2020.04.007
1740-1445/

1.1. Body image, mood, and social media use

Much of the available research on the body image and mood-related outcomes of social media use focuses on Facebook. Facebook is one of the most widely-used social media platforms, with over 1.5 billion daily active users (Facebook, 2019). Facebook users report greater body dissatisfaction than non-users (Stronge et al., 2015), and more frequent users report higher levels of depression than less avid users (Lin et al., 2016). One study found that adolescent women who frequently used Facebook reported higher levels of body dissatisfaction than those who frequently used other websites, such as YouTube and Google (Tiggemann & Miller, 2010). Using an online survey administered immediately after participants had been using Facebook, Sagioglou and Greitemeyer (2014) found the number of minutes participants had been using Facebook before taking the survey was negatively correlated with positive mood. In a follow-up experimental study, these same authors found that spending 20 min actively using Facebook decreased positive mood relative to browsing the Internet (without using social media) for 20 min.

Fardouly, Diedrichs, Vartanian, and Halliwell (2015) assigned young women to spend 10 min either browsing their Facebook account, browsing a fashion magazine website, or browsing an appearance-neutral control website. Compared to the control group, women who browsed Facebook reported more negative mood. Additionally, for women who scored high on trait appearance comparison tendencies (as assessed during a separate testing session), browsing Facebook led to greater face, hair, and skin-related discrepancies (i.e., a greater desire to change the appearance of these features) compared to the control group. No effects on body dissatisfaction or body shape-related discrepancies emerged, though the authors acknowledged that the study was likely underpowered to detect these effects (112 participants across three conditions).

Some research suggests that specific appearance-related content or interactions on Facebook, rather than general use, is particularly harmful to body image (Modica, 2019). For example, when presented with images of attractive same-gender individuals on simulated Facebook profiles, both men and women reported lower body satisfaction and higher negative affect than those shown less attractive individuals (Haferkamp & Krämer, 2011). Greater photo activity, such as updating one's profile picture or looking at photos of one's friends, is associated with greater body surveillance (i.e., chronic monitoring of the appearance of one's body), thin ideal internalization, drive for thinness, self-objectification (a preoccupation with physical appearance that involves viewing oneself as an object), and weight dissatisfaction (Cohen, Newton-John, & Slater, 2017; Meier & Gray, 2013). In a related finding, those who are more emotionally invested in Facebook report greater appearance orientation, even if they are less frequent users (Rutledge, Gillmor, & Gillen, 2013).

Recently, body image researchers have increased focus on another social media platform, Instagram. From 2016 to 2018, Instagram's user base doubled. The platform now has over a billion monthly active users (Statista, 2019) and 71 % of 18–24 year-olds in the U.S. use Instagram (Smith & Anderson, 2018). Instagram's platform focuses on sharing photos and allows for easy editing and manipulation of these images. Users' ability to carefully select and enhance the images they post, and to digest similarly "perfected" images of other users, makes Instagram a concerning platform when it comes to body image.

In general, self-reported Instagram use is correlated with body image disturbance, including body dissatisfaction, drive for thinness, self-objectification, body surveillance, and desire for cosmetic surgery (Cohen et al., 2017; Fardouly, Pinkus, & Vartanian, 2017; Hendrickse et al., 2017; Walker, Krumhuber, Dayan, & Furnham, 2019). Greater investment in accumulating "likes" on Instagram is also correlated with higher levels of appearance comparisons (Tiggemann, Hayden, Brown, & Veldhuis, 2018).

Previous work has generally found that exposure to appearance-focused, thin-ideal images in traditional mass media can negatively affect women's body image (Grabe, Ward, & Hyde, 2008; Whyte, Newman, & Voss, 2016), though meaningful effects may be limited to women with pre-existing body image concerns or high levels of neuroticism (Ferguson, 2013). Instagram provides an abundance of opportunities for users to interact with such images. Recent research demonstrated that exposure to thin-ideal Instagram photos (compared to images of average-sized women) increased women's body dissatisfaction (Tiggemann et al., 2018), as did interacting with photos of attractive peers on Instagram *or* Facebook (Hogue & Mills, 2019).

