



Hiding Instagram Likes: Effects on negative affect and loneliness

Elaine Wallace^{a,*}, Isabel Buil^b

^a Whitaker Institute, National University of Ireland Galway, University Road, Galway H91 TK33, Ireland

^b Faculty of Business and Economics of the University of Zaragoza, María de Luna, s/n - Edificio "Lorenzo Normante", 50018 Zaragoza, Spain

ARTICLE INFO

Keywords:

Instagram
Social comparison
Negative affect
Loneliness
Vulnerable narcissism

ABSTRACT

Instagram, the social networking site (SNS), recently tested the initiative of hiding the number of Likes a post receives from other users. Instagram's rationale for hiding Likes was to support wellbeing through reduced competition for Likes. In an experiment with 280 Instagram users in the United States, we investigated the effect of hiding Likes on negative affect and loneliness. Scenarios were created to simulate receipt of higher or lower Likes than desired, and the visibility of those Likes to others. Findings indicate that receiving greater Likes than desired reduces loneliness but increases negative affect, and this result is exacerbated by the visibility of Likes. However, when Likes are low, it does not make a difference to negative affect whether those Likes are visible or not. Vulnerable narcissism was associated with loneliness. Findings provide support for Instagram's initiative, and reveal new insights about the interrelationship between loneliness and negative affect in Instagram use.

1. Introduction

Instagram has more than one billion monthly active users and over 500 million daily active stories users (Instagram, 2020). Instagram users are motivated by self-expression and social interaction (Lee, Lee, Moon, & Sung, 2015). The functionality of Instagram makes it particularly attractive to users, as it presents opportunities for self-presentation through photographs and short videos (Moon, Lee, Lee, Choi, & Sung, 2016). Instagram can also be a means of social comparison through viewing others' posts and photos (Lee, 2014). However, social comparison has been associated with negative psychological outcomes, including negative affect (Vogel, Rose, Okdie, Eckles, & Franz, 2015). Social media users are also motivated by a need to belong (Nadkarni & Hofmann, 2012) and a question remains about whether SNSs make people more or less lonely (Yang, 2016).

Instagram recently undertook a pilot initiative to hide the visibility of Likes. In the trial, users could see their own Likes but their followers were not able to see how many Likes the photo or video received. Adam Mosseri, Instagram CEO, said 'the aim is to depressurize Instagram, make it less of a competition, and give people more space to focus on connecting with the people they love' (Paul, 2019). Given Instagram's popularity, it is important to investigate how hiding Likes could impact user wellbeing. Research has begun to consider the impact of SNSs on wellbeing, for example investigating the relationship between depression symptoms and Facebook use (Baker & Algorta, 2016), and reduced

feelings of belonging (Whillans & Chen, 2018). Image-based platforms such as Instagram have been highlighted for associations with negative outcomes such as loneliness (Pittman & Reich, 2016). Also, Jackson and Luchner (2018) found that self-critical individuals responded with negative affect to Instagram scenarios including receiving fewer than a desired number of Likes.

The current study contributes to this literature. We present the results of an experiment investigating the impact of the number of Likes received, and the visibility of those Likes, on users' negative affect and loneliness. Furthermore, cognisant that vulnerable narcissism relates to a fearful or anxious attachment style (Besser & Priel, 2010), the study investigates vulnerable narcissism as a covariate.

1.1. Social comparison theory, Instagram Likes and well-being outcomes

Studies show that SNS use fulfils the need to belong, through affiliation with others (Nadkarni & Hofmann, 2012). For example, loneliness is associated with greater daily use of SNSs, with lonely individuals seeking to connect with others via SNSs (Hunt, Marx, Lipson, & Young, 2018), and generating and consuming more content on Instagram (Pittman, 2015). However, SNSs are also a means for social comparison. Social comparison is the process of thinking about other people in relation to oneself (Wood, 1996). Social comparison is 'an adaptive mechanism for sizing up ones' competitors' (Buunk & Gibbons, 2007, p. 3). Comparisons are made with a target in relation to some criterion that

* Corresponding author.

