7-19-2022

Selfies and the Self: The Influence of Instagram Posting on Self and Cognition

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B.S. Psychology, University of California, San Diego, 2018

A Thesis submitted to The Graduate School at the University of Missouri- St. Louis

in partial fulfillment of the requirements for the degree

Master of Arts in Psychology

with an emphasis in Behavioral Neuroscience

August, 2022

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Abstract

Research on Social Networking Sites (SNS) has shown a variety of both beneficial and detrimental psychological and cognitive outcomes associated with high frequency usage. We conducted an online study consisting of a series of questionnaires and a working memory task to explore the relationship between Instagram use intensity and cognition. The present study first investigated the relationship between Instagram (IG) use intensity, rumination, and cognitive failures. We randomly assigned participants into a selfie-posting, selfie-sending, or likes/comments reporting condition to determine whether selfie-posting behavior affects working memory performance. While we did not find significant associations between IG use intensity, rumination, and cognitive failures, we conducted a series of ANCOVAs to assess working memory task performance and found a trend-level significant effect of experimental condition on one measure of accuracy (d'), showing an improved performance for the IG Post condition in comparison to Selfie and Report condition. No significant differences were found on reaction time for correct responses. Instagram use intensity was included in a moderation analysis, yielding a significant interaction showing faster reaction times for those in the Selfie condition and marginally faster times for the Report condition in comparison to IG Post condition at higher levels of IG use intensity. Rumination was also included in a moderation analysis, yielding a significant interaction demonstrating faster reaction times for those in the Report condition compared to IG Post condition at higher levels of rumination. These findings are discussed in the context of previous research and experimental limitations encountered in online recruitment.

Selfies and the Self: The Influence of Instagram Posting on Self and Cognition

The arrival of social networking sites (SNS) in the 21st century has had a significant impact on our social worlds. As SNS made their way from home computers to mobile phones, we have become more constantly connected to our social networks than ever before. SNS users worldwide have climbed to 3.6 billion people in 2020, with an average of 144 minutes a day spent on social media (Tankovska, 2021). As usage trended upwards during the COVID-19 pandemic (Fischer, 2020; Molla, 2021) and social media companies look to expand, including to kids (Heilweil, 2021), SNS usage and its effects on mental health outcomes has received renewed interest. While previous studies have investigated how SNS usage affects emotion (for a review, see Yoon et al., 2019), the current study aims to investigate the cognitive and psychological effects of SNS usage.

Researchers have approached SNS usage from several disciplines and have found varying results and effect sizes. While some researchers have found evidence for positive influences on social connectedness, social capital, and self-esteem related to specific types of SNS use (Burke et al., 2010; Gonzales & Hancock, 2011; Krause et al., 2021; Valkenburg & Peter, 2009), others have found an overall negative effect of SNS usage. For example, SNS usage has been associated with increased levels of depression (Frost & Rickwood, 2017; Hussain & Griffiths, 2018; Yoon et al., 2019), and decreased well-being (Kross et al., 2013; Shakya & Christakis, 2017). However, other studies have found either no significant association between SNS use and mental health outcomes (Berryman et al., 2018; Coyne et al. 2020) or mixed results (Seabrook et al., 2016). The heterogeneity of results suggests that a more targeted approach to SNS research is necessary in order to gain a better understanding of how and why SNS usage has diverse consequences for a range of people. One suggestion offered to address the variability of results is

a deeper exploration of SNS usage than the traditional "time spent" measure used most often across SNS research. In the present study, we used a modified version of the Multidimensional Facebook Intensity Scale (Orosz et al. 2016) to assess the extent to which individuals have incorporated Instagram into their daily lives. The Multidimensional Facebook Intensity Scale (MFIS) takes into consideration the strength of emotional bond between Facebook and the user, motivation for use, tendency for excessive use and self-expression on Facebook. This measure, modified for Instagram for its primarily visual nature and likelihood to invite self-evaluative processes, will provide additional contextual information related to SNS usage by addressing different emotional and motivational aspects of SNS usage.