1.2. Social comparisons and social media use

A number of researchers argue that social comparison processes drive the association between social media use and body image concerns (for a review, see Fardouly & Vartanian, 2016). According to Social Comparison Theory (Festinger, 1954), people regularly evaluate their attributes via comparison with relevant others. Social media feeds (particularly visually focused feeds) provide a stream of images featuring sociocultural beauty ideals. Viewing these images can result in ongoing upward comparisons, where the woman perceives herself as falling short of the beauty ideals presented in these images (Tiggemann & Miller, 2010). These types of appearance comparisons are linked to negative mood, depression, disordered eating, and feelings of envy (Puccio, Kalathas, Fuller-Tyszkiewicz, & Krug, 2016; Rousseau, Eggermont, & Frison, 2017; Sagioglou & Greitemeyer, 2014; Tandoc, Ferrucci, & Duffy, 2014).

Social media use is associated with a greater tendency to make appearance comparisons (Tiggemann & Miller, 2010). Further, both experimental and correlational studies have suggested that the relationship between social media use and body dissatisfaction may be partially mediated by appearance comparisons (Brown & Tiggemann, 2016; Fardouly & Vartanian, 2016; Feltman & Szymanski, 2018; Hendrickse et al., 2017; Sherlock & Wagstaff, 2019; Tiggemann & Zaccardo, 2015). In a sample of patients being treated for eating disorders (93 % were women), the association between image-focused social media use and symptom severity was mediated by more frequent physical appearance comparisons (Griffiths, Castle et al., 2018). Kleemans, Daalmans, Carbaat, and Anschutz (2018) examined the moderating effect of social comparisons, finding evidence that adolescent girls prone to greater appearance comparison tendencies were particularly likely to report lower body satisfaction after exposure to digitally enhanced Instagram photos.

1.3. The current study

Despite Instagram's growing influence and the argument that visually focused social media activity may have the greatest impact on body image concerns, few studies have directly compared the effects of Instagram and Facebook. In the present study, we experimentally manipulated college women's exposure to either Instagram, Facebook, or a control activity. We then examined the impact of these activities on body satisfaction, mood, and frequency of appearance comparisons and appearance thoughts.

This design differs in two key ways from most previous studies. First, unlike studies in which researchers created fake Instagram feeds for participants to view (for example, a feed featuring attractive comparison targets vs. a feed featuring travel images, as in Sherlock & Wagstaff, 2019, and Tiggemann & Zaccardo, 2015), we allowed participants to interact with their own feeds in order to

assess the impact of a more realistic type of social media engagement. This element of our design is most similar to Fardouly et al.'s (2015) study (described above). However, Fardouly et al. (2015) instructed participants to "browse" their Facebook feeds. It is unclear whether their participants were allowed to interact with their feeds by posting, liking, or commenting. Because our design allowed participants to interact with their social media feeds, we selected a different type of control condition than most previous studies (which have tended to use browsing appearance-neutral websites or viewing images without people in them as control conditions). Specifically, we selected a game for the control condition rather than a control that would simply involve passive browsing. Thus, we offered participants an interactive, online task (completed on the same type of mobile device as would be used for social media apps). We anticipated that participants would find this game familiar and engrossing, just as using their social media app would likely be familiar and engrossing for the seven-minute exposure time period used in the study. Bejeweled is a "match three" game (similar to "Candy Crush") that requires users to move shapes around to match them by features. We chose the game Bejeweled because it is highly popular among young women (Yee, 2017) and because it can be played for periods of time on a mobile device without an Internet connection. By turning off the Internet connection, we could ensure that no advertisements would be shown in the game. Thus, Bejeweled would be free of any appearance content or potential comparison targets.

Because Instagram is a more visually driven social media platform, we hypothesized that participants in the Instagram condition would report engaging in more appearance comparisons and report more appearance-focused thoughts than those in the Facebook condition. Based on the findings reviewed above, we also predicted that both Facebook use and Instagram use would decrease body satisfaction and positive affect (and increase negative affect) relative to the control condition, but that the effects of Instagram use would be larger than the effects of Facebook.