E-mail addresses: elaine.wallace@nuigalway.ie (E. Wallace), ibuil@unizar.es (I. Buil).

<https://doi.org/10.1016/j.paid.2020.110509>

Received 23 June 2020; Received in revised form 15 September 2020; Accepted 6 November 2020

Available online 12 November 2020

0191-8869/© 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

one considers important (Buunk & Gibbons, 2007). Social comparisons on social media could lead to negative outcomes for the self (Baker & Algorta, 2016), such as negative affect (Vogel et al., 2015).

A major goal of Instagram is to achieve a large number of Likes for posts, relative to others (Dumas, Maxwell-Smith, Davis, & Giulietti, 2017; Sheldon & Bryant, 2016). In general, individuals are motivated to form social attachments and supportive social networks to enhance wellbeing (Baumeister & Leary, 1995). Social media are a source of perceived social support (Whon, Carr, & Hayes, 2016). Paralinguistic digital affordances (PDAs) such as Likes, are one-click, lightweight feedback cues that facilitate communication through an icon (Hayes, Carr, & Wohn, 2016). Extant research found that perceived social support is ascribed to PDAs (Whon et al., 2016), with those seeking greater social support from posts more likely to perceive this support from PDAs (Carr, Wohn, & Hayes, 2016). Thus, it is reasonable that Instagram users, especially those seeking social support, appreciate greater numbers of Likes. Instagram users are aware that greater numbers of Likes indicate popularity (Sheldon & Bryant, 2016). Research investigating Like-seeking behaviour therefore considers that attaining attention and approval through Likes is valued (Dumas et al., 2017).

However, as yet, there are not conclusive results from studies investigating the effects of Instagram Likes on wellbeing outcomes. For example, de Vries, Möller, Wieringa, Eigenraam, and Hamelink (2018) found that social comparison was not the catalyst of negative emotions. Meier and Schäfer (2018) found that envy on Instagram could drive inspiration, which minimised negative affect. Reich, Schneider, and Heling (2018) found that those who received zero Likes had less satisfaction of belongingness and greater negative affect. Jackson and Luchner (2018) found that negative feedback in terms of Likes or follows were associated with negative affect, when individuals seek to connect with others. On the other hand, Dumas et al. (2017, p. 8) suggest that some lonely individuals could be discouraged from seeking Likes because they do not perceive that others 'care or are interested in them enough to actually acknowledge or Like their photos'. Yet Likes are considered a form of validation and a signal of popularity (Sheldon & Bryant, 2016), and users have sometimes sought to increase Likes to achieve further Likes (Dumas et al., 2017). Clearly, the effect of Instagram Likes on negative affect and loneliness merits further study.

Moreover, little is known about the effect of hiding Likes on users' wellbeing. Drawing on Instagram's recent initiative, and building on the emerging body of research on Likes and wellbeing, we conducted an experiment to examine the effect of the number of Likes received for an Instagram post, and the visibility of those Likes, on negative affect and loneliness. We hypothesised that receiving more than the desired number of Likes for a post would decrease negative affect (H1) and loneliness (H2). Instagram has argued that removing Likes stops users from worrying about feedback, allowing them to focus on content, and removing the pressure on the popularity of the post. Therefore, we hypothesised that hiding Likes received would decrease negative affect (H3) and loneliness (H4). Moreover, as individuals seek to obtain Likes but Instagram proposes that hiding Likes supports wellbeing, we considered an interaction effect between number of Likes received and the visibility of Likes on users' negative affect (H5) and loneliness (H6).

Furthermore, research suggests that vulnerable narcissists have a greater fear of being evaluated (Hart, Adams, Burton, & Tortoriello, 2017). Vulnerable narcissists may be hypersensitive to image threat, expecting that others will evaluate the self negatively (Leary, 1983). Vulnerable narcissists' impression management motivation is high where there are opportunities for image cultivation (Hart et al., 2017), such as SNSs. Vulnerable narcissism has also been associated with anxiety and an avoidance attachment style, as well as feelings of inadequacy, incompetence and negative affect (Miller et al., 2011). Therefore, we included vulnerable narcissism as a covariate and investigated whether vulnerable narcissism would be positively related to negative affect (H7) and loneliness (H8).

