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Battling self-esteem issues during SNS use: A multilevel latent variable path analysis approach

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BATTLING SELF-ESTEEM ISSUES DURING SNS USE: A MULTILEVEL LATENT VARIABLE PATH ANALYSIS APPROACH

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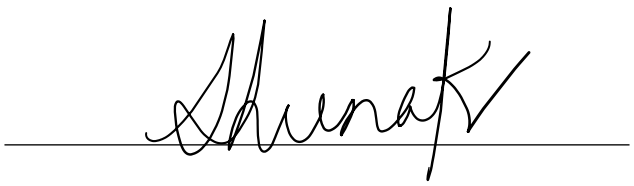

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BATTLING SELF-ESTEEM ISSUES DURING SNS USE: A MULTILEVEL LATENT VARIABLE PATH ANALYSIS APPROACH

Khoo Shi Ann Shuna, PhD

Singapore Management University, 2022

Although studies have consistently indicated that heavier social networking sites (SNS) use perpetuates poorer self-esteem outcomes, no study has examined potential intervention methods that can counteract the ill-effects of SNS use. We sought to examine whether SNS use in a self-affirmative manner could mitigate threats to self that are often experienced during its use. Specifically, we hypothesized that the viewing of one's SNS profile (i.e., Instagram profile) would have self-affirmative effects on individuals and improve their self-perception, and these effects are mediated by self-concept clarity. We tested these hypotheses through cross-sectional (Study 1) and intensive longitudinal (Study 2) studies. Across two studies, we found that participants who spent time on their own Instagram profile felt more positive about themselves. In Study 2, using multilevel latent variable path analyses, we found that SNS-influenced self-concept clarity mediated the relations between self-affirmative SNS use and SNS-influenced self-esteem. Our findings provide preliminary evidence for our hypothesis that guided SNS use can have beneficial effects on one's self-perception.

Keywords: multilevel latent variable path analyses, self-affirmation, self-concept clarity, self-esteem, social networking, mediation

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BATTLING SELF-ESTEEM ISSUES DURING SNS USE: A MULTILEVEL LATENT VARIABLE PATH ANALYSIS APPROACH

1. Introduction

"*No man is an island entire of itself; every man is a piece of the continent, a part of the main…*", English poet John Donne's famous writing in the 17th century succinctly described man's fundamental desire to belong to social groups. This desire likely drove the rapid adoption of social networking sites – at an alarming rate of 15.5 new users per second (DataReportal, 2021). Such a booming phenomenon has since attracted much research attention, especially from psychologists who are concerned about the implications of social networking on individuals (Cheng et al., 2021; Huang, 2017; Yoon et al., 2019). A large body of research has alluded that the use of social networking sites (SNS) leads to adverse psychological outcomes, such as negative self-evaluations, because of its nature to perpetuate upward social comparisons (de Vries et al., 2018; Feinstein et al., 2013; Midgley et al., 2020; Vogel et al., 2014). However, no study has investigated strategies that individuals can use to mitigate these ill-effects of SNS use. Since self-affirmation, a classic self-concept defense mechanism, has been shown to buffer against threats to self arising from social comparison (Tesser, 2001; Tesser & Cornell, 1991), the present study's first research goal is to find evidence that naturalistic self-affirmation, through guided SNS use, could mitigate the ill-effects of SNS use on one's self-esteem. Our second research goal is to answer the question of "how" self-affirmative SNS use could boost one's self-esteem by examining an important mediator. Past studies have shown that SNS use influenced one's self-concept clarity—the clarity and coherence of one's perception of self-aspects, which could in turn implicate one's self-esteem (e.g., Appel et al., 2018; Vess et al.,

2011). Thus, in addressing our second research goal, we aimed to clarify the mechanism through which self-affirmation influences self-esteem by examining self-concept clarity as a mediator.

1.1 Social networking site (SNS) use implicates poorer self-esteem

Self-esteem is an individual's sense of self-worth and self-respect (Monteiro et al., 2021). Self-esteem is instrumental to individual's well-being (e.g., Lee-Flynn et al., 2011) and thus, it is critical to understand why the use of social networking sites (SNS) implicated poorer self-esteem and how these ill-effects could be mitigated. SNS is a subset of social media, and specifically refers to communities where users can create individual public profiles, interact with real-life friends, and connect with other people based on shared interests (Kuss & Griffiths, 2017). Extant psychological findings have largely focused on more egocentric platforms that allow individuals to represent themselves using individual profiles and posts, and befriend other real-life individuals to build social connections. Examples of such platforms include *Facebook* and *Instagram*. Importantly, the use of these SNS has been found to implicate considerable self-evaluative consequences within individuals (Cramer et al., 2016; de Vries et al., 2018; Gonzales & Hancock, 2011; Lup et al., 2015; Yang, 2016). A recent systematic review by Krause et al. (2021) highlighted three processes that explain SNS' varying implications on self-esteem: (a) social comparison, (b) social feedback processing, and (c) self-reflection. According to this framework, social comparison mainly resulted in adverse effects on self-esteem, but the social feedback processing and self-reflective processes have potential to boost individuals' self-esteem. In light of these findings, the present study is interested in whether self-reflective processes, such as self-affirmation, could be robustly performed on SNS platforms such that they mitigate the ill-effects of SNS use on one's self-esteem.

Studies have consistently demonstrated that heavier SNS use is associated with greater social comparison that adversely implicated one's self-esteem (e.g., Midgley et al., 2020; Pang, 2021; Saiphoo et al., 2020; Vogel et al., 2014; Wang et al., 2017). Social comparison refers to the fundamental adaptive processing of information about one or more other people in relation to the self (Festinger, 1954; Gilbert et al., 1995; Wood, 1996). SNS use perpetuates social comparisons because it provides a unique and rich source of interpersonal information that individuals would otherwise not be exposed to (Krause et al., 2021). Specifically, SNS facilitates easy sharing of personal information, quick connections with strangers or acquaintances, and online interactions—all of which motivates individuals to engage in high levels of self-disclosure and in turn expose them to overwhelming interpersonal information. Furthermore, most of this information is positively valenced because SNS users typically engage in selective positive self-presentation and post positive rather than negative content (Qiu et al., 2012; Vogel & Rose, 2016). The constant exposure to such positive interpersonal information then drove upward social comparison—comparison of oneself to superior others—within SNS users. One study found that SNS use, and not any other types of digital use e.g., internet browsing or watching online videos, facilitated more frequent and extreme upward social comparisons that resulted in immediate declines in self-evaluations (Midgley et al., 2020). Other studies similarly found that heavier SNS use perpetuated more upward social comparison that led to poorer state self-esteem and lower subjective well-being (Pang, 2021; Vogel et al., 2014; Wang et al., 2017). Taken together, these studies provided support for Krause et al. (2021)'s framework that social comparison processes tend to engender adverse effects on one's self-esteem. However, given that individuals could substitute various self-esteem regulation processes to alleviate threats to their

self (Tesser, 2001), it is possible to devise an intervention, such as self-affirmative SNS use, that can mitigate the ill-effects of SNS use.

1.2 Self-affirmative SNS use as an intervention

Individuals are fundamentally motivated to maintain a positive, global self-evaluation (Steele, 1988; Tesser, 1988). When external influences thwarted this positive self-image, an individual could leverage a substitutable self-maintenance mechanism to restore that self-image. In line with this notion, past studies have shown that self-esteem maintenance mechanisms, including social comparison, cognitive dissonance and self-affirmation, were substitutable to the extent each activity served the goal to maintain one's self-esteem (Tesser, 2000, 2001). In particular, the current study is interested to examine whether self-affirmative SNS use could mitigate the self-related threats that individuals may experience during SNS use.

According to the self-affirmation theory (Steele, 1988), an individual could affirm some important aspects of the self that were unrelated to the threatened domain to maintain or restore one's global positive self-image. Specifically, self-affirmation served to reduce the psychological discomfort that stemmed from cognitive dissonance between one's positive self-image and the threat to self (McQueen & Klein, 2006; Steele, 1988). In support of this, one study found that self-affirmation diminished the use of defensive strategies in a threatening social comparison situation (Tesser & Cornell, 1991), where self-affirmed participants were more helpful and kinder to counterparts who had supposedly outperformed them in a previous task than unaffirmed participants.

Importantly, although self-affirmation was often experimentally induced effectively, the manipulation paradigms (e.g., writing an essay about one's important values) were usually remote and irrelevant for daily practice (McQueen & Klein, 2006). Given that SNS use is

prevalent and ingrained in daily living, it is critical to identify how self-affirmation can be applied to the context of SNS use in a more natural way. Accordingly, one study investigated how Facebook use could warrant self-affirmative effects (Toma & Hancock, 2013). In the study, participants were instructed to spend time on their own Facebook profiles, which was said to meet the three criteria required for self-affirmation namely (a) represents the domains of self on which self-worth is contingent, (b) offers a positive and desirable self-representation, and (c) is an accurate representation of themselves. Facebook profile posts were often curated by individuals to reflect positive (Denti et al., 2012), essential (e.g., meaningful relations, cherished personal characteristics), and accurate aspects of self-concepts (Michikyan et al., 2015), all of which could satisfy one's fundamental need for self-worth (Sherman & Cohen, 2006; Steele, 1988). In line with this notion, the study found that participants who examined their own Facebook profiles for 5 mins were more accepting of negative feedback (i.e., less defensive), compared to those who viewed a stranger's Facebook profile (Toma & Hancock, 2013). Notably, the results indicated that participants who were affirmed through Facebook were equally accepting of the negative feedback as those affirmed through a classic values essay. Similarly, a number of studies found that updating and viewing one's own SNS profile had positive effects on one's self-esteem (Gentile et al., 2012; Gonzales & Hancock, 2011). Given these, we believe that similar self-affirmative effects can be induced if users were to view their own Instagram profiles.