2. Method

2.1. Participants

For a repeated measures design with two time points and three groups, an *a priori* power analysis using G*power (Faul, Erdfelder, Georg Lang, & Buchner, 2007) suggested a minimum sample size of 288 to detect a small to moderate effect ($d = 0.35$) with an alpha of .05 and a power level of .80. Thus, we set 300 as our minimum sample size but continued collecting data until the end of the academic term.

Three-hundred eight U.S. undergraduate women from a private, midwestern university (M_{age} = 19.40, SD = 1.23, age range 18–26) participated. We required women to be self-identified active users of both Facebook and Instagram in order to participate. One-hundred thirty participants were recruited from an introductory psychology student pool and an additional 178 participants from a campus library and several residence halls. Students from the introductory psychology pool were given course credit; those recruited outside of the participant pool were paid $8 in cash for their participation. The plurality of our sample was White (45 %, n = 139), followed by 29 % Asian or Asian American (n = 89), 10 % Hispanic or Latinx (n = 32), 7 % multiracial (n = 21), and 6 % (n = 18) African American/Black. Three percent of participants (n = 9) indicated a race/ethnicity that did not fall into one of the above categories. We described the study as "a research study on social media" that was "investigating how various types of social media can influence how you think and feel." No additional cover story was provided.

2.2. Design and procedure

We used a 2 (time point: pre, post) × 3 (condition: Facebook, Instagram, or Control) design with time point as a within-subjects factor and condition as a between-subjects factor. Participants were randomly assigned to one of the three conditions using a random order generator. Following informed consent, participants completed a pre-test survey with measures of state body satisfaction and mood on an iPad. Upon completing this survey, we asked participants to use the iPad to either log in to Instagram, Facebook, or play Bejeweled (depending on condition) for seven minutes. We chose the seven-minute time frame based on both empirical and practical considerations. In 2017, Instagram revealed that users under the age of 25 spent an average of 32 min per day on Instagram. However, this total results from multiple, shorter visits to the app that tend to last for less than 10 min (Statista, 2019). Thus, we chose seven minutes as an estimate of a typical session duration that would also allow participants to complete all components of the study in under 20 min, a practical consideration for this study.

In the social media conditions, we directed participants to use the application as they typically would. They could post, comment, or "like" images, or simply look at images/videos and read posts. We prohibited using messaging (on Facebook, this would take users to a separate app) or leaving the app (though participants could read outside content within the app; for example, a news article). For Bejeweled, the iPad was set to airplane mode to prevent advertisements from appearing in the sidebar, ensuring there were no potential appearance comparison targets in the Bejeweled condition. The experimenter guided participants to a space to use the iPad privately, in a quiet setting that was relatively free from distractions (though some could see other students passing nearby). After seven minutes, the experimenter returned and asked the participant to log off and close the application they were using. The experimenter then opened a post-test on the iPad containing the same measures as the pre-test along with basic demographic questions. Participants in the Facebook and Instagram conditions received additional questions about social comparisons and the social media activity they engaged in during the allotted seven minutes. Order of measures was counterbalanced.

2.3. Pre- and post-test measures

2.3.1. Positive and negative affect

The brief version of the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) comprises two, 10-item subscales capturing the two general dimensions of self-rated mood: positive affect (PA) and negative affect (NA). Respondents indicate the extent to which they feel a given emotion at that current moment (i.e., "right now"), on a 5-point scale from 1– *Very slightly* or *not at all* to 5– *Extremely*. NA scores are correlated with depression, anxiety, and other forms of psychopathology (e.g., Watson & Clark, 1994; Watson et al., 1988). PA scores are strongly correlated with alternate measures of positive mood and with peer ratings of positive mood (Watson & Clark, 1994). In a sample of college women, alphas were .92 and .82 for the PA and NA subscales, respectively (Stern & Engeln, 2018). In the current sample, alphas for PA were .86 at pre-test and .91 at post-test. Alphas for NA were .87 at both pre-test and post-test.