Literature Review

Self-Evaluative Processing

One pattern that seems to remain consistent throughout the SNS literature is the influence of self-evaluative processes on negative SNS outcomes. For example, appearance-related dissatisfaction (Frost & Rickwood, 2017; Mills et al., 2018), self-objectification (Salomon & Brown, 2020), reduced self-esteem (Vogel et al., 2015), reduced subjective well-being (Verduyn et al., 2020), and increased depressive symptoms (Steers et al., 2014) via social comparison have frequently been associated with SNS use. These findings of self-evaluation contributing to negative SNS usage outcomes are supported by theories of self in social psychology. Specifically, according to Objective Self-Awareness Theory (Duval & Wicklund, 1972) when the self becomes the object of attention, the ensuing self-evaluation can emphasize inconsistencies between self and an idealized standard they hold themselves to, which may lead to experienced negative affect. This conflict in the face of mirror-induced objective self-awareness was theorized to serve as motivation and boost performance on a simple passage

copying task (Wicklund & Duval, 1971). However, this same paradigm produced the opposite effect when participants were informed the task may be representative of IQ (Liebling & Shaver, 1973), a protocol that replicated a detrimental effect of inducing objective self-awareness on a Stroop task as well (Geller & Shaver, 1975). The authors suggested that enhancing self-awareness may not serve as a motivational boost under high evaluative conditions. Objective Self-Awareness Theory differentiates from another self-related processing concept, self-objectification, in that the latter highlights the sociocultural context in which women's bodies exist and how individuals sometimes internalize the view that they are merely an object to be evaluated by others (Frederickson & Roberts, 1997; Salomon & Brown, 2020).

Self-Discrepancy Theory (Higgins, 1987) further elaborates on self-evaluative processes by emphasizing the psychological discomfort that can arise from a perceived mismatch between three levels of self: the actual self (who I am), the ideal self (who I want to be), and the ought self (who I think I should be). While Higgins' (1987) initial assertion that ideal and ought discrepancies differentially produce dejection and agitation, respectively, has been challenged, these discrepancies being made salient nevertheless have been shown to predict negative emotion (Phillips & Silvia, 2005). While Objective Self-Awareness and Self-Discrepancy theories diverge from one another in emphasizing motivational consequences versus specific affective outcomes, they both underscore an increase in negative affect when self-awareness is manipulated as a result of self-evaluation. Consistent with these theories, the consequences of maladaptive self-evaluation are often amplified in an online social environment. SNS users are constantly subjected to highly curated, idealized self-presentations from other users, with increased pressure to present their best selves (Appel et al., 2016; Reinecke & Trepte, 2014; Rosenberg & Egbert, 2011). For example, in a selfie-posting condition, Shin et al. (2017)

showed that individuals become more sensitive to social cues than those who did not post a selfie, which the authors attributed to social comparison. However, it is also possible that posting a picture of the actual self onto a medium that pressures users to present the ideal self could result in increased psychological discomfort and negative self-evaluation. Instagram, a mobile application where users post photos or videos and comment or "like" others' posts (Lee et al., 2015), may be particularly susceptible to these kind of self-presentation pressures due to its primarily visual nature. With this pressure underlying Instagram usage in mind, the current study examined whether high intensity Instagram users showed a tendency toward increased negative self-evaluation after posting a picture of their "actual self" to Instagram.

Negative Self-Evaluation and Cognition on SNS Platforms

Although few studies have examined the cognitive repercussions of SNS usage, some studies have explored the links between smartphone usage and cognitive functioning (Wilmer et al., 2017). A review on the topic by Wilmer and colleagues (2017) investigated the influence of smartphone usage across four cognitive domains: attention, memory, delayed gratification and everyday cognitive functioning. Particularly of relevance to the current study were the findings that frequent media multitaskers had more difficulty in a task-switching paradigm (Monsell, 2003), exhibited diminished long-term memory functioning (Uncapher et al., 2015), and showed poorer working memory performance on the n-back task (Cain et al., 2016). While emphasizing that overall empirical research on the matter is limited and inconclusive, Wilmer et al. (2017) also suggested that when using smartphones, we "generally learn and remember less from our experiences" (p. 9) and that habituating to immediate gratification could have long-term cognitive repercussions.