Instagram was launched in 2010 as a picture sharing SNS, and has since evolved to allow video sharing, instant messaging, live streaming and video-calling etc. ("Instagram," 2021). While there is growing research indicating that heavier Instagram use implicated poorer self-esteem outcomes (de Vries et al., 2018; Midgley et al., 2020; Stapleton et al., 2017), none

has examined Instagram for its self-affirmative potential. As a possible avenue that individuals can use for self-affirmation, Instagram meets the criteria similarly to Facebook (Toma & Hancock, 2013). Similar to other SNS users, Instagram users post about domains that are important to themselves in a positive and desirable manner. Studies have shown that Instagram users are motivated to post content that appear interesting, well-liked, and attractive (Yau & Reich, 2019). Therefore, content that appears on one's Instagram profile is likely to be a curated collection of events and memories about one's positive self-aspects. Studies have indicated that the top three posted photos on Instagram include selfies, activities (e.g., concerts) and friends (Hu et al., 2014), which are instrumental self-aspects. Importantly, we expected only Instagram accounts which individuals use to post curated personal (i.e., important self-aspects), accurate, and positive updates to be suitable avenues for self-affirmation. Such accounts are sometimes referred to as Real Instagram accounts (i.e., Rinsta)—as opposed to 'spam' accounts in which individuals post random unflattering and negative aspects of themselves (i.e., Fake Instagram, Finsta; Kang & Wei, 2020). Since studies have shown that Instagram users presented their actual-self and ideal-self to a greater extent on their Rinsta than on Finsta (Kang & Wei, 2020), our study only focused on users' viewing of their primary Instagram account which they use to share personal updates with most of their friends (i.e., Rinsta). In short, we hypothesized that individuals who are self-affirmed by viewing their own Instagram profile would experience better self-esteem outcomes (Hypothesis 1).

1.3 Self-concept clarity as a mediator

Our second research goal is to elucidate "how" self-affirmative SNS use would implicate one's self-esteem outcomes. Although a number of studies have found that self-affirmation is positively related to both self-concept clarity (Cerully, 2011; Wakslak & Trope, 2009) and

self-esteem (Gentile et al., 2012; Gonzales & Hancock, 2011; Krause et al., 2021), few have examined the possible mediating role of self-concept clarity between self-affirmation and self-esteem. Specifically, self-concept clarity refers to the extent to which self-beliefs are clearly and confidently defined, internally consistent and stable (Campbell et al., 1996). Notably, while an individual's self-concept clarity was found to be relatively stable over time, it was still susceptible to environmental influences (Campbell et al., 1996). Importantly, three lines of accumulative evidence strongly suggest that self-affirmative SNS use could strengthen one's self-concept clarity and in turn engender positive influences on one's self-esteem.

First, existing studies consistently demonstrated that SNS use can influence self-concept clarity (Appel et al., 2018; Lin et al., 2021; Liu et al., 2019; Yang et al., 2021). Two competing hypotheses could explain the influence of online activities, including SNS use, on the clarity of the users' self-concept – the fragmentation hypothesis and the self-concept unity hypothesis (cf. Valkenburg & Peter, 2011). The fragmentation hypothesis posited that online activities allow users to present multiple possible selves (e.g., ideal selves, false selves), but the heterogeneity of these self-expressions—exacerbated by others' responses to these different selves—impaired the development of a consistent and temporally stable self-concept. On the other hand, the self-concept unity hypothesis suggested that online activities provided opportunities for individuals to present positive and yet honest aspects of their selves and receive validations regarding these self-aspects; thereby building a firm sense of self within the users (Appel et al., 2018; Valkenburg & Peter, 2011). Although existing studies have predominantly found support for the fragmentation hypothesis such that online activities negatively implicated one's self-concept clarity (Appel et al., 2018; Lin et al., 2021; Liu et al., 2019), we proposed that the self-concept unity hypothesis can find support through specific SNS use, such as self-affirmative

SNS use (Toma & Hancock, 2013). Specifically, only SNS use that focuses on one's essential and valued self-concepts would entail greater clarity on one's self-concept and positive self-esteem outcomes. Further, it was possible that existing studies did not find support for the self-concept unity hypothesis because their assessments of SNS use were general (e.g., intensity of SNS use; Appel et al., 2018) and did not assess the type of SNS activity (e.g., viewing one's own profile *versus* others' posts) that influenced one's self-concept clarity.

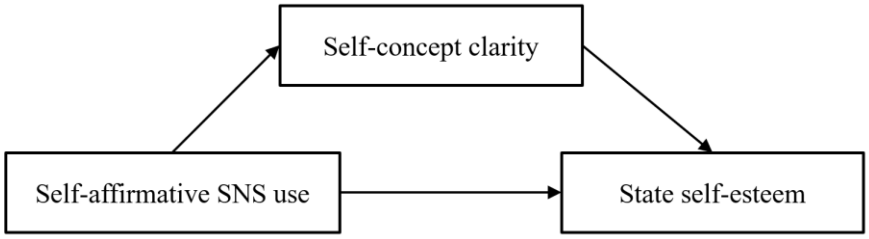
Second, there are theoretical and empirical support that self-affirmation positively influenced one's self-concept clarity (Cerully, 2011; Wakslak & Trope, 2009). Engaging in self-affirmation required individuals to consider their self in terms of its most central features, and doing so acts as a procedural information processing prime that causes individuals to consequently think about themselves in a higher-level and more structured fashion (Wakslak & Trope, 2009). According to the construal level theory (Trope & Liberman, 2003), high-level construals are abstractions that capture core central aspects without details, while low-level construals are relatively concrete, unstructured representations that include great details about events. Importantly, studies found that high-level construal thinking was associated with a coherent, structured self representation that emphasized the self's core characteristics, while low-level construal thinking was associated with a more contextualized self representation that was less structured and consistent (Wakslak et al., 2008). In line with this notion, studies found that individuals who were self-affirmed by writing about their most important values adopted a higher-level construal thinking on the self and rated themselves higher on their self-concept clarity (Cerully, 2011; Wakslak & Trope, 2009). Together, these studies indicated that self-affirmation could activate a higher-level construal of information processing that facilitates the perception of greater coherence and structure within one's self representations—in other

words, higher self-concept clarity. Therefore, we hypothesized that self-affirmation through the viewing of one's own Instagram profile would positively predict self-concept clarity (Hypothesis 2).

Third, prevailing studies indicated that higher self-concept clarity engendered higher self-esteem (Campbell, 1990; Stinson et al., 2008; Usborne & Taylor, 2010). Individuals who have greater confidence in their trait self-ratings and more congruence amongst their self-concepts tended to have higher self-esteem (Campbell, 1990). This is because when an individual has a clear sense of his self-aspects, it is easier to recall his own positive traits after experiencing a threat to self, strengthening the resilience of his self-esteem against external influences (Campbell & Lavallee, 1993; Dodgson & Wood, 1998). Accordingly, existing evidence suggested that higher self-concept clarity, an outcome of higher-level construal thinking, could attenuate the sensitivity of state self-esteem to contextual evaluations such as social comparisons (Vess et al., 2011; Wakslak et al., 2008). One study found that participants who were primed to hold a high-level construal mindset did not experience reductions in their state self-esteem despite receiving negative feedback, unlike those who were primed with a low-construal mindset (Vess et al., 2011). Thus, it was possible that perceiving one's self representations more abstractly and in a bigger-picture manner would beget higher self-concept clarity that consequently strengthen one's resilience against threats to self-esteem. In line with this notion, we predicted that higher self-concept clarity would predict more positive state self-esteem (Hypothesis 3). Taken together, we hypothesized that self-affirmative SNS use would indirectly predict one's self-esteem, and the effect would be mediated by self-concept clarity (Hypothesis 4; see Figure 1).

Figure 1

Hypothesized Mediation Model



1.4 Present study

Our research goals were twofold. First, we aimed to investigate whether naturalistic self-affirmative SNS use (i.e., viewing one's own profile) benefited one's state self-esteem. Second, we sought to elucidate the mechanism through which self-affirmative SNS use influenced one's state self-esteem by examining self-concept clarity as mediator. We aimed to achieve these two goals through two studies. In Study 1, participants were subjected to either a self-affirmation or control condition. Then, after experiencing an upward social comparison paradigm, their state self-esteem was assessed. Study 2 extended Study 1's findings by providing intensive longitudinal evidence for the hypothesized model (see Figure 1). Longitudinal findings, if conclusive, would be instrumental to establish the role of self-concept clarity as a mediator in the model. Together, through Study 1 and 2, we sought to uncover whether self-affirmative SNS use would influence one's self-concept clarity and consequently influence one's state self-esteem.

2 Study 1

Study 1 sought to demonstrate that self-affirmative SNS use would positively influence one's state self-esteem. Following prior work on self-affirmation through SNS use (Toma & Hancock, 2013), participants in the self-affirmation condition spent time on their own Instagram

profiles, while participants in the control condition viewed the Instagram profile of a neutral abstract art account. Then, participants in both conditions were subjected to an upward social comparison ego threat using SNS content. After the social comparison paradigm, participants rated how they felt about themselves.

2.1 Method

2.1.1 Participants

Two-hundred and six undergraduate students were recruited for the study. The study only recruited participants who use the Instagram application on their smartphones regularly (i.e., at least once a day). Participants were compensated either through course credits or monetary means (S$5), and randomly assigned into one of the two experimental conditions (self-affirmation *versus* control). The study was conducted in two parts. 14 participants did not turn up for the study, 1 participant withdrew, and 7 did not complete the second part of the study. Therefore, the remaining sample size was 184 (M_{age} = 21.67 years; Female = 82.6%; $n_{control}$ = 51.1%).