2.3.2. State body image

The 6-item Body Image States Scale (BISS) (Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002) measures affective and situational evaluations of body image (i.e., "Right now I feel") using a 9-point fully anchored response scale (for example, ranging from *Extremely dissatisfied with my physical appearance* to *Extremely satisfied with my physical appearance*). Higher scores indicate a

more favorable evaluation of one's appearance/body at that given moment (Cash et al., 2002). BISS scores are negatively correlated with measures of body shame and body surveillance and positively correlated with measures of body area satisfaction (Cash et al., 2002). Additionally, scores are sensitive to context, decreasing under conditions of heightened focus on appearance (e.g., after exposure to idealized media images, after overhearing negative body talk, Salk & Engeln-Maddox, 2012). Reported internal consistencies for the scale in samples of college women range from .77 to .87 (Cash et al., 2002; Stern & Engeln, 2018; van den Berg & Thompson, 2007). In the current sample, alpha was .80 at pre-test and .82 at post-test.

2.4. Additional post-test measures

2.4.1. Social media activity

For the Facebook and Instagram conditions, participants estimated the percent of time they spent during the seven minutes engaging in different activities: looking at images of people, looking at images not containing people, reading content/comments, watching videos of people, watching videos not featuring people, and doing anything other than the options listed. Percentage estimates were required to add to one-hundred. Those in the Bejeweled condition were not asked these questions.

2.4.2. Social comparison and appearance thoughts

Appearance-based social comparison and appearance thoughts were assessed using the 3-item measure created by Tiggemann and McGill (2004) to measure responses to magazine images. Two of the items assess state appearance comparisons; the third assesses state appearance-focus. These items originally included the wording "when viewing the magazine advertisements." We altered the wording to reference participants' respective platform rather than magazine images (i.e., How much did you compare your overall appearance to people you saw on Instagram/Facebook?; How much did you compare specific body parts to people you saw on Instagram/Facebook?). As in Tiggemann and McGill (2004), response options ranged from 1 – *No comparison* to 7 – *A lot of comparison*. For these two items, Cronbach's alpha was .83 in the current sample. All participants, including those in the control condition, also responded to the third item about appearance-focused thoughts (i.e., "How much did you think about your appearance while playing Bejeweled/using Facebook/using Instagram?") Response options for this item ranged from 1 – *No thought about my appearance* to 7 – *A lot of thought about my appearance*.

3. Results

The full data file (excluding demographic data that could identify participants) and complete output from analyses are available here https://osf.io/4ntsg/?view_only=70d031eab1fb4923bc7fbe8deefbc849. See Tables 1 and 2 for descriptive statistics for each scale. To determine whether random assignment was effective, we ran one-way ANOVAs with condition as the IV and participant age, pre-test positive affect, pre-test negative affect, and pre-test body satisfaction as DVs. The three conditions did not significantly differ on any of these variables (*p*s ranging from .47 to .93).

3.1. Social media activity and appearance comparisons

As a reminder, participants in the two social media conditions estimated the amount of time they spent viewing images of people, amount of time viewing images without people, time spent reading content/comments, time spent watching videos of people, time spent watching videos with no people, as well as an "other" category. There was a multivariate effect of platform (Facebook vs. Instagram) on the type of activity students engaged in, Wilk's $\lambda = .69$, $F(5, 193) = 17.71$, $p < .001$, $\eta_p^2 = .31$. Follow-up univariate analyses found that participants assigned to use Instagram spent a greater proportion of their time looking at images of people compared to participants who used Facebook, $F(1, 197) = 86.36$, $p < .001$, $\eta_p^2 = .31$. Compared to Instagram, participants in the Facebook condition spent more time looking at images without people, $F(1, 197) = 14.79$, $p < .001$, $\eta_p^2 = .07$, reading content or reading/writing comments, $F(1, 197) = 8.61$, $p = .004$, $\eta_p^2 = .04$, watching videos without people, $F(1, 197) = 8.46$, $p = .004$, $\eta_p^2 = .04$, and activities that fell into the "other" category, $F(1, 197) = 4.52$, $p = .035$, $\eta_p^2 = .02$.