2. Method

2.1. Study design and participants

Participants were first asked how many Likes ('x') they would need to receive to be satisfied with an Instagram post. The study then employed a 2 (Number of Likes received for an Instagram post: more vs. less than 'x') x 2 (Likes visibility: followers can see Likes vs. followers cannot see Likes) between-subjects experimental design.

The study was performed in line with university ethical standards. Participants were recruited in the United States from Amazon Mechanical Turk (MTurk) in November 2019. They were paid \$1.70 for participation. Only MTurk users with an approval rate of 95% or better were allowed to take part in the study. Data was collected over 24 h. All participants passed two screening questions –they had an Instagram account which they had accessed since September 2019 and they had posted about climate change on their Instagram account in the previous six months. All participants were over 18 years of age and gave full consent to participate in the study.

The study requested individuals to think about posting an image about climate change because it is a timely topic, and therefore posts about this issue are common, and could be reasonably expected to achieve Likes. We considered that scenarios about posting selfies or other images featuring the self could result in a misinterpretation of Likes received as a proxy of liking for the self, rather than the post. Thus, the more neutral topic of climate change was considered appropriate.

The expected effect size was unknown. Therefore, the software G*Power (version 3.1.9.7) was used to estimate the sample size (Faul, Erdfelder, Lang, & Buchner, 2007). For an alpha of 0.05, an effect size estimated of 0.2 and a power of 80%, a total sample size of 199 would be required. In line with best practice for MTurk, we provided a quality question as a screening check (Meade & Craig, 2012). Additionally, only participants who completed the questionnaire at a reasonable length of time were included. Overall, these checks resulted in 436 participants. Following the manipulation checks, described below, the final number of participants was 280, above the required sample size. 61.8% were male and the mean age was 34.3 years. The majority of participants worked full time outside the home (86.4%), and 60.7% held an Undergraduate Degree or Diploma. 20.4% of participants had up to 100 followers on Instagram and 26.1% had between 101 and 300 followers. 53.2% spent up to 1 h on Instagram daily.

2.2. Procedure

Participants were asked: 'What is the minimum number of Likes you would think is necessary for you to be satisfied with an Instagram post?' In response to this question, the average number of Likes was 145.92, with a standard deviation of 647.5. The median was 25 with an interquartile range (IQR) of 8.5 to 100. The number of Likes provided by the respondent was then included as the text entry value 'x' in a scenario presented as follows: "Imagine a scenario where you have posted an image about climate change on your Instagram feed, and after 3 days you have received a lot less/a lot more than 'x' Likes. Your followers can see/None of your followers can see the number of Likes your post has received".

The experiment was set up on Qualtrics. Participants were randomly assigned to one of the four experimental conditions. They then completed manipulation checks, and answered questions relating to the dependent variables and covariate, and provided demographic information. After assessing the effectiveness of the experimental manipulations, the composition of the groups was as follows: group 1 (more Likes, followers can see Likes, $n = 96$); group 2 (more Likes, followers cannot see Likes, $n = 62$); group 3 (less Likes, followers can see Likes, $n = 68$); and group 4 (less Likes, followers cannot see Likes, $n = 54$).

2.3. Measures

Negative affect was measured using the negative affect items (i.e., upset, hostile, ashamed, nervous, and afraid) from the positive and negative affect schedule (PANAS) (Watson, Clark, & Tellegen, 1988). Participants were asked to think about the scenario presented to them, and indicate how the 5 different emotional states corresponded with how they would feel in that moment, on a 5-point scale (1 = very slightly or not at all, 5 = extremely). The 5 items were averaged ($M = 2.93$, $SD = 1.08$, $\alpha = 0.91$).