2.1.2 Procedure

Participants were told that the study requires them to evaluate their Instagram experience, and there were two parts to the study. During Part 1, participants underwent the self-affirmation exercise prior to being exposed to an ego-threat (i.e., upward social comparison), a procedural sequence that was consistent with research demonstrating that self-affirmation should happen prior to ego-threat to effectively and consistently reduce defensiveness (Critcher et al., 2010; Toma & Hancock, 2013). Participants read different instructions depending on their assigned conditions. For the *self-affirmation condition*, participants read the following instructions (underlined words are different from control condition):

> *The evaluation is about your experience on your own profile on Instagram. If you have multiple Instagram accounts, please use the account that you most frequently use for personal updates to most of your friends (i.e., not spam account, not Finsta, not professional accounts). You can view any element of your own Instagram profile (e.g., your posts, tagged posts, highlights). Please only stay on your own profile and do not navigate to your feed or friends' profiles. Please view the content carefully as you would be asked questions about the content you have viewed. You would be able to see the questions pertaining to the profile you have just viewed after 5 mins have passed. Please view your profile now.*

Participants in the control condition received similar instructions, but instead of their own Instagram profile, they were instructed to view the Instagram profile of *@abstract.mag* for 5 mins (see Supplementary Materials for detailed instructions). The *@abstract.mag* profile is an online platform that showcases abstract art pieces, and it was selected because the content was neutral and unlikely to facilitate upward social comparison within participants. To ensure that participants have carefully viewed the assigned profiles, they answered questions about the viewed content and uploaded relevant screenshots of their Instagram. After the self-affirmation exercise, participants responded to questions about how they felt about themselves (i.e., self-feeling) and their self-concept clarity.

Next, participants were subjected to ego-threat by viewing four positive Instagram posts and answering questions pertaining to each post (see Supplementary Materials for details on the upward social comparison paradigm). Then, participants responded to questions about their self-feeling and self-esteem. Finally, participants shared screenshots of designated screen time monitoring applications that captured their Instagram usage. Two days later, participants completed Part 2 of the study which involved a series of questionnaires regarding demographic details and personality traits. After all questionnaires have been completed, participants

answered questions to check for suspicion and were debriefed. Participants provided their informed consent before the start of the study, and all procedures were approved by the university's institutional review board.

2.1.3 Measures

2.1.3.1 Manipulation check

As a manipulation check, self-affirmed participants indicated on a 7-point scale (1 = *Strongly disagree*; 7 = *Strongly agree*) whether the content on the viewed profile (a) "… represented different aspects of yourself that are important to you", (b) "… made you think about positive aspects of yourself", (c) "… is an accurate representation of yourself" (Toma & Hancock, 2013). Participants in the control condition only responded to whether the content on the viewed profile made them think about positive aspects of themselves.

2.1.3.2 Self-feeling

To examine if participants' perception about self changed between post-affirmation and post-social comparison, participants completed a one-item measure of self-feeling twice; once immediately after affirmation (i.e., before upward social comparison) and again after experiencing upward social comparison. Participants indicated how they felt about themselves right now (0 = *Poorly*; 6 = *Extremely positive*; Napper et al., 2009).

2.1.3.3 Self-concept clarity

Participants' self-concept clarity was assessed using a 12-item scale (α = .862; Campbell et al., 1996). Sample items include "Right now, I have a clear sense of who I am and what I am" and "Right now, my beliefs about myself often conflict with one another" (1 = *Strongly disagree*; 5 = *Strongly agree*).

2.1.3.4 SNS-influenced self-concept clarity

Participants responded to two adapted items from the self-concept clarity scale (α = .855; Campbell et al., 1996) on how viewing the assigned profile affected their self-concept clarity i.e., "The contents on my Instagram profile (in the profile) helped me gained a clearer picture of myself as a person." and "The contents on my Instagram profile (in the profile) helped me to consider various aspects of myself in a coherent way." (1 = *Strongly disagree*; 5 = *Strongly agree*). The responses were averaged to derive a mean score.

2.1.3.5 State self-esteem

Participants' state self-esteem was assessed using the 10-item Rosenberg (1965) self-esteem scale (α = .929; 1 = *Not at all*; 5 = *Extremely*; Vess et al., 2011). Participants completed the items based on how they felt at the moment (e.g., "Right now, I am satisfied with myself", "Right now, I take a positive attitude toward myself"). Participant's responses were averaged to provide a single score.

2.1.3.6 Demographics

Participants provided information about their age, sex, and monthly household income.

2.1.3.7 Personality traits

Participants completed questionnaires pertaining to their trait self-esteem (α = .887; Rosenberg, 1965) and social comparison orientation (Gibbons & Buunk, 1999)—two subscales: ability (α = .767) and opinion (α = .565; see Supplementary Materials for full scales). These individual differences served as covariates in the study because they affect SNS' influence on self-esteem (Vogel et al., 2014, 2015; C. Yang, 2016).

2.1.3.8 Instagram use duration

Participants provided screenshots of a screen time monitoring application to show the average amount of time spent on Instagram application daily. iPhone users used the default Screen Time application in their smartphones (Apple Inc., 2019), while Android users used a free screen time monitoring application called *Screen Time – Restrain Yourself & Parental Control* (Iridium Dust Limited, 2020).

2.2 Results

Table 1

Descriptive Statistics of Study 1's Variables and Covariates

	M	*SD*	Min	Max	Skew-ness	Kurtosis
Mediators						
Self-concept clarity	2.98	0.67	1.25	4.58	-0.01	-0.52
SNS-influenced self-concept clarity	3.03	1.01	1.00	5.00	-0.22	-0.33
Outcome variables						
State self-esteem	4.51	1.14	1.10	6.80	-0.28	-0.29
Self-feeling (before social comparison)	4.22	0.85	2.00	6.00	-0.28	-0.01
Self-feeling (after social comparison)	3.77	1.00	1.00	6.00	-0.19	-0.58
Covariates						
Age	21.6	1.67	19.00	29.00	0.83	1.82
Sex[1]	1.83	-	1.00	2.00	-1.75	1.06
Monthly household income[2]	4.37	2.38	1.00	9.00	0.64	-0.66
Social comparison (ability)	3.46	0.67	1.33	4.83	-0.58	0.35
Social comparison (opinions)	3.82	0.52	2.00	5.00	-0.34	0.82
Trait self-esteem	4.24	0.92	1.70	6.30	-0.17	-0.28
Instagram use (mins)	62.53	43.53	0	266	1.46	3.65

Note. [1] 1 = *Male*; 2 = *Female*.

[2] 1 = *Less than $2,500*; 2 = *$2,500 – $5,000*; 3 = *$5,000 - $7,999*; 4 = *$7,500 - $9,999*; 5 = *$10,000 - $12,499*; 6 = *$12,500 - $14,999*; 7 = *$15,000 - $17,499*; 8 = *$17,500 - $19,999*; 9 = *More than $20,000*.

2.2.1 Manipulation check

Participants in the self-affirmative condition indicated that viewing contents in the assigned profile made them think about positive aspects of themselves (M = 4.08) more so than participants in the control condition (M = 2.93), $t(182) = -8.82$, $p < .001$.

2.2.2 Self-affirmative effect

To examine whether participants in the self-affirmation condition experienced better self-related outcomes, we ran between-participants ANCOVAs on self-concept clarity, SNS-influenced self-concept clarity, self-feeling and state self-esteem (see Table A1 in Appendix for zero-order correlations). The covariates included were social comparison orientation, trait self-esteem, sex, age, monthly household income and daily average Instagram screen time. There were no significant differences between the self-affirmed and control groups for self-concept clarity, $F(1, 174) = 2.91$, $p = .090$, and state self-esteem, $F(1, 174) = 1.17$, $p = .147$. Thus, Hypothesis 1 was not supported.

Notably, the self-affirmed group indicated that viewing their own Instagram profile helped them to gain better self-concept clarity (i.e., SNS-influenced self-concept clarity; M = 3.47) than the control group that viewed the abstract art profile (M = 2.62), $F(1, 174) = 32.28$, $p < .001$. Similarly, the self-affirmed group indicated that they felt more positive about themselves (M = 4.42) compared to the control group (M = 4.04) after viewing their Instagram profile, $F(1, 174) = 10.22$, $p = .002$. This difference in self-feeling ($M_{affirmed} = 3.92$, $M_{control} = 3.64$) persisted even after upward social comparison, $F(1, 174) = 5.09$, $p = .025$.

2.2.3 Self-concept clarity as a mediator

We tested our hypothesized model with self-concept clarity as a mediator between self-affirmative SNS use and state self-esteem, using the SPSS PROCESS macro (model 4;

Hayes, 2018), bootstrapped for 10,000 samples, and controlling for notable covariates such as age, sex, monthly household income, personality traits (i.e., social comparison orientation and trait self-esteem) and average daily Instagram screen time. However, self-concept clarity was not a significant mediator between self-affirmative SNS use and state self-esteem (β = .051, 95% CI [-.009, .126]). Self-affirmative SNS use did not predict self-concept clarity (β = .142, p = .090, 95% CI [-.022, .306]), but self-concept clarity significantly predicted state self-esteem (β = .360, p < .001, 95% CI [.167, .553]). In other words, Study 1's results support Hypothesis 3, but did not support Hypothesis 2 and 4.

On the other hand, SNS-influenced self-concept clarity significantly mediated the link between self-affirmative SNS use and self-feeling—but only for the self-feeling assessed before the social comparison paradigm (β = .298, 95% CI [.181, .435]) and not the self-feeling assessed after social comparison (β = .053, 95% CI [-.099, .201]; see Table 2 for details). These results provide preliminary evidence that viewing one's Instagram profile does have self-affirmative effects.

Table 2

Pathway Coefficients for Mediational Analyses

Pathways	**β**	**Boot strapped *SE***	***p***	**Boot strapped LLCI**	**Boot strapped ULCI**
Self-affirmative SNS use → SCC → State SE	.051	.034	-	-.009	.126
Self-affirmative SNS use → SCC	.142	.083	.090	-.022	.306
SCC → State SE	**.360**	**.098**	**< .001**	**.167**	**.553**
Direct effect	.111	.108	.307	-.103	.324
Self-affirmative SNS use → SNS-influenced SCC → Self-feeling (T1)[1]	**.298**	**.064**	**-**	**.181**	**.435**
Self-affirmative SNS use → SNS-influenced SCC	**.849**	**.137**	**< .001**	**.579**	**1.12**
SNS-influenced SCC → Self-feeling (T1)[1]	**.351**	**.061**	**< .001**	**.230**	**.471**
Direct effect	.087	.122	.479	-.154	.328
Self-affirmative SNS use → SNS-influenced SCC → Self-feeling (T2)[1]	.053	.076	-	-.099	.201
Self-affirmative SNS use → SNS-influenced SCC	**.849**	**.137**	**< .001**	**.579**	**1.12**
SNS-influenced SCC → Self-feeling (T2)[1]	.063	.071	.376	-.077	.202
Direct effect	.235	.141	.098	-.044	.514

Note. Bolded statistics are significant at $p < .05$ level. Covariates of age, sex, monthly household income, trait self-esteem and social comparison orientation were included in analyses. SCC refers to self-concept clarity and SE refers to self-esteem.