We created a total appearance comparison score by taking the mean of the appearance comparison and specific body part comparison items; the two items were strongly correlated, $r(200) = .71$, $p < .001$. The difference in total appearance comparison scores between the Facebook and Instagram conditions was statistically significant, $t(200) = 3.51$, $p < .001$, $d = 0.49$, 95 % CI [0.36, 1.28], with women reporting more appearance comparisons in the Instagram condition. Additionally, results indicated a significant difference between conditions in how much participants thought about their appearance during the study, $F(2, 305) = 76.81$, $p < .001$, $\eta_p^2 = .34$. Post-hoc tests indicated that participants in the Instagram condition thought about their appearance significantly more than both the Facebook and Bejeweled conditions (*p*s < .001) and that those in the Facebook condition thought about their appearance significantly more than the Bejeweled condition ($p < .001$).

3.2. Body dissatisfaction and mood

We ran a series of three mixed ANOVAs, one for each of the DVs (body satisfaction, positive affect, and negative affect), with condition as the between-subjects factor and time (pre- vs. post-test) as the within-subjects factor. For body satisfaction, there was a significant time by condition interaction, Wilk's $\lambda = .96$, $F(2, 238) = 5.87$, $p = .003$, $\eta_p^2 = .04$. Simple effects analyses indicated that body satisfaction scores for those using Facebook or playing Bejeweled did not change significantly from pre- to post-test (*p*s of .64 and .053,

Table 1
Social Media Activity Descriptive Statistics.

	Facebook ($n = 99$)			Instagram ($n = 103$)		
Activity	*M*	*SD*	95 % *CI*	*M*	*SD*	95 % *CI*
Images with people***	20.86	19.10	[16.83, 24.46]	51.15	26.21	[46.45, 56.68]
Images without people***	32.92	23.62	[28.18, 37.65]	21.06	19.76	[16.95, 24.64]
Reading Content/Comments**	14.16	16.10	[10.81, 17.22]	8.70	9.35	[7.05, 10.70]
Videos with people	13.80	17.83	[10.11, 17.21]	10.75	16.25	[7.44, 13.74]
Videos without people**	10.98	15.32	[8.35, 15.40]	5.19	12.68	[2.66, 7.62]
Other*	7.29	15.56	[4.13, 10.31]	3.15	11.70	[0.83, 5.41]

Note: Means and standard deviations above given in terms of percent of the allotted time (seven minutes) spent doing each activity.
Facebook and Instagram conditions differed significantly, * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2
Descriptive Statistics by Condition.

	Facebook (n = 99)			Instagram (n = 103)			Bejeweled (Control) (n = 106)		
Variable	*M*	*SD*	95 % *CI*	*M*	*SD*	95 % *CI*	*M*	*SD*	95 % *CI*
Appearance thoughts	2.57	1.47	[2.27, 2.86]	3.62	1.65	[3.30, 3.94]	1.31	0.81	[1.16, 1.47]
Appearance comparisons	2.75	1.68	[2.27, 2.86]	3.57	1.64	[3.25, 3.89]	n/a	n/a	n/a
Negative affect, pre-test	1.49	0.53	[1.39,1.60]	1.49	0.52	[1.39, 1.59]	1.55	0.70	[1.41, 1.68]
Negative affect, post-test	1.55	0.54	[1.44, 1.66]	1.64	0.59	[1.53, 1.76]	1.59	0.61	[1.47, 1.71]
Positive affect, pre-test	2.53	0.68	[2.40, 2.67]	2.44	0.71	[2.30, 2.58]	2.42	0.69	[2.28, 2.55]
Positive affect, post-test	2.53	0.80	[2.36, 2.68]	2.33	0.81	[2.17, 2.49]	2.62	0.92	[2.44, 2.79]
Body satisfaction, pre-test	4.48	1.44	[4.19, 4.77]	4.51	1.31	[4.25, 4.77]	4.56	1.32	[4.30, 4.81]
Body satisfaction, post-test	4.45	1.42	[4.18, 4.74]	4.33	1.24	[4.09, 4.58]	4.67	1.31	[4.40, 4.92]

respectively). However, there was a significant decrease in body satisfaction from pre- to post-test for those using Instagram (p = .004). There was no significant main effect of time, Wilk's λ = .99, $F(1, 297) = 0.71$, p = .40, η_p^2 = .002, or condition, $F(2, 297) = 0.61$, p = .54, η_p^2 = .004.