Loneliness was measured using the 10 items from the R-UCLA scale (Russell, Peplau, & Cutrona, 1980). Again, participants were asked to think about the scenario, and indicate how they might feel in that scenario. The scale items include 'I feel in tune with the people around me' and 'I do not feel alone', measured on a 5-point scale (never, seldom, sometimes, regularly, and often). Results suggested deleting four items since their item-to-total correlation was below 0.3. The remaining items were averaged ($M = 2.26$, $SD = 1.15$, $\alpha = 0.94$).

Vulnerable narcissism was measured using the hypersensitive narcissism scale by Hendin and Cheek (1997). This scale is commonly used to measure vulnerable narcissism (e.g., Hart et al., 2017). Participants rated their level of agreement on a 5-point Likert scale (1 = strongly agree; 5 = strongly disagree) to a series of statements which include 'My feelings are easily hurt by ridicule or by the slighting remarks of others'. One item from this scale was deleted since its item-to-total correlation was below 0.3. The remaining items were averaged ($M = 2.87$, $SD = 0.87$, $\alpha = 0.84$).

3. Results

3.1. Manipulation check

Two items assessed the participants' understanding of the manipulation. The first question was "Thinking about the scenario you have just read, were the number of Likes a lot more or a lot less than 'x'?", with 'x' being the number of Likes previously provided by the respondent. Possible answers were 'A lot more' and 'A lot less'. Second, we asked "Thinking about the scenario you have just read, can your followers see how many Likes you received for the post?" 'My followers can see' and 'None of my followers can see' were the options provided. Overall, 76.78% of participants correctly filled out the manipulation check question about the number of Likes (93.87% in the 'a lot more' condition and 60.54% in the 'a lot less' condition). 75.86% of participants correctly filled out the manipulation check question about the visibility of Likes (96.28% in the 'My followers can see' condition and 55.91% in the 'None of my followers can see' condition). Only those participants who correctly identified i) the scenario had presented them with more/fewer Likes than they had indicated, and ii) their followers could/could not see their Likes, were included in the remainder of the study.

3.2. Test of hypotheses

To test the hypotheses, we conducted two ANCOVAs, one for each dependent variable: negative affect and loneliness. The independent variables were number of Likes and visibility of Likes. Vulnerable narcissism was included as covariate. Table 1 presents the ANCOVA results. Marginal means and standard deviations are presented in Table 2.

We posited that when the number of Likes a user receives is more than their desired number of Likes, negative affect (H1) and loneliness (H2) are lower. The analysis revealed a significant main effect of the number of Likes on negative affect ($F(1, 275) = 42.42$; $p < 0.01$; partial $\eta^2 = 0.13$). However, those individuals who received a lot more Likes had greater negative affect than those that received a lot less Likes ($M_{\text{More Likes}} = 3.23$; $M_{\text{Less Likes}} = 2.45$). Thus, H1 was not supported. The number of Likes had a significant impact on loneliness ($F(1, 275) = 7.10$;

Table 1

ANCOVA results for the effects of number of Likes and visibility of Likes on negative affect and loneliness outcomes, and vulnerable narcissism as a covariate.

	Negative affect F-statistic	Loneliness F-statistic
Main effects		
Number of Likes	42.42***	7.10***
Visibility of Likes	6.44**	0.49
Interaction		
Number x visibility	6.90***	0.46
Covariate		
Vulnerable narcissism	0.90	158.52***

Note: values in bold indicate significant levels at ** $p < 0.05$ and *** $p < 0.01$.

Table 2

Marginal means and standard deviations.

	Negative affect	Loneliness
More Likes	3.23 (0.08)	2.12 (0.07)
Less Likes	2.45 (0.09)	2.42 (0.08)
Followers can see Likes	2.99 (0.08)	2.31 (0.07)
Followers cannot see Likes	2.69 (0.09)	2.23 (0.08)

Note: displayed are means adjusted for the covariate; 5-point scale.

$p < 0.05$; partial $\eta^2 = 0.03$). Loneliness was greater among participants who received a lot less Likes than those who received a lot more Likes ($M_{\text{More Likes}} = 2.12$; $M_{\text{Less Likes}} = 2.42$), supporting H2.