[1]T1 refers to the first assessment of self-feeling prior to the social comparison paradigm. T2 refers to the second assessment of self-feeling right after the social comparison paradigm.

2.3 Discussion

Although Study 1's results did not support all our hypotheses, additional analyses involving SNS-specific questions (i.e., SNS-influenced self-concept clarity) and self-feeling provided preliminary evidence that viewing one's Instagram profile evoked self-affirmative effects. Given that the significant mediation effects were only limited to self-feeling prior to the social comparison paradigm (i.e., T1), it was possible that the experimentally induced upward social comparison paradigm overpowered the self-affirmative effects that viewing one's Instagram profile elicited. Therefore in Study 2, we decided to assess the effects of viewing one's Instagram profile in a more naturalistic manner, and not require participants to undergo the artificial upward social comparison paradigm. Participants were not given specific instructions to

change their Instagram use habits in Study 2, and should therefore be exposed to normative levels of social comparison in their daily Instagram use (Midgley et al., 2020).

It was also likely that generic measures such as the self-concept clarity (Campbell et al., 1996) and self-esteem (Rosenberg, 1965) scales were not sensitive enough to pick up subtle self-related changes elicited by self-affirmative Instagram use. Therefore in Study 2, we included SNS-specific measures for self-concept clarity and self-esteem alongside the generic measures.

3 Study 2

Study 2 sought to further establish Study 1's findings by using an intensive longitudinal design and multilevel latent variable path analysis to examine the robustness of the effect. Participants were assigned to either the control or self-affirmative SNS use group—similar to Study 1—and completed daily surveys for seven consecutive days. Importantly, Study 2 addressed two limitations of Study 1. First, Study 1 required participants to engage in an experimentally induced upward social comparison which may have masked the effects of self-affirmative Instagram use and resulted in null findings. Therefore, in Study 2, participants only engaged in normative upward social comparison in their daily use of Instagram (Midgley et al., 2020). Second, Study 1 used cross-sectional data to examine the mediational role of self-concept clarity between self-affirmative SNS use and self-related outcomes, which could have biased the results (for detailed reviews, refer to Cole & Maxwell, 2003; Maxwell & Cole, 2007; Selig & Preacher, 2009). For instance, the use of cross-sectional data for mediational analyses overlooks the effect of previous levels of variables by not controlling for it, and inaccurately assumes that mediational effects are instantaneous and remain the same across time (Selig & Preacher, 2009). Therefore, by using intensive longitudinal data, Study 2 provided more reliable findings pertaining to the hypothesized mediational effects.

Given that the longitudinal data are nested within individuals, the use of multilevel modeling (MLM) was necessary to provide unbiased estimates of the hypothesized 2-1-1 mediation effect in Study 2 (Krull & MacKinnon, 2001). The self-affirmative intervention effect was a level 2 (i.e., group) construct, while the mediator (e.g., self-concept clarity) and outcome variable (e.g., self-esteem) were repeatedly measured as level 1 constructs. Importantly, recent statistical advancements have indicated that multilevel structural equation modeling (MSEM) is more suitable to assess mediation in multilevel data because it addresses several limitations of traditional MLM when applied to mediation analysis (cf. Preacher et al., 2010, 2011). For instance, the traditional applications of MLM to examine multilevel mediation models that involved linkages between Level 1 variables (e.g., the Mediator → Outcome effect in a 2-1-1 design) often resulted in conflation of *Within* and *Between* components of effects (Preacher et al., 2011) and biases in findings. For example, the use of group means of Level 1 predictors to represent their group standings on Level 2 in a traditional MLM biases *Between* effects (e.g., resulting in low intraclass correlations and small cluster sizes), and consequently biases related Between-level indirect effects. On the other hand, MSEM separates the Between and Within parts of all variables and allows for an examination of direct and indirect effects at each level (Preacher et al., 2011). Given this, we chose to examine the hypothesized mediational effects with a specific type of MSEM called multilevel latent variable path analysis (Sadikaj et al., 2019). The use of multilevel latent variable path analysis is especially relevant for intensive repeated measurement studies because it helps to reduce bias in estimation due to measurement error (Cole & Preacher, 2014)—a problem that arises when shortened scales are included to counter participant burden and attrition.

3.1 Method

3.1.1 Participants

Two-hundred and fifty-three participants were recruited from a local university, and participants who completed the entire study were compensated through course credits or monetary means (S$30). Only participants who use Instagram on their smartphones regularly (i.e., using the app at least once a day) were recruited for the study. Participants were randomly and equally assigned into two conditions (self-affirmation *versus* control). 32 participants did not complete the study, resulting in a final sample size of 221 (M_{age} = 21.71 years; Female = 80.5%; $n_{control}$ = 50.2%).

3.1.2 Procedure

The study consisted of two parts. All participants completed Part 1 two days before the start of Part 2. Part 1 consisted of the briefing, informed consent form and a baseline questionnaire (e.g., demographics, personality traits), while Part 2 consisted of daily surveys. Participants completed the daily surveys once a day at 9:30pm for seven consecutive days (Monday – Sunday), within a two-hour window period (e.g., 9:30 – 11:30pm).

For Part 2 (daily surveys) of the study, participants were told that the study required them to report their user experience on Instagram for various uses and improvements. During the daily surveys, participants were respectively instructed to spend 5 mins on their own Instagram profile (e.g., posts, tagged posts, highlights; self-affirmative condition) or on a neutral abstract art profile (i.e., *@abstract.mag*; same as Study 1; control condition). Similar to Study 1, participants responded to questions about the viewed profile and uploaded relevant screenshots of their Instagram to ensure that they carefully viewed the assigned profiles. Participants provided their

informed consent before the start of the study and all procedures were approved by the university's institutional review board.

3.1.3 Baseline measures

The same demographics and personality traits that were assessed in Study 1 were assessed in Study 2 as part of the baseline questionnaire. Specifically, the assessed personality traits were social comparison orientation (Gibbons & Buunk, 1999) and trait self-esteem (Rosenberg, 1965).

3.1.4 Daily measures

3.1.4.1 Manipulation check

As a manipulation check to ensure that the viewed profile mirrored the required elements for self-affirmation (Toma & Hancock, 2013), participants responded to four items about the viewed Instagram profile. Participants indicated if the contents they viewed (a) represented different aspects of themselves that are important to them, (b) made them think about positive aspects of themselves, (c) was an accurate representation of themselves, (d) made them feel good about themselves (1 = *Strongly disagree*; 7 = *Strongly agree*; see Supplementary Materials for full scale). The items were averaged to form a mean score.

3.1.4.2 Self-concept clarity

Participants responded to four items from the Self-Concept Clarity scale (Campbell et al., 1996) on a 7-point scale (1 = *Strongly disagree*; 7 = *Strongly agree*; see Supplementary Materials for details). These items were selected because they were commonly used in repeated measures studies (Alessandri et al., 2021; Ellison et al., 2020; Schwartz et al., 2011). Sample items include "Right now, my beliefs about myself conflict with one another." and "Right now, I have a clear picture of who and what I am.".

3.1.4.3 SNS-influenced self-concept clarity

Participants responded to four adapted items from Campbell et al.'s (1996) self-concept clarity scale (1 = *Strongly disagree*; 7 = *Strongly agree*). Sample items include "The contents on my Instagram profile (in the profile) helped me to consider various aspects of myself in a coherent way." and "The contents on my Instagram profile (in the profile) helped me gained a clearer picture of myself as a person" (see Supplementary Materials for full scale).

3.1.4.4 State self-esteem

Participants' state self-esteem was assessed using five items from Rosenberg's (1965) self-esteem scale (Monteiro et al., 2021; see Supplementary Materials for details). Participants indicated how true the statements represent themselves right now (1 = *Not at all*; 7 = *Extremely*). Sample items include "Right now, I am satisfied with myself" and "Right now, I think I am no good at all.".

3.1.4.5 SNS-influenced self-esteem

Participants responded to five adapted self-esteem items (Monteiro et al., 2021) including "The contents on my Instagram profile (in the profile) helped me to feel satisfied with myself." and "The contents on my Instagram profile (in the profile) made me think that I am no good at all." (1 = *Strongly disagree*; 7 = *Strongly agree*; see Supplementary Materials for full scale).

3.1.4.6 Instagram use duration

Similar to Study 1, participants sent in screenshots of their daily use of Instagram as captured by the respective designated screen time monitoring applications on their smartphones.

3.2 Results

3.2.1 Planned analyses

To examine the mediational effects captured through intensive longitudinal data, we performed a multilevel latent variable path analysis. We followed the steps suggested by Sadikaj et al. (2019). First, we conducted a multilevel confirmatory factor analysis (MCFA) to examine the reliability of the measures and model fit of each construct at each level of analysis. MCFA was performed only for the level 1 variables that were analyzed as latent factors, which were the mediators (i.e., self-concept clarity, SNS-influenced self-concept clarity) and outcome variables (i.e., self-esteem, SNS-influenced self-esteem).

The McDonald's (1999) omega (ω) statistic was used to evaluate the measures' reliability (Geldhof et al., 2014). At each level, ω is calculated as the ratio of "true score" variation (i.e., squared sum of factor loadings) over the total variation (i.e., squared sum of the factor loadings plus the sum of item residual variances). This ratio reflects the percentage of total variability that is accounted for by the latent factor. The within-person reliability indicates the extent to which within-person variation in item scores across days represent true within-person change (i.e., how reliably individual differences in within-person change in item scores across days can be measured). The between-persons reliability indicates the degree to which between-persons differences in item mean scores reflect true individual differences in the construct that the items purport to measure. Factor variances were fixed to 1.0 in this procedure (Sadikaj et al., 2019).