The ANOVA for positive affect also resulted in a significant time by condition interaction, Wilk's λ = .95, $F(2, 302) = 8.51$, p < .001, η_p^2 = .05. Simple effects analyses indicated that positive affect scores significantly decreased from pre-test to post-test in the Instagram condition (p = .04). Positive affect significantly increased from pre-test to post-test for participants who played Bejeweled (p < .001). Scores for those in the Facebook condition did not change significantly from pre- to post-test (p = .94). For positive affect, there was no significant main effect of time, Wilk's λ = .99, $F(1, 302) = 0.77$, p = .38, η_p^2 = .003, or condition, $F(2, 302) = 1.27$, p = .28, η_p^2 = .008.

Finally, analyses of negative affect of scores resulted in a significant time by condition interaction, Wilk's λ = .98, $F(2, 304) = 3.08$, p = .047, η_p^2 = .02. Subsequent simple effects analyses showed a significant increase in negative affect from pre-test to post-test in the Instagram condition (p < .001). There was no significant change in negative affect in the Facebook or Bejeweled conditions (ps of .13 and .20, respectively). For negative affect, there was a main effect of time, Wilk's λ = .95, $F(1, 304) = 17.49$, p < .001, η_p^2 = .05, but no main effect of condition, $F(2, 304) = 0.23$, p = .79, η_p^2 = .002.

4. Discussion

Consistent with predictions, using either Facebook or Instagram for seven minutes led to more self-reported appearance-related thoughts than playing a matching game with no visual comparison targets. This was a large effect (using the metric of Cohen's d, nearly one and a half standard deviations). Though somewhat obvious at face value, this finding does provide evidence that, at a minimum, social media use (or at least social media use where one sees images of people) increases the tendency to think about one's appearance compared to engaging in tasks with no visual comparison targets. However, compared to browsing one's Facebook feed, Instagram use resulted in more appearance thoughts. This contrast makes sense based on what women in this study reported doing as they used either Facebook or Instagram. Those in the Instagram condition reported spending significantly more time looking at images of people than those in the Facebook condition. Consistent with this finding, women in the Instagram condition also reported making significantly more appearance comparisons than those using Facebook. These findings are in line with recent arguments that "highly visual social media" (a category which includes Instagram, but not Facebook) may have an especially negative impact on young people's body image because these platforms provide many opportunities for appearance-based comparisons (Marengo et al., 2018; Royal Society for Public Health, 2017; Sherlock & Wagstaff, 2019).

Results for effects on body dissatisfaction and mood followed a similar trend. Instagram use (but not Facebook use) led to a significant decrease in body satisfaction, a significant decrease in positive affect, and a significant increase in negative affect. Effect sizes for these findings were all around one-third of a standard deviation – large enough to be meaningful, especially given the limited amount of time (seven minutes) participants spent on the apps for this study. The finding that Instagram use can lead to more negative mood and lower body satisfaction is consistent with recent correlational findings (e.g., Hendrickse et al., 2017; Sherlock & Wagstaff, 2019). However, we also predicted that Facebook use would negatively affect body satisfaction and mood relative to the control condition. Some experimental research has demonstrated that Facebook use may increase negative mood (Fardouly et al., 2015, 10 min of use; Sagioglou & Greitemeyer, 2014, 20 min of use). However, one recent experimental test reported no effect of ten minutes of Facebook browsing on body satisfaction in a sample of young women (Fardouly et al., 2015) and another found no effect of twenty minutes of Facebook browsing on weight and shape concerns (Mabe, Forney, & Keel, 2014). Several correlational studies have found significant associations between Facebook use and negative body image and/or mood outcomes (Cohen et al., 2017; Fardouly & Vartanian, 2016; Lin et al., 2016; Manago, Ward, Lemm, Reed, & Seabrook, 2014; Meier & Gray, 2013; Tandoc et al., 2014), but cannot speak to the causal direction of these links. Causal direction is especially important to consider given that those already struggling with body image or negative affect may be more likely to seek out social media. Indeed, a recent longitudinal study found that, among adolescent girls, increases in depression *preceded* increases in social media use (Heffer, Good, Daly, MacDonell, & Willoughby, 2019).