In relation to the visibility of Likes (H3 and H4), results revealed that the main effect of the visibility of Likes on negative affect was significant ($F(1, 275) = 6.44$; $p < 0.05$; partial $\eta^2 = 0.02$). When Likes were seen by others, negative affect was greater ($M_{\text{Likes seen}} = 2.99$; $M_{\text{Likes not seen}} = 2.69$). Thus, H3 was supported. Loneliness was also greater when Likes were visible ($M_{\text{Likes seen}} = 2.31$; $M_{\text{Likes not seen}} = 2.23$). However, means were not statistically different ($F(1, 275) = 0.49$; $p > 0.1$). Therefore, H4 was not supported.

Results showed a statistically significant two-way interaction ($F(1, 275) = 6.90$; $p < 0.05$; partial $\eta^2 = 0.02$) between number of Likes received and the visibility of those Likes on negative affect (see Fig. 1), supporting H5. When the number of Likes received was a lot more than their desired number of Likes, negative affect was higher when those Likes were seen than when they were not seen. However, when the number of Likes received was a lot less, negative affect was the same whether Likes were seen or not. Results also showed that the interaction of number of Likes and visibility was non-significant for loneliness ($F(1, 275) = 0.46$; $p > 0.1$). Therefore, H6 was not supported.

Finally, we posited that vulnerable narcissism is positively associated with both negative affect (H7) and loneliness (H8). Contrary to what was expected, the results showed negative affect was not linked to vulnerable narcissism ($F = 0.90$, $p > 0.1$). Therefore, H7 was not supported. By contrast, vulnerable narcissism had a positive and significant relationship with loneliness ($F = 158.52$, $p < 0.01$; partial $\eta^2 = 0.37$), supporting H8.

4. Discussion

While attaining Likes is a goal for Instagram followers (Sheldon & Bryant, 2016), and social attention through Likes is valued (Dumas et al., 2017), previous research had suggested a negative relationship between social media use and psychological wellbeing (Baker & Algorta, 2016; Vogel et al., 2015), including loneliness (Pittman & Reich, 2016) and negative affect (Jackson & Luchner, 2018). Following Instagram's recent initiative to support wellbeing by hiding users' Likes from others, our study is the first to investigate the effect of the number of Likes received, and the visibility of those Likes, on wellbeing outcomes.

Using a simulated scenario we investigated the effect of hiding

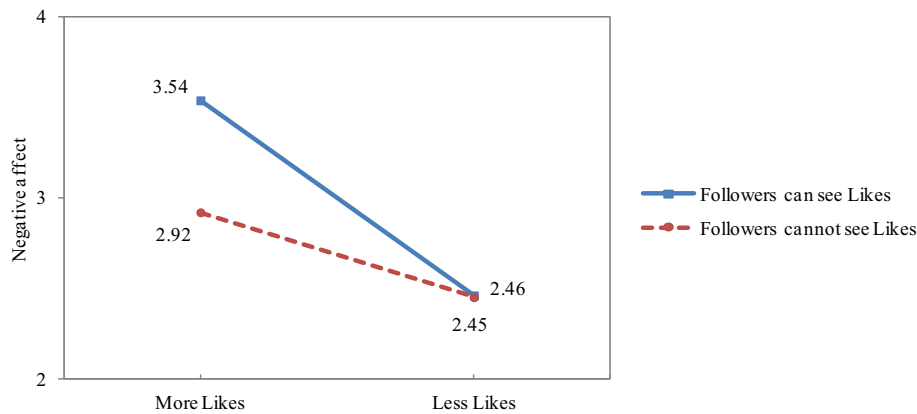


Fig. 1. Interaction effect of number of Likes and visibility on negative affect.

Instagram Likes on users' wellbeing, considering the effect of the number of Likes that their Instagram post received in the scenario of high (versus low) Likes received and those Likes being visible (versus hidden) to Instagram followers. Our study shows that the measure proposed by Instagram helps to improve wellbeing, in particular in terms of changes to negative affect.