To evaluate level-specific model fit, the models were saturated at the within-person level and between-persons level respectively (i.e., estimating all correlations among the set of indicators; Ryu & West, 2009). The fit of the models were assessed based on standards set by Hu and Bentler (1999). Specifically, the following standards were adopted: root mean square error

of approximation (RMSEA) values equal to or below 0.08 and 0.06 indicate acceptable and good fit, respectively; comparative fit indices (CFI) close to or greater than 0.95; and standardized root mean squared residual (SRMR) values equal to or below 0.08. A good fitting model indicates that it reproduces the structure of the data reasonably well.

Next, we performed a multilevel latent variable path analysis to examine our hypothesized mediational effects. Given that we are interested to examine a mediational relation that lies on level 2 (indirect between-persons effect of self-affirmative SNS use), we fitted a fixed effects model at level 1 (i.e., modeling the same regression slope for all persons). All modeling analyses were conducted using M*plus* 7.4 (Muthén & Muthén, 2015) with a full information maximum likelihood estimation procedure that is robust to non-normality of observations.

3.2.2 Manipulation check

Results from *t*-tests (*p*s < .001) indicated that participants in the self-affirmative condition felt that that the contents in the assigned profile (a) represented different aspects of themselves that were important to them, (b) made them think about positive aspects of themselves, (c) was an accurate representation of themselves, (d) made them feel good about themselves, significantly more than participants in the control condition.

3.2.3 Multilevel confirmatory factor analyses (MCFA)

3.2.3.1 Self-concept clarity

We fitted a single-factor model for self-concept clarity with its four scale items as indicators. The model fit indices were mostly acceptable (see Table A2 in Appendix for details), except for the RMSEA = 0.095 > 0.08 (Hu & Bentler, 1999). However, since RMSEA between 0.08 – 0.010 indicates fit that is neither good nor bad (Cangur & Ercan, 2015) and the other fit

statistics (i.e., CFI and SRMR) were acceptable, we decided to retain this model for self-concept clarity. The factor loadings suggest that the items were acceptable indicators of the latent factor, with standardized factor loadings ranging from 0.24 to 0.59 at within-person level and 0.50 to 0.98 at between-persons level (*p*s < .001; see Table A3 in Appendix for details). The within-person and between-persons omega (ω) reliability for self-concept clarity were 0.59 and 0.93 respectively. The between- and within-level models had acceptable model fit, with the exception of the between-level model's RMSEA = 0.113 > 0.08.

3.2.3.2 SNS-influenced self-concept clarity

We fitted a single-factor model for SNS-influenced self-concept clarity with four scale items as indicators. However, the model contained errors due to small and nonsignificant negative residual variance related to one item, and was thus not reliable. Therefore, we constrained the residual variance of that item to zero (Muthén, 2005), and the model fit was acceptable (see Table A2 and A3 in Appendix for details). The standardized factor loadings ranged from 0.68 to 0.81 at within-person level and 0.94 to 1.00 at between-persons level (*p*s < .001). The within-person and between-persons ω for SNS-influenced self-concept clarity were excellent at 0.82 and 0.99 respectively. The between- and within-level models had excellent model fit.

3.2.3.3 State self-esteem

We fitted a single-factor model for state self-esteem with five scale items as indicators, but the model contained errors due to small and nonsignificant negative residual variance related to one item that is negatively worded. We constrained the residual variance of that item to zero (Muthén, 2005), but the model fit was still unacceptable (see Table A2 and A3 in Appendix for details). Therefore, we dropped that specific negatively worded item (Corwyn, 2000), and the model fit was acceptable. The standardized factor loadings ranged from 0.35 to 0.75 at within-

person level and 0.70 to 0.99 at between-persons level (*p*s < .001). The within-person and between-persons ω for self-esteem were acceptable at 0.63 and 0.93 respectively. The between- and within-level models had excellent model fit.

3.2.3.4 SNS-influenced self-esteem

We fitted a single-factor model for SNS-influenced self-esteem with five scale items as indicators. The model fitted poorly and two items did not load significantly into the latent factor (see Table A2 and A3 in Appendix for details). These two items were negatively worded and past studies have indicated that they are associated with a method effect that contaminated the unidimensional construct of self-esteem (Corwyn, 2000). Therefore, we dropped those two items and refitted the model. The model became fully saturated (i.e., model fit cannot be evaluated). The standardized factor loadings ranged from 0.65 to 0.86 at within-person level, and 0.97 to 1.00 at between-persons level (*p*s < .001). The within-person and between-persons ω for self-esteem were excellent at 0.85 and 0.99 respectively. The models at the within- and between-level were fully saturated, and their model fit could not be evaluated.

3.2.4 Mediational analyses using multilevel latent variable path analysis

3.2.4.1 Self-concept clarity as mediator, state self-esteem as outcome variable

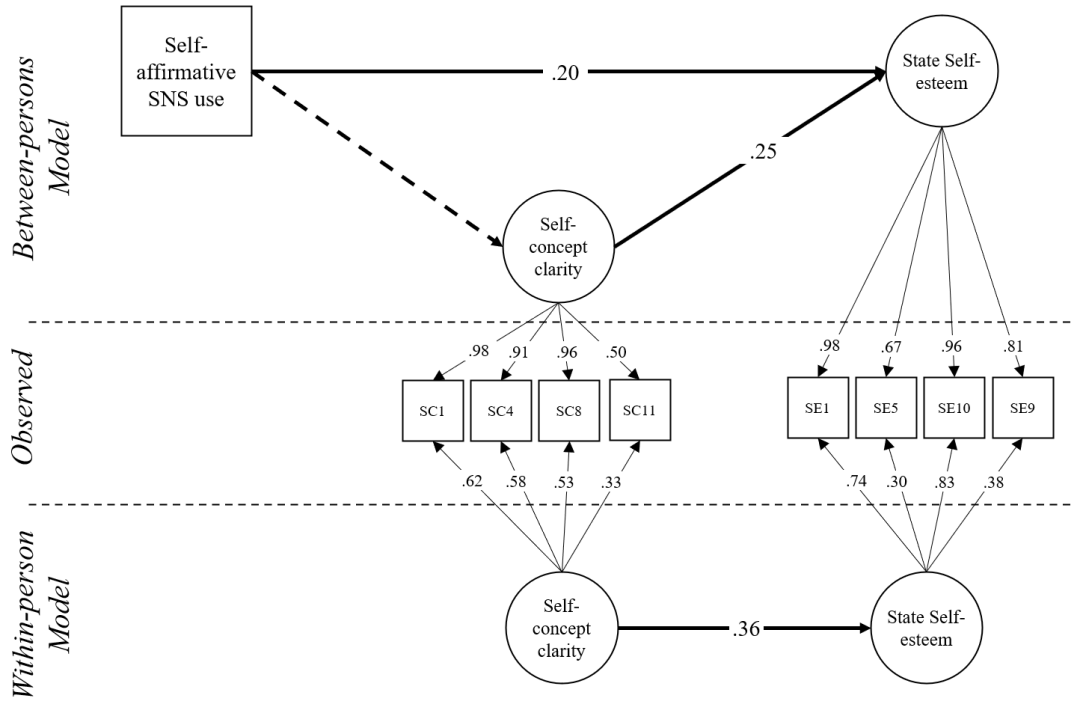
Using multilevel latent variable path analyses, we calculated the indirect effect between self-affirmative SNS use and state self-esteem, with self-concept clarity as a mediator (Berli et al., 2021). As our study undertook a between-persons randomized design, the indirect effect was calculated at the between-persons level (Preacher et al., 2010). The model fit was acceptable: χ^2 (*df* = 44) = 414.87, *p* < .001; RMSEA = .073; CFI = .89; and $SRMR_{Within}/SRMR_{Between}$ = .059/.166. However, our results showed that self-concept clarity did not significantly mediate the relation between one's self-affirmative SNS use and self-esteem (*B* = 0.242, *SE* = 0.142,

p = .088). Specifically, self-affirmative SNS use did not have any between-persons effect on one's self-concept clarity (β = 0.116, *SE* = 0.067, p = 0.082). However, self-concept clarity significantly predicted self-esteem at both between-persons (β = 0.505, *SE* = 0.056, p < .001) and within-person (β = 0.360, *SE* = 0.038, p < .001) levels. The direct effect between self-affirmative SNS use and between-persons self-esteem was not significant (β = 0.078, *SE* = 0.060, p = .197).

Results remained largely the same when we re-ran the analyses and controlled for age, sex, monthly household income, trait self-esteem, social comparison orientation at the between-persons level and Instagram screen time at the within-person level (see Figure 2). The model fit was acceptable: χ_2 (*df* = 92) = 526.89, p < .001; RMSEA = .054; CFI = .88; and $SRMR_{Within}/SRMR_{Between}$ = .054/.176. Controlling for covariates, the indirect effect between self-affirmative SNS use and between-persons self-esteem remained nonsignificant (*B* = 0.178, *SE* = 0.108, p = .101). Self-affirmative SNS use did not significantly predict between-persons self-concept clarity (β = 0.112, *SE* = 0.0467, p = .092), although between-persons self-concept clarity did predict between-persons self-esteem (β = 0.249, *SE* = 0.062, p < .001). Notably, the direct effect between self-affirmative SNS use and self-esteem is significant (β = 0.200, *SE* = 0.052, p < .001). Within-person self-concept clarity predicted within-person self-esteem (β = 0.360, *SE* = 0.038, p < .001). These results mirrored that of Study 1 in that self-concept clarity was not a significant mediator between self-affirmative SNS use and state self-esteem.