Participants in the social media conditions of the current study were instructed to use their assigned social media platform as they normally would. This allowed for both active use (e.g., commenting on content, sharing content) and passive use (e.g., looking at images, watching videos). However, the categories of online activities we assessed were primarily passive, with an "other" category for activities like posting comments. Given evidence that passive vs. active social media use may be differentially associated with mood symptoms (e.g., Aalbers, McNally, Heeren, De Wit, & Fried, 2019; Escobar-Viera et al., 2018), future research that more carefully differentiates between these two types of use may help to clarify these mixed findings.

It is also worth noting that effect sizes for the key experimental tests on body image and mood in the current study were somewhat lower than anticipated. Given our prediction that the effect of Facebook use on body satisfaction would be smaller than the effect of Instagram use, it is possible that we were underpowered to detect the effects of Facebook use, even with a sample of over 300 participants.

We chose to use rating-based scales in the current study: the Body Image States Scale (BISS) and the Positive and Negative Affect Schedule (PANAS), both of which have substantial validity evidence supporting their use. The BISS has demonstrated sensitivity to experimental manipulations related to body image (e.g., Diedrichs & Lee, 2010; Halliwell, Easun, & Harcourt, 2011; Salk & Engeln-

Maddox, 2012; Stern & Engeln, 2018), as has the state version of the PANAS (Mu, Schoenleber, Castro Leon, & Berenbaum, 2019; Salk & Engeln-Maddox, 2012; Stern & Engeln, 2018). However, other researchers have employed visual analog scales for experimental studies similar to the current study (e.g., Fardouly et al., 2015; Prichard & Tiggemann, 2012). Though visual analog scales may offer more sensitivity to small shifts in mood or body image, mixed findings on the effect of Facebook use on these variables do not appear to be reliably linked to the methodological choice of rating scales vs. visual analog scales. Mabe et al. (2014) used visual analog items to assess weight and shape concerns but found no effect of Facebook browsing on these variables. However, the study did show a significant effect of Facebook browsing on anxiety, which was assessed using a rating-based scale rather than a visual analog scale. Sagioglou and Greitemeyer (2014) found significant effects of Facebook use on mood using the state version of the PANAS. Fardouly et al. (2015) used visual analog scales for both mood and body satisfaction in a study on the impact of Facebook browsing, finding significant effects for mood but not body satisfaction. Careful validation studies on visual analog scales for mood and body image could assist future researchers in the choice of assessment methods for these types of experiments.

The current study's null findings for Facebook are also challenging to interpret given the rapidly changing landscape of social media apps. Though the median 18–29 year-old in the U.S. uses four different social media platforms (with Instagram and Facebook among the most commonly used; Smith & Anderson, 2018), young people have become substantially less likely to use Facebook in recent years and more likely to use Instagram (EMarketer, 2019). Given young people's switch from preferring Facebook to preferring Instagram, their Facebook feeds may now contain fewer relevant targets for appearance comparisons (i.e., few images of peers relative to images of older users), making Facebook use less influential when it comes to body image concerns. Along these same lines, recent anecdotal evidence (e.g., Facebook, 2016) suggests that social media users are more likely to follow celebrities on Instagram than Facebook, which could also change the nature of the comparison images they see on one platform vs. another. Facebook also offers utilities that are less likely to prime appearance-related thoughts, such as "marketplace" (to sell goods to other users) and "events" (to manage invitations and RSVPs to events). However, even with these key differences between Facebook and Instagram, it is possible that had we used a longer period of exposure, Facebook would have affected participants' mood and body satisfaction. This seems plausible given that, like Instagram use, Facebook use increased appearance thoughts relative to our control condition.

In the current study, participants used their assigned social media platform for seven minutes. Recently released marketing data suggests that the average Facebook user spends 38 min per day on the app (EMarketer, 2019). In 2017, Instagram reported that users under the age of 25 spent an average of more than 32 min per day on the platform ("Celebrating one year of Instagram stories," 2017). However, the majority of users check their social media feeds several times per day (Smith & Anderson, 2018), making shorter bursts of exposure like the type employed in this study common for many users. Future research could systematically vary the time periods during which users engage with these platforms in order to more thoroughly address the question of the "dose" of use that is likely to have effects.