Findings indicate that receiving more Likes leads to greater negative affect, and this is compounded by the visibility of those Likes. When the number of Likes received is lower, negative affect is the same whether those Likes are visible or not. Jackson and Luchner (2018) found that lower Likes were associated with greater negative affect. We find the opposite effect for number of Likes, and we offer an explanation for the result. Those who score lower on life satisfaction are more likely to use Instagram to appear 'cool' (Sheldon & Bryant, 2016). Perhaps Instagram users who achieve more Likes experience negative affect from pressure to appear 'cool', and this is exacerbated by the visibility of those Likes to others, as they perceive that they are being judged.

We also considered that social comparison could lead to negative affect. When individuals compare themselves with others that are better off (Festinger, 1954), they may feel inferior (Meier & Schäfer, 2018). In the context of Instagram, we find that more Likes leads to greater negative affect, especially when those Likes are seen. It is likely that individuals strive to achieve more Likes, aware that others are comparing themselves to them. When Likes are high, possibly those Likes are never sufficient to avoid negative affect, as one is always comparing oneself to others, whose Likes are also seen. By contrast, when those Likes are low, the visibility of those Likes makes no difference to the level of negative affect. Perhaps in such instances, the Instagram user perceives they have already 'lost' to others who have more Likes, therefore the visibility of lower Likes does not matter to them.

Extant literature suggests that fewer Likes may be interpreted as implied criticism from others, and therefore negative feedback in terms of fewer Likes has greater negative outcomes than positive feedback in terms of greater Likes (Jackson & Luchner, 2018). This study also found that lower levels of Likes lead to greater loneliness. Possibly not receiving the desired number of Likes leads one to feel left out by peers. Although loneliness was higher when Likes were visible, means were not statistically different. Therefore, results suggest that individuals feel lonely whether their Likes are visible or not. Yet attaining more Likes is associated with a reduction in loneliness. Individuals may engage in Like-seeking behaviour (Dumas et al., 2017) if they feel lonely, to attain more validation (Sheldon & Bryant, 2016), or to increase their visibility among peers (Dumas et al., 2017). While we also find that achieving greater numbers of Likes is associated with lower levels of loneliness, achieving greater numbers of Likes also leads to greater negative affect. We suggest that Like-seeking may be a vicious cycle, whereby individuals seek Likes to feel less lonely, yet more Likes exacerbate their

negative affect. This cycle may, in turn, lead the individual to feel dissatisfied, which may trigger Like-seeking.

Our study also addresses Zhang, Zou, Wang, and Finy's (2015) call to investigate the relationship between vulnerable narcissism and loneliness. Results indicate a relationship between vulnerable narcissism and loneliness in the context of Instagram. Research suggests that vulnerable narcissists may experience more sensitivity to interpersonal rejection (Besser & Priel, 2010), and vulnerable narcissists may choose to engage in tactics to avoid rejection (Hart et al., 2017). As this study's findings show that greater numbers of Likes helps to reduce loneliness, we suggest that those with vulnerable narcissism may seek Likes to avoid rejection, and therefore feel less lonely. However, this Like-seeking may compound a 'vicious cycle' where one achieves more Likes, and feels less lonely, but experiences more negative affect.

Findings indicate that individuals' negative outcomes of Instagram use may depend on whether those outcomes are visible to others or not. The visibility of Likes is associated with negative affect and negative affect is greater when the number of Likes is high. Therefore, findings extend the contention that there is a negative psychological impact of Instagram use. Indeed, we find little evidence to suggest that the indicators of individuals' wellbeing in our study are improved by showing Likes to others, and we suggest that Instagram's initiative to hide likes would support individuals' wellbeing.

4.1. Limitations and future directions

Several limitations should be considered. First, our study provided users with a scenario, whereby users imagined receiving greater/less Likes than they would have liked following an Instagram post, and that their followers could/could not see the number of Likes received. While manipulation checks offered reassurance, we acknowledge that participants could have found it difficult to imagine themselves in those scenarios. We advocate further research to test these results in an experiment during which participants use Instagram and receive live responses to their posts which are visible/hidden.