Figure 2

Multilevel Latent Variable Path Analysis of Self-concept Clarity Mediating Between Self-affirmative SNS Use and State Self-esteem (Adjusted Model)



Note. Squares represent observed variables; circles represent latent variables. SC1 – SC11 and SE1 – SE10 represent scale items of self-concept clarity and self-esteem respectively (see Supplementary Materials for details). Thicker arrows represent regression paths and values on them signify pathway coefficients. Thinner arrows indicate the observed variables (i.e., indicators) that load onto a latent variable and values on them represent factor loadings. Dotted single-head arrow lines indicate nonsignificant pathways. Covariates (i.e., age, sex, monthly household income, social comparison orientation and trait self-esteem) and residual variances were excluded from the figure for brevity.

3.2.4.2 SNS-influenced self-concept clarity as mediator, SNS-influenced self-esteem as outcome variable

Given that it was possible that generic measures of self-concept clarity and self-esteem could not capture the effects of self-affirmative SNS use, we ran similar analyses involving

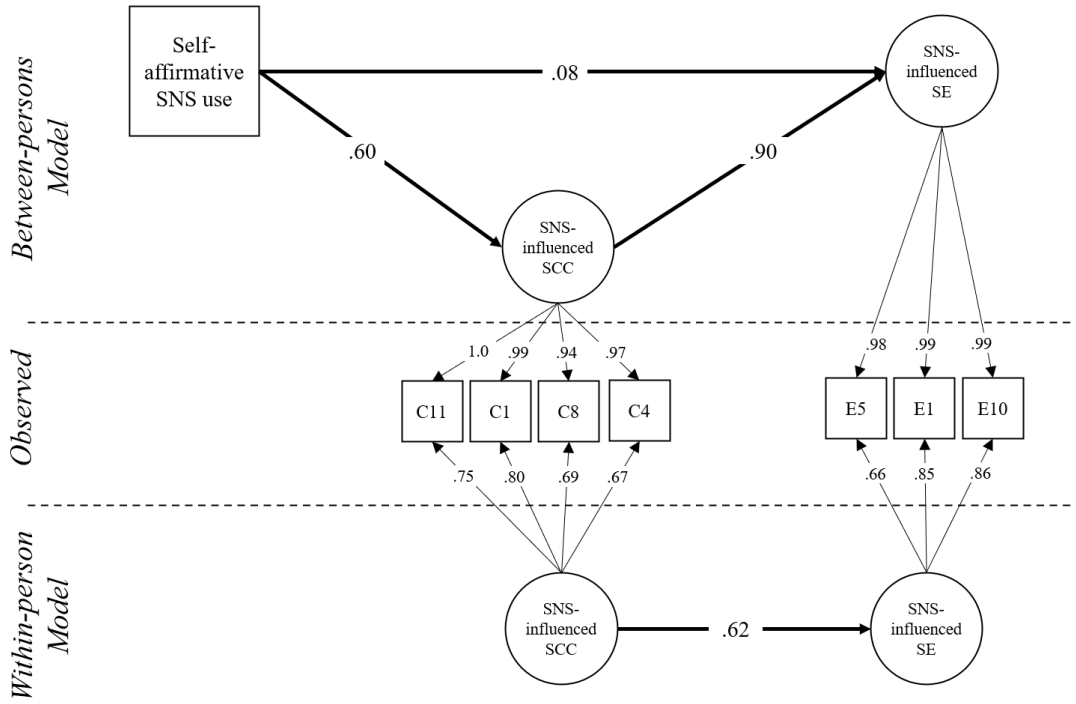
SNS-specific items (i.e., SNS-influenced self-concept clarity and self-esteem). Specifically, we modeled an indirect effect between self-affirmative SNS use and SNS-influenced self-esteem, with SNS-influenced self-concept clarity as a mediator (see Table A4 in Appendix for zero-order correlations). The model fit was acceptable: χ_2 (*df* = 32) = 106.761, $p < .001$; RMSEA = .038; CFI = .990; and $SRMR_{Within}/SRMR_{Between}$ = .021/.015. Importantly, the results showed that SNS-influenced self-concept clarity was a significant mediator between self-affirmative SNS use and SNS-influenced self-esteem (*B* = 2.270, *SE* = 0.221, $p < .001$). Self-affirmative SNS use positively predicted between-persons SNS-influenced self-concept clarity (β = 0.593, *SE* = 0.044, $p < .001$), which in turn positively predicted between-persons SNS-influenced self-esteem (β = 0.915, *SE* = 0.024, $p < .001$). The direct effect between self-affirmative SNS use and between-persons SNS-influenced self-esteem was not significant (β = 0.045, *SE* = 0.034, $p = .185$). Within-person SNS-influenced self-concept clarity positively predicted within-person SNS-influenced self-esteem (β = 0.615, *SE* = 0.022, $p < .001$).

Next, we re-ran the analyses while controlling for age, sex, monthly household income, trait self-esteem, social comparison orientation at the between-persons level, and Instagram screen time at the within-person level (see Figure 3). The model fit was acceptable: χ_2 (*df* = 72) = 146.97, $p < .001$; RMSEA = .025; CFI = .990; and $SRMR_{Within}/SRMR_{Between}$ = .019/.045. The indirect effect between self-affirmative SNS use and between-persons SNS-influenced self-esteem remained significant (*B* = 2.244, *SE* = 0.218, $p < .001$). Self-affirmative SNS use significantly predicted between-persons SNS-influenced self-concept clarity (β = 0.596, *SE* = 0.044, $p < .001$), which in turn predicted between-persons SNS-influenced self-esteem (β = 0.899, *SE* = 0.025, $p < .001$). The direct effect between self-affirmative SNS use and between-persons SNS-influenced self-esteem is significant (β = 0.080, *SE* = 0.035, $p = .022$),

indicating a partial mediation. Within-person SNS-influenced self-concept clarity positively predicted within-person SNS-influenced self-esteem (β = 0.621, *SE* = 0.022, $p < .001$). These results provide preliminary support for our hypotheses that self-affirmative SNS use improves one's self-esteem.

Figure 3

Multilevel Latent Variable Path Analysis of SNS-influenced Self-concept Clarity Mediating Between Self-affirmative SNS Use and SNS-influenced Self-esteem (Adjusted Model)



Note. Squares represent observed variables; circles represent latent variables. C1 – C11 and E1 – E10 represent scale items of SNS-influenced self-concept clarity (SCC) and SNS-influenced self-esteem (SE) respectively (see Supplementary Materials for details). Thicker arrows represent regression paths and values on them signify pathway coefficients. Thinner arrows indicate the observed variables (i.e., indicators) that load onto a latent variable and values on them represent factor loadings. Covariates (i.e., age, sex, monthly household income, social comparison orientation and trait self-esteem) and residual variances were excluded from the figure for brevity.

3.3 Discussion

Using multilevel latent variable analyses and controlling for notable covariates, we found that self-concept clarity was not a significant mediator between self-affirmative SNS use and state self-esteem. However, the average within-person effect of self-concept clarity predicting self-esteem was significant and positive, suggesting that on a given day, participants' reports of higher-than-usual (i.e., above a participant's average across the 7 days) self-concept clarity were associated with reports of increased self-esteem. These findings corroborate with existing studies to show that individuals feel better about themselves when they perceive their self-aspects as congruent and consistent (e.g., Campbell, 1990; Stinson et al., 2008; Usborne & Taylor, 2010).

On the other hand, SNS-influenced self-concept clarity significantly mediated the effects of self-affirmative SNS use on SNS-influenced self-esteem. Our findings find support with existing studies which showed that online activities such as SNS can implicate individual's self-concept clarity (e.g., Appel et al., 2018; Liu et al., 2019) and consequently their self-esteem (Campbell, 1990; Vogel et al., 2014). Specifically, our findings are in line with the self-concept unity hypothesis (Valkenburg & Peter, 2011) in demonstrating that guided SNS use can be beneficial in helping one build a firm sense of self. However, the mediation was partial, indicating that there are other unknown factors that explain the positive link between self-affirmative SNS use and SNS-influenced self-esteem. It is plausible that individuals who were instructed to view their own profile experienced other self-related processes such as social feedback processing (Krause et al., 2021) that affected their SNS-influenced self-esteem, but not their SNS-influenced self-concept clarity.

Notably, we had to drop some scale items which are negatively worded while fitting the measurement models for self-esteem and SNS-influenced self-esteem. This decision is in line

with past findings of Rosenberg self-esteem (1965) as a unidimensional construct that is contaminated by a method effect primarily associated with negatively worded items (Corwyn, 2000).

Overall, Study 2's results were congruent with Study 1's results in showing that mediation involving generic measures (i.e., self-concept clarity and self-esteem) was not significant. However, mediation involving measures that tapped specifically into SNS-influenced aspects of self-concept clarity and self-esteem proved to be significant.

4 General discussion

Across two studies, we manipulated individuals' SNS use to elicit self-affirmative effects and examined whether their self-concept clarity and self-esteem improved. We found that self-affirmative SNS use (i.e., viewing one's own Instagram profile) helped individuals to feel more positive about themselves (i.e., self-feeling; Study 1) and positively influenced their self-esteem (Study 2)—the effect is mediated by SNS-influenced self-concept clarity. Although self-affirmative SNS use did not improve individual's general self-concept clarity nor self-esteem, our findings provide preliminary support for our hypotheses and present notable insights and practical implications for this field of study.

First, our study is one of the first to present novel experimental evidence that SNS, specifically Instagram, can elicit naturalistic self-affirmative effects that boost individuals' self-views. These findings extend existing scarce work on self-affirmation in natural settings (e.g., Toma & Hancock, 2013), and corroborate with the self-esteem updating processes postulated by Krause et al. (2021). Past studies have shown that self-defensive mechanisms (e.g., social comparison and self-affirmation) were flexible and substitutable (Tesser, 2001). Our findings provide validating evidence that the positive effects of self-affirmative SNS use are

observable despite exposure to normative social comparison during daily SNS use. Given the consistent findings that SNS use perpetuates upward social comparison and diminishes one's self-esteem (e.g., Krause et al., 2021; Midgley et al., 2020; Vogel et al., 2014), our findings provide new insights into possible self-affirmative intervention methods to curb such effects. Furthermore, our studies suggest that self-affirmative SNS use can be flexibly extended to different SNS platforms (e.g., Facebook, TikTok), as long as their use satisfy the three criteria required for self-affirmation namely (a) representing domains of self that are instrumental to one's self-worth, (b) offering a positive and desirable self-representation and (c) being an accurate representation of the self (Toma & Hancock, 2013).