Only a few prior studies have examined the cognitive effects of SNS usage. Two correlational studies found a working memory benefit related to specific Facebook behaviors, like checking friends' updates (Alloway & Alloway, 2012; Alloway et al., 2013). Although Alloway and Alloway (2012) and Alloway et al. (2013) took different types of SNS behavior into consideration, there were some limitations. Specifically, these studies measured SNS usage by how long participants had been using the SNS, which may not be as effective as the measure we used in the present study, the MFIS. For example, someone who has been on Facebook for 1 year may have higher use intensity than someone who has been on it for 5 years. In addition, these studies examined SNS usage with Facebook and did not experimentally manipulate selfie posting on SNS, which may be more likely to generate negative cognitions and psychological distress. Another previous study also found a working memory benefit as a function of Facebook use in a sample of healthy older adults, aged 75-86 (Myhre et al., 2017). However, the study was an experimental manipulation in a sample of older adults who had never used Facebook before, as opposed to the current study, which investigates a younger population that is currently on Instagram with varying levels of usage intensity. While these studies suggest that there may be cognitive repercussions to SNS usage in Facebook, Instagram in particular is a topic in the literature where further research is needed. Moreover, it is unclear whether the maladaptive self-perceptions after posting a selfie may also contribute to the cognitive effects of SNS usage. Specifically, we are interested in investigating the interaction between self-focused cognition and working memory performance following selfie-posting on Instagram. If objective self-awareness is triggered by posting a selfie, the subsequent self-discrepancy between actual and online ideal self could create the high evaluative conditions where self-awareness ends up having a negative

influence on performance (Geller & Shaver, 1975; Liebling & Shaver, 1973). If these conditions trigger negative self-focused thought could this interfere with working memory?

Rumination

Prior SNS research indicates that trait levels of negative self-evaluation, specifically rumination, may contribute to the relationship between the use of SNS and poor mental health. Rumination, defined as the repetitive and passive attentional focus on symptoms of distress (Nolen-Hoeksema & Morrow, 1991), has been shown to mediate the relationship between problematic Facebook use and social anxiety (Dempsey et al., 2019), to mediate the effects of status updates on subjective well-being (Locatelli et al., 2012), and has been implicated as a mechanism for negative mental health outcomes related to Facebook (Feinstein et al., 2013). Given that rumination has also been shown to interfere with working memory (De Lissnyder et al., 2012; Joormann et al., 2011), we sought to determine whether rumination could moderate the interaction between experimental condition and cognitive performance.

Aims and Hypotheses

Aim 1: To investigate the effect of Instagram usage on self-focused cognition.

Hypothesis 1.1: Instagram use intensity will be positively related to rumination.

Hypothesis *1.2*: Instagram use intensity will be positively related to cognitive failures.

Aim 2: To investigate the influence of Instagram use intensity and selfie-posting on working memory performance.

Hypothesis 2.1: Selfie-posting condition will be associated with poorer working memory task outcomes (accuracy, reaction time).

Hypothesis 2.2: Selfie-posting condition will be negatively associated with poorer working memory task outcomes and will be moderated by Instagram use intensity, such that higher use intensity will result in poorer working memory outcomes.

Aim 3: To investigate the possible role rumination plays on the relationship between posting condition and working memory performance.

Hypothesis 3.1: The relationship between selfie-posting condition and working memory performance will be moderated by ruminative response style, such that higher rumination will result in poorer working memory outcomes.

Method

Participants

Based on an a priori power analysis in G*Power 3.1 with 80% power and a medium effect size (f = .25), approximately 100 adults (age 18 and older) with Instagram profiles and with no history of neurological (e.g. epilepsy) disorders were invited to participate. Recruitment took place via UMSL's SONA system (n = 58), Amazon's Mechanical Turk (n = 11), and Facebook advertising (n = 33). Participants were compensated for their participation in this study with course extra credit or an Amazon e-gift card. Participants provided written informed consent in accordance with the University of Missouri-St. Louis Institutional Review Board.

Our sample (N = 102) was comprised of 75 female, 21 male, 2 trans male, 3 non-binary, and 1 undisclosed participant, with an average age of 29.83 years (SD = 9.07). In order to facilitate the ease of interpretability in our analyses and to increase statistical power, we coded trans male and non-binary participants as "Other". Participants were asked to self-report education from a selection of categories, with 76.5% reporting having completed or attended some form of post-secondary education (Some College No Degree, Trade school, Associates,

Bachelors), and 13.7% having completed graduate level training (Masters, Professional Degrees). The rest of our sample consisted of 8.8% with a high school diploma, and 1% without a high school diploma. Lastly, our sample self-reported their race and identified as 63.7% White, 12.7% Asian, 13.7% Black, 4.9% Latino, 1% Native, and 3.9% multi-racial.