An additional limitation of this study was the reliance on a single-item measure of appearance thoughts and a two-item measure of appearance comparisons. Though these measures showed strong effects in the predicted direction, future research could benefit from the careful development of state-based measures of these constructs.

Although allowing participants to browse their own social media feeds rather than experimenter-created profiles/feeds likely made the experience of using the assigned social media platform similar to everyday use, this design choice involved an important trade-off in terms of experimental control. More specifically, although participants using Instagram reported spending more time viewing images of people than those assigned to use Facebook, we have no direct data on the content of each participant's feed (e.g., how many images they saw, what types of comparison targets those images contained). Social media use is not a monolithic construct; most certainly, *what* a person is doing/seeing while using social media matters. At a basic level, questions about the impact of social media call out for descriptive research examining the content of individuals' feeds and how variation in that content might more precisely predict psychological outcomes. Future studies could also use screen capture technology to directly assess what users see in their feeds.

Though the sample of young women who participated in this study was diverse in terms of race/ethnicity, they were all students at the same private university, limiting the generalizability of these results. The choice to focus only on women was made in response to research showing that adolescent girls and young women are especially likely to struggle with body dissatisfaction (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Griffiths et al., 2017), and are more likely to engage in photo-based activity on social media (Stefanone, Lackaff, & Rosen, 2011). Additionally, researchers have suggested that young women may be more vulnerable to the effects of social media on negative mood (Twenge et al., 2017). However, among the most active Instagram users, the gender split is relatively equal (Worthy, 2018), and evidence suggests that social media use can affect men's body image as well (Griffiths, Murray, Krug, & McLean, 2018; Haferkamp & Krämer, 2011; Kim & Chock, 2015). Though a much larger sample size would be required, future research could examine potential gender differences in appearance thoughts and appearance comparisons resulting from social media use and how these variables might differ by platform.

Finally, we did not employ a cover story or include distractor measures in this study. It is possible that participants may have been influenced by demand characteristics or hypothesis guessing (though they would not have known what the other conditions were in this study). This is especially important to consider in light of recent evidence that young people believe Instagram has more detrimental effects on mental health compared to other platforms (including YouTube, Twitter, Facebook, and Snapchat; Royal Society for Public Health, 2017). Results of the current study should be interpreted in light of this limitation.

4.1. Conclusions

Overall, the results of this study suggest that when it comes to young women's body image and mood, Instagram may be a more problematic platform than Facebook. Though Facebook use increased appearance comparisons relative to a control condition, Instagram use did so to a greater extent. This finding was consistent with participants' reports that they spent more time looking at images of people on Instagram (compared to Facebook). Even a few minutes of browsing one's Instagram feed negatively affected young women's body satisfaction and decreased positive affect.

Adoption rates for social media in general, and Instagram in particular, are growing rapidly, especially among young people. A 2018 survey by the Pew Research Institute found that over half of 18- to 24-year-olds said it would be "hard" to give up social media (Smith & Anderson, 2018). Because it is unlikely that young people will begin abandoning social media in large numbers, those concerned about social media's impact on body image might focus on

encouraging users to more carefully curate their feeds. Users can unfollow, hide, or block accounts that regularly prompt appearance comparisons and choose to engage more with content that uplifts rather than content that inspires jealousy or insecurity. Two recent studies suggest that exposure to parody accounts or accounts that expose the "fake" nature of overly-perfected posts may improve women's body image (Slater, Cole, & Fardouly, 2019; Tiggemann & Anderberg, 2019). Perhaps by taking control of the content one sees in their Instagram feed, users can ameliorate some of Instagram's negative outcomes.

Funding

This research was supported by a grant from Northwestern University's Office of Undergraduate Research.

CRediT authorship contribution statement

Renee Engeln: Conceptualization, Methodology, Validation, Formal analysis, Writing - original draft, Writing - review & editing, Supervision, Project administration. **Ryan Loach:** Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft, Funding acquisition. **Megan N. Imundo:** Conceptualization, Methodology, Investigation, Writing - review & editing, Project administration. **Anne Zola:** Validation, Formal analysis, Investigation, Writing - original draft, Writing - review & editing.

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