Second, our findings elucidated the mechanism, at least in part, on how self-affirmative SNS use implicated one's SNS-influenced self-esteem through SNS-influenced self-concept clarity. Specifically, our findings lend support to the self-concept unity hypothesis that online activities provide opportunities for individuals to present positive and honest aspects of themselves and thereby cultivate a firm sense of self within the users (Valkenburg & Peter, 2011). In our study, self-affirmed participants viewed their own positively curated Instagram profiles which reflect important self-aspects with relatively little details (e.g., a photo of a birthday celebration with loved ones). Viewing such content not only affirms the individual of positive aspects of self, but also acted as a procedural prime that activated higher-level construal thinking within the individuals (Cerully, 2011; Wakslak & Trope, 2009). This mode of thinking led one to perceive greater coherence in one's self-aspects (e.g., having a clear picture of oneself, experiencing less conflict between different self-aspects) and engendered a stronger SNS-influenced self-concept clarity. In line with this notion, studies indicated that a higher-level construal mindset strengthens one's self-esteem to be more resilient against negative feedback

(Vess et al., 2011). Accordingly, the stronger SNS-influenced self-concept clarity facilitated individuals to hold a more positive view of themselves that is resilient against external influences, resulting in a stronger SNS-influenced self-esteem (Campbell & Lavallee, 1993).

Notably, our hypothesized mediation effect involving self-affirmative SNS use, self-concept clarity and state self-esteem was not supported. There are three possible reasons for the null finding. First, it is possible that the 5 mins daily self-affirmative SNS use was too subtle to evoke a change in a person's overall self-perception which is complex and longstanding. Although previous studies (e.g., Toma & Hancock, 2013) found that participants who spent 5 mins on their own Facebook profile were less defensive towards negative feedback compared to non-affirmed participants, it was conceivable that one's level of defensiveness towards artificial negative feedback was more malleable and observable compared to naturalistic changes in one's overall self-concept clarity and self-esteem. Second, it is plausible that the items pertaining to one's self-concept clarity and self-esteem were too generic and insensitive to pick up any changes elicited by self-affirmative SNS use. Third, our cross-sectional and even 7-day study may have been too short to witness any observable changes in individuals' self-concept clarity and self-esteem. Therefore, future studies that are interested in self-affirmative effects of SNS use could consider examining the effects over a longer period.

Our study is also limited in a few other aspects. First, our studies restricted users to the use of their real Instagram (i.e., Rinsta) accounts only. Given that there are interesting differences between individuals' use of Rinsta and Finsta (i.e., Fake Instagram) accounts (Kang & Wei, 2020; Taber & Whittaker, 2020), our findings may not extend to one's use of Finsta. For instance, studies have found that Finsta users demonstrated more authentic but negative self-presentation (Taber & Whittaker, 2020), which may not facilitate self-affirmation. Thus,

future studies may wish to explore the type of Instagram account as a moderator of this effect. Second, despite the rigor of the intensive longitudinal study design and multilevel latent variable analyses in testing the mediational effect, they could not establish causality of the mediator-outcome relationships (Berli et al., 2021). Therefore, future studies could employ specific experimental designs to examine the relations between self-concept clarity and self-esteem. Third, our sample consisted of only young adults and therefore the effects may not be generalized to other groups of SNS users such as children or older adults. Furthermore, as there are cultural differences in self-affirmation (Heine & Lehman, 1997) and social comparison (Guimond et al., 2007; White & Lehman, 2005), it would be interesting to examine if our findings are replicable in other Asian or non-Asian cultures.

Despite the limitations of our study and findings that were constrained to SNS-specific contexts (e.g., SNS-influenced self-concept clarity and self-esteem), they still provide practical implications pertaining to our research question. First, our study demonstrated that viewing one's own positively curated Instagram profile can elicit positive thoughts about self. Given that studies have indicated that pre-emptive self-affirmation has stronger protective effects against self-diminishing forces (Critcher et al., 2010), technology application designers could consider making one's own profile the first thing that comes up when one opens an SNS app. This would ensure that prior to being entertained and subconsciously subjected to upward social comparison, individuals would be encouraged to spend time affirming their identities through their own positively curated profiles. Second, our findings echoed the strong link between self-concept clarity and self-esteem. Thus, counsellors who sought to help SNS users with self-esteem issues can be informed that interventions that target changes to their self-concept clarity would be very effective to boost their self-esteem.

In conclusion, individuals' SNS use can be guided to provide beneficial effects to their self-perceptions. Although this study's findings are preliminary, they indicate an enormous potential in the use of SNS for mobile-health purposes. Individuals could possibly leverage familiar SNS apps to improve their daily emotions and mental health wellbeing.

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6 Appendix

Table A1

Zero-order Correlations Between Study 1's Variables

		M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	Self-affirmative SNS use[1]	-	-	-											
2.	Self-concept clarity	2.98	0.67	.08	-										
3.	SNS-influenced self-concept clarity	3.00	1.01	**.41**	.02	-									
4.	State self-esteem	4.51	1.14	.02	**.56**	.07	-								
5.	Self-feeling (T1)[2]	4.22	0.85	**.23**	**.27**	**.45**	**.30**	-							
6.	Self-feeling (T2)[2]	3.77	1.00	.12	**.38**	**.16**	**.70**	**.47**	-						
7.	Age	21.6	1.67	.02	**.16**	**.06**	.08	.04	.04	-					
8.	Sex[3]	1.83	0.38	.06	.02	**-.14**	-.02	-.03	.06	**-.26**	-				
9.	Monthly Household income[4]	4.37	2.38	-.01	.10	.00	.12	.11	.10	**-.20**	-.02	-			
10.	Trait self-esteem	4.24	0.92	-.08	**.55**	.10	**.75**	**.22**	**.51**	.13	-.07	.10	-		
11.	Social comparison orientation (Ability)	3.46	0.67	.00	**-.16**	-.01	**-.23**	-.01	-.14	.08	-.07	-.05	**-.17**	-	
12.	Social comparison orientation (Opinions)	3.83	0.52	-.02	-.08	.04	-.02	-.07	-.08	**-.15**	-.01	-.07	-.01	**.31**	-
13.	Instagram screen time (mins)	62.5	43.5	-.06	-.03	.01	.06	.05	.05	-.13	.11	**.18**	.03	.05	.07

Note. Significant statistics at $p < .05$ level appear in bold.

[1] Self-affirmative condition was coded as 1 = *Control condition*, 2 = *Self-affirmative condition*.

[2] T1 refers to the first assessment of self-feeling prior to the social comparison paradigm. T2 refers to the second assessment of self-feeling right after the social comparison paradigm.

[3] Sex was coded as 1 = *Male*, 2 = *Female*.

[4] 1 = *Less than $2,500*; 2 = *$2,500 – $5,000*; 3 = *$5,000 - $7,999*; 4 = *$7,500 - $9,999*; 5 = *$10,000 - $12,499*; 6 = *$12,500 - $14,999*; 7 = *$15,000 - $17,499*; 8 = *$17,500 - $19,999*; 9 = *More than $20,000*.

Table A2

Model Fit Indices and Reliability Statistics

	χ^2	*df*	RMSEA	CFI	TFI	SRMR Within	SRMR Between	ω_{Within}	$\omega_{Between}$
Self-concept clarity									
4-item	61.26***	4	0.095	0.96	0.87	0.025	0.060	0.593	0.930
Between-level	42.61***	2	0.113	0.97	0.81	0.004	0.058	-	-
Within-level	13.99***	2	0.061	0.99	0.95	0.025	0.003	-	-
SNS-influenced self-concept clarity									
4-item with modifications[1]	32.50***	5	0.059	0.99	0.98	0.018	0.008	0.818	0.987
Between-level	10.65*	3	0.040	1.00	0.99	0.003	0.007	-	-
Within-level	16.94***	2	0.068	1.00	0.97	0.018	0.001	-	-
Self-esteem									
5-item with modifications[1]	639.02***	11	0.189	0.77	0.58	0.114	0.111	0.659	0.952
4-item	17.25**	4	0.045	0.99	0.98	0.024	0.024	0.627	0.923
Between-level	4.78	2	0.029	1.00	0.99	0.002	0.025	-	-
Within-level	10.70**	2	0.052	1.00	0.97	0.024	0.004	-	-
SNS-influenced self-esteem									
5-item	1263.25***	10	.280	.700	.400	.165	.254	.634	.892
3-item[2]	0.00	0	.00	1.00	1.00	.000	.000	.853	.992

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

[1] The residual variance for one item (negative, small and nonsignificant) was constrained to 0. See Table A3 for details on the specific item.

[2] Between- and within-level model fit statistics were omitted because the model was saturated and thus its model fit could not be evaluated.