Second, we asked people to think about the post they made about climate change, instead of using personal images such as selfies. Future research could investigate the same manipulations in a scenario where images of the self are posted, to determine whether the type of post has an impact on results.

Third, the study provides new insights into the effect of Instagram's initiative of hiding Likes on the user. However, capturing followers' views was outside of the scope of the study. As the effects on viewers of Instagram posts are also important, we advocate further research to extend the investigation of hidden Likes' effects on Instagram followers.

Fourth, only those respondents who correctly answered the manipulation checks were included in the study. As the hiding of Instagram Likes is a new initiative from Instagram, perhaps some respondents were

not familiar with the idea and could not conceptualise how Likes might be hidden. Nevertheless, the removal of these cases offers reassurance that the respondents who answered correctly understood the manipulation.

Fifth, our study investigated vulnerable narcissism but we did not consider other forms of narcissism, or other ‘dark triad’ traits (Hart et al., 2017) that contribute to explaining variance in loneliness (Zhang et al., 2015). Further research could consider these traits in investigating effects of hiding Likes.

Funding

This work was supported by the Government of Spain and the European Regional Development Fund (ERDF) (project ECO2017-82103-P); the Gobierno de Aragón (GENERES Group S-54_20R); and the Research Incentivisation Scheme at the J. E. Cairnes School of Business & Economics, National University of Ireland Galway.

CRedit authorship contribution statement

Elaine Wallace: Conceptualization, Methodology, Validation, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Funding acquisition. **Isabel Buil:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Funding acquisition.

Declaration of competing interest

None.