Table A3

Multilevel Confirmatory Factor Analysis (MCFA) Parameters

	Within-person		Between-persons		
Parameter	**Unstandardized (*SE*)**	**Standardized**	**Unstandardized (*SE*)**	**Standardized**	**ICC**
Factor loadings					
Self-concept clarity (4-item)					
Item 1	0.596 (0.03)	0.660	1.215 (0.06)	0.983	0.652
Item 4	0.529 (0.03)	0.542	1.019 (0.06)	0.904	0.573
Item 8	0.499 (0.03)	0.568	1.196 (0.06)	0.953	0.671
Item 11	0.241 (0.03)	0.270	0.487 (0.07)	0.497	0.549
SNS-influenced self-concept clarity					
Item 1	0.703 (0.02)	0.805	1.304 (0.06)	0.995	0.693
Item 4	0.616 (0.02)	0.678	1.284 (0.07)	0.964	0.682
Item 8	0.632 (0.02)	0.683	1.237 (0.07)	0.940	0.669
Item 11[1]	0.673 (0.02)	0.745	1.294 (0.06)	1.000	0.672
Self-esteem (5-item)					
Item 1	0.734 (0.03)	0.764	0.847 (0.06)	0.856	0.551
Item 2[1]	0.369 (0.03)	0.383	1.246 (0.06)	1.000	0.617
Item 5	0.376 (0.04)	0.313	0.427 (0.06)	0.518	0.345
Item 9	0.385 (0.03)	0.406	1.249 (0.06)	0.990	0.632
Item 10	0.743 (0.03)	0.812	0.789 (0.06)	0.847	0.543

Self-esteem (4-item)					
Item 1	0.692 (0.03)	0.737	1.033 (0.06)	0.991	0.551
Item 5	0.350 (0.04)	0.294	0.605 (0.06)	0.703	0.345
Item 9	0.354 (0.03)	0.370	0.991 (0.07)	0.794	0.543
Item 10	0.746 (0.03)	0.833	0.934 (0.05)	0.955	0.631
SNS-influenced self-esteem (5-item)					
Item 1	0.771 (0.02)	0.853	1.315 (0.07)	0.999	0.679
Item 2	-0.012 (0.03) *n.s.*	-0.013 *n.s.*	0.089 (0.07) *n.s.*	0.089 *n.s.*	0.538
Item 5	0.593 (0.02)	0.653	1.320 (0.07)	0.974	0.690
Item 9	-0.029 (0.03) *n.s.*	-0.032 *n.s.*	0.066 (0.07) *n.s.*	0.068 *n.s.*	0.537
Item 10	0.782 (0.02)	0.861	1.316 (0.07)	0.993	0.680
SNS-influenced self-esteem (3-item)					
Item 1	0.771 (0.02)	0.852	1.315 (0.07)	0.999	0.679
Item 5	0.592 (0.02)	0.652	1.329 (0.07)	0.974	0.690
Item 10	0.784 (0.02)	0.862	1.314 (0.07)	0.993	0.680

Note. All loadings are significant at $p < .001$ level, unless indicated otherwise (*n.s.*). Item numberings are adapted from the respective original scales, see supplementary materials for more details.

[1] The scale item's residual variance (negative, small and nonsignificant) at the between-level was constrained to 0.

Table A4

Zero-order Correlations Between Study 2's Variables

Level 2 (Between-level)	SNS-influenced self-concept clarity		SNS-influenced state self-esteem	
	r	*SE*	*r*	*SE*
Self-affirmative SNS use[1]	**.60**	**.04**	**.60**	**.04**
Covariates				
Age	.03	.04	.03	.05
Sex[2]	-.08	.04	-.09	.05
Monthly household income[3]	-.01	.04	.01	.05
Social comparison (Ability)	-.04	.04	-.09	.05
Social comparison (Opinion)	-.04	.04	-.04	.05
Trait self-esteem	-.06	.04	.08	.05
Level 1 (Within-level)				
Covariate				
Instagram screen time	.04	.04	-.01	.04

Note. Significant statistics at $p < .05$ level appear in bold.

[1] Self-affirmative condition was coded as 1 = *Control condition*, 2 = *Self-affirmative condition*.

[2] Sex was coded as 1 = *Male*, 2 = *Female*.

[3] 1 = *Less than $2,500*; 2 = *$2,500 – $5,000*; 3 = *$5,000 - $7,999*; 4 = *$7,500 - $9,999*; 5 = *$10,000 - $12,499*; 6 = *$12,500 - $14,999*; 7 = *$15,000 - $17,499*; 8 = *$17,500 - $19,999*; 9 = *More than $20,000*.

7 Supplementary Materials

7.1 Detailed procedure for Study 1

For the *self-affirmation condition,* participants read the following instructions (underlined words are different from control condition):

> *The evaluation is about your experience on your own profile on Instagram. If you have multiple Instagram accounts, please use the account that you most frequently use for personal updates to most of your friends (i.e., not spam account, not Finsta, not professional accounts). You can view any element of your own Instagram profile (e.g., your posts, tagged posts, highlights). Please only stay on your own profile and do not navigate to your feed or friends' profiles. Please view the content carefully as you would be asked questions about the content you have viewed. You would be able to see the questions pertaining to the profile you have just viewed after 5 mins have passed. Please view your profile now.*

Participants in the control condition were told the following:

> *The evaluation is about the use of Instagram for information sharing purposes. Please navigate to this profile @**abstract.mag**. You can view any element of this profile (e.g., the posts, tagged posts, highlights). Please only stay on this profile on Instagram and not navigate to your own profile or friends' profiles. Please view the content carefully as you would be asked questions about the content you have viewed. You would be able to see the questions pertaining to the profile you have just viewed after 5 mins have passed. Please view the profile now.*

7.2 Upward social comparison paradigm

7.2.1 Pretest for stimuli

To pretest the content used for upward social comparison, 30 individuals rated whether specific Instagram posts were negative or positive on a 7-point scale (0 = *Negative*; 7 = *Positive*). We selected the posts that were rated, on average, above the scale's midpoint (i.e., 4). In line with previous studies (Midgley et al., 2020), the positive Instagram content described either a personal achievement or a pleasant outcome (i.e., getting a good internship/job or positive relationship experiences), and the negative post described a personal negative experience (i.e., a lay-off or break-up).

7.2.1.1 Social comparison questions

Participants viewed four positive posts in total. After viewing each of the post, participants were first asked "When you were reading this post, to what extent did you compare yourself to another person (either the person who posted it, or someone else)?" (1 = *Not at all*, 7 = *Completely*). For participants who indicated making a comparison (i.e., answering 2 or higher on the previous questions), they were asked "Which domain does this comparison fall under?" (*looks/attractiveness, health/physical fitness, lifestyle/leisure activities/vacations, popularity/social life, personality/morality, skills/abilities, academics/career, wealth/possessions, dating/romantic relationships, family, others*). Lastly, participants were asked "In this domain, to what extent is this person doing better- or worse-off than you?" (-3 = *Much worse off than me, 0 = About the same as me,* +3 = *Much better off than me*).

7.3 SNS-influenced scale items

7.3.1 Manipulation check items for self-affirmation

Self-affirmation	**Control (adapted from Toma & Hancock, 2013)**
The contents on my Instagram profile represented **different aspects of myself that are important to me.**	The contents in the profile made me think about **different aspects of myself that are important to me.**
The contents on my Instagram profile made me think about **positive aspects of myself.**	The contents in the profile made me think about **positive aspects of myself.**
The contents on my Instagram profile **is an accurate representation of myself.**	The contents in the profile made me think **whether my Instagram posts are an accurate representation of myself.**
The contents on my Instagram profile **made me feel good about myself.**	The contents in the profile **made me feel good about myself.**

7.3.2 SNS-influenced self-concept clarity scale

Item no. (in original scale)	**Self-affirmation**	**Control**	**Original scale (Campbell et al., 1996)**
Item 1	The contents on my Instagram profile helped me **to consider various aspects of myself in a coherent way.**	The contents in the profile helped me **to consider various aspects of myself in a coherent way.**	My beliefs about myself often conflict with one another. (reversed)
Item 4	The contents on my Instagram profile **made me consider how I am the person that I appear to be**.	The contents in the profile **made me consider how I am the person that I appear to be.**	Sometimes, I feel that I am not really the person that I appear to be. (reversed)
Item 8	The contents on my Instagram profile **made me consider how various aspects of myself have been consistent over time.**	The contents in the profile **made me consider how various aspects of myself have been consistent over time.**	My beliefs about myself seems to change very frequently. (reversed)
Item 11	The contents on my Instagram profile helped me gained **a clearer picture of myself as a person.**	The contents in the profile helped me gained **a clearer picture of myself as a person.**	In general, I have a clear sense of who I am and what I am.

7.3.3 SNS-influenced self-esteem scale

Item no. (in original scale)	**Self-affirmation**	**Control**	**Original short-form scale (Monteiro et al., 2021)**
Item 1	The contents on my Instagram profile helped me to feel **satisfied with myself.**	The contents in the profile helped me to feel **satisfied with myself.**	On the whole, I am satisfied with myself.
Item 2	The contents on my Instagram profile made me **think that I am no good at all. (reverse)**	The contents in the profile made me **think that I am no good at all. (reverse)**	At times, I think I am no good at all.
Item 5	The contents on my Instagram profile **helped me to feel that I have much to be proud of.**	The contents in the profile **helped me to feel that I have much to be proud of.**	I feel I do not have much to be proud of.
Item 9	The contents on my Instagram profile made me **inclined to think that I am a failure. (reverse)**	The contents in the profile made me **inclined to think that I am a failure. (reverse)**	All in all, I am inclined to think that I am a failure.
Item 10	The contents on my Instagram profile **helped me to take a positive attitude towards myself.**	The contents in the profile **helped me to take a positive attitude towards myself.**	I take a positive attitude toward myself.

7.4 Scale items for personality traits (covariates)

7.4.1 Social comparison orientation

Scale taken from Gibbons and Buunk (1999)

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with other of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with other people. To do that, we would like to ask you to indicate how much you agree with each statement below, by using the following scale. (1 = I disagree strongly; 5 = I agree strongly.)

1. I often compare how my loved ones (boy or girlfriends, family members, etc.) are doing with how others are doing.
2. I always pay a lot of attention to how I do things compared with how others do things.
3. If I want to find out how well I have done something, I compared with how others do things.
4. I often compare how I am doing socially (e.g., social skills, popularity) with other people.
5. (reversed) I am not the type of person who compares often with others.
6. I often compare myself with others with respect to what I have accomplished in life.
7. I often like to talk with others about mutual opinions and experiences.
8. I often try to find out what others think who face similar problems as I face.
9. I always like to know what others in a similar situation would do.
10. If I want to learn about something, I try to find out what others think about it.
11. (reversed) I *never* considered my situation in life relative to that of other people

*Item 1 – 6 (Ability); Item 7 – 11 (Opinions)

7.4.2 Trait self-esteem

Scale taken from Rosenberg (1965)

Below is a list of statements dealing with your general feelings about yourself. Please indicate the extent you agree or disagree with each statement. (1 = strongly disagree, 7 = strongly agree)

1. On the whole, I am satisfied with myself.
2. At times, I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude toward myself.