References

- Baker, D. A., & Algorta, G. P. (2016). The relationship between online social networking and depression: A systematic review of quantitative studies. *Cyberpsychology, Behavior and Social Networking*, 19(11), 638–648.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529.
- Besser, A., & Priel, B. (2010). Grandiose narcissism versus vulnerable narcissism in threatening situations: Emotional reactions to achievement failure and interpersonal rejection. *Journal of Social and Clinical Psychology*, 29(8), 874–902.
- Buunk, A. P., & Gibbons, F. X. (2007). Social comparison: The end of a theory and the emergence of a field. *Organizational Behavior and Human Decision Processes*, 102, 3–21.
- Carr, C. T., Wohn, D. Y., & Hayes, R. A. (2016). Thumbs up as social support: Relational closeness, automaticity, and interpreting social support from paralinguistic digital affordances in social media. *Computers in Human Behavior*, 62, 385–393.
- de Vries, D. A., Möller, A. M., Wieringa, M. S., Eigenraam, A. W., & Hamelink, K. (2018). Social comparison as the thief of joy: Emotional consequences of viewing strangers’ Instagram posts. *Media Psychology*, 21(2), 222–245.
- Dumas, T. M., Maxwell-Smith, M., Davis, J. P., & Giulietti, P. A. (2017). Lying or longing for likes? Narcissism, peer belonging, loneliness and normative versus deceptive like-seeking on Instagram in emerging adulthood. *Computers in Human Behavior*, 71, 1–10.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7(2), 117–140.
- Hart, W., Adams, J., Burton, K. A., & Tortoriello, G. K. (2017). Narcissism and self-presentation: Profiling grandiose and vulnerable Narcissists’ self-presentation tactic use. *Personality and Individual Differences*, 104, 48–57.
- Hayes, R. A., Carr, C. T., & Wohn, D. Y. (2016). One click, many meanings: Interpreting paralinguistic digital affordances in social media. *Journal of Broadcasting & Electronic Media*, 60, 171–187.
- Hendin, H. M., & Cheek, J. M. (1997). Assessing hypersensitive narcissism: A re-examination of Murray’s Narcissism Scale. *Journal of Research in Personality*, 31(4), 588–599.
- Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No more FOMO: Limiting social media decreases loneliness and depression. *Journal of Social and Clinical Psychology*, 37(10), 751–768.
- Instagram. (2020). <https://instagram-press.com/our-story/2/>. (Accessed 7 April 2020) (online).
- Jackson, C. A., & Luchner, A. F. (2018). Self-presentation mediates the relationship between self-criticism and emotional response to Instagram feedback. *Personality and Individual Differences*, 133, 1–6.
- Leary, M. R. (1983). A brief version of the Fear of Negative Evaluation Scale. *Personality and Social Psychology Bulletin*, 9, 371–376.
- Lee, E., Lee, J. A., Moon, J. H., & Sung, Y. (2015). Pictures speak louder than words: Motivations for using Instagram. *Cyberpsychology, Behavior and Social Networking*, 18(9), 552–556.
- Lee, S. Y. (2014). How do people compare themselves with others on social network sites?: The case of Facebook. *Computers in Human Behavior*, 32, 253–260.
- Meade, A. W., & Craig, S. B. (2012). Identifying careless responses in survey data. *Psychological Methods*, 17(3), 437–455.
- Meier, A., & Schäfer, S. (2018). The positive side of social comparison on social network sites: How envy can drive inspiration on Instagram. *Cyberpsychology, Behavior and Social Networking*, 21(7), 411–417.
- Miller, J. D., Hoffman, B. J., Gaughan, E. T., Gentile, B., Maples, J., & Keith Campbell, W. (2011). Grandiose and vulnerable narcissism: A nomological network analysis. *Journal of Personality*, 79(5), 1013–1042.
- Moon, J. H., Lee, E., Lee, J. A., Choi, T. R., & Sung, Y. (2016). The role of narcissism in self-promotion on Instagram. *Personality and Individual Differences*, 101, 22–25.
- Nadkarni, A., & Hofmann, S. G. (2012). Why do people use Facebook? *Personality and Individual Differences*, 52(3), 243–249.
- Paul, K. (2019). Instagram tests how many people like a post. That has influencers worried, The Guardian online. Available at <https://www.theguardian.com/technology/2019/nov/15/instagram-likes-influencers-social-media>. (Accessed 13 May 2020).
- Pittman, M. (2015). Creating, consuming, and connecting: Examining the relationship between social media engagement and loneliness. *The Journal of Social Media in Society*, 4(1).
- Pittman, M., & Reich, B. (2016). Social media and loneliness: Why an Instagram picture may be worth more than a thousand Twitter words. *Computers in Human Behavior*, 62, 155–167.
- Reich, S., Schneider, F. M., & Heling, L. (2018). Zero likes—symbolic interactions and need satisfaction online. *Computers in Human Behavior*, 80, 97–102.
- Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA loneliness scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39(3), 472–480.
- Sheldon, P., & Bryant, K. (2016). Instagram: Motives for its use and relationship to narcissism and contextual age. *Computers in Human Behavior*, 58, 89–97.
- Vogel, E. A., Rose, J. P., Okdie, B. M., Eckles, K., & Franz, B. (2015). Who compares and despairs? The effect of social comparison orientation on social media use and its outcomes. *Personality and Individual Differences*, 86, 249–256.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.
- Whillans, A. V., & Chen, F. S. (2018). Facebook undermines the social belonging of first year students. *Personality and Individual Differences*, 133, 13–16.
- Whon, D. Y., Carr, C. T., & Hayes, R. A. (2016). How affective is a “Like”? The effect of paralinguistic digital affordances on perceived social support. *Cyberpsychology, Behavior and Social Networking*, 19(9), 562–566.
- Wood, J. V. (1996). What is social comparison and how should we study it? *Personality and Social Psychology Bulletin*, 22, 520–537.
- Yang, C. C. (2016). Instagram use, loneliness, and social comparison orientation: Interact and browse on social media, but don’t compare. *Cyberpsychology, Behavior and Social Networking*, 19(12), 703–708.
- Zhang, W., Zou, H., Wang, M., & Finy, M. S. (2015). The role of the Dark Triad traits and two constructs of emotional intelligence on loneliness in adolescents. *Personality and Individual Differences*, 75, 74–79.