Data from 35 participants used in Aim 1 were unusable for Aims 2 and 3 due to missing working memory task data for a final sample of (N = 66, M = 29.18, SD = 8.88) that consisted of 47 female, 15 male, 2 non-binary, 1 Trans Male, and 1 undisclosed participant in the IG Post condition (n = 15), Selfie condition (n = 24), and Report condition (n = 27). Two participants were excluded for having too few working memory trials, and duplicated working memory trials.

Procedure

Participants were randomly assigned to 1 of 3 conditions: 1) take a selfie and post it on their Instagram profile (IG post condition), 2) take a selfie and send it to a lab profile to verify compliance (Selfie condition), and 3) look back through their last 5 posts to report the number of comments and likes (Report condition). Immediately after the experimental manipulation, participants completed a 1-back working memory task (described below) and proceeded to a series of questionnaires. The purpose of the IG post condition was to test the effect of selfie-posting online, while the Selfie condition was meant to compare the effect of selfie-taking itself, without the online posting component. The Report condition was intended as a simple SNS usage control, to account for any self-evaluative effects that may arise from merely using Instagram.

Measures

Multidimensional Facebook Intensity Scale (modified)

The Multidimensional Facebook Intensity Scale (Orosz et al., 2015) is a 13-item scale (α = .90) meant to assess Facebook intensity, defined as the level of involvement in Facebook use and the "magnitude of the integration of Facebook" (p. 96) in everyday life. In order to examine Instagram use for this study, "Facebook" was replaced with "Instagram" throughout the scale. Items include statements such as "I feel bad if I don't check my Instagram daily", "I spend more time on Instagram than I would like to" and "I like refining my Instagram profile". Participants responded on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). As in Phu and Gow (2019), a total score was calculated to establish a user's Instagram intensity.

Ruminative Responses Scale

The Ruminative Responses Scale (RRS; Treynor et al., 2003) is a 22-item scale (α = .93) that measures a participant's tendency to ruminate. Participants rate the frequency of each item on a 4-point scale ranging from 1 (*almost never*) to 4 (*almost always*) on items such as "Think about how alone you feel" and "Analyze recent events to try to understand why you are depressed". The total Ruminative Responses Scale score corresponds to the sum of all responses.

Cognitive Failures Questionnaire

The Cognitive Failures Questionnaire (Broadbent et al., 1982) is a 25-item self-report questionnaire (α = .95) that measures frequency of failures in perception, memory, and motor function. Participants were asked to rate how often each item has occurred within the previous 6 months on a 5-point scale ranging from 4 (*Very often*) to 0 (*Never*). Some example items include: "Do you read something and find you haven't been thinking about it and must read it again?", "Do you fail to listen to people's names when you are meeting them?", and "Do you bump into people?". The total Cognitive Failures Questionnaire score corresponds to the sum of all responses.

1-back Working Memory Task

On each trial, participants were presented one letter (X, D, R, T, M, N, P, L, C, V, Z, H, J, or K) on a black background. They were instructed to pay attention to the letter "X", known as the target letter. If the letter "X" appears on the screen and was the same letter present in the previous trial (where each letter is a considered a trial), participants were asked to press the letter "Y" for "yes" on the keyboard. If the letter on the screen is (1) not an "X" and/or (2) not the same letter ("X") one trial back, they were asked to press the letter "N" for "no" on the keyboard. Participants first completed the practice 1-back task (20 items) to ensure they understood the task, and then completed the full task (140 trials).

Statistical Analyses

Our first aim exploring the relationship between Instagram use intensity and cognition was addressed using linear regression with Instagram use intensity as the independent variable and the Cognitive Failures Questionnaire as the dependent variable. We hypothesized that there would be a significant association between Instagram use intensity and the Cognitive Failures Questionnaire. We also used linear regression to address Hypothesis 1.2 that Instagram use intensity would be associated with the Ruminative Responses Scale.

Our second aim investigating the effect of experimental condition on working memory outcomes was addressed using multiple linear regression analyses. Two analyses were run using experimental condition as the independent variable, accuracy (d') as the outcome variable in the first model, and reaction time for correct responses as the outcome variable in the second model. We hypothesized that experimental condition, specifically Instagram posting condition, would be associated with poorer working memory task outcomes, defined as lower accuracy scores and longer reaction times for correct responses. Two moderation analyses were completed to

determine whether Instagram use intensity moderated the relationship between experimental condition and working memory task outcomes. Both analyses used experimental condition as the independent variable and Instagram use intensity scores as the moderator, while the first model used accuracy (d') as the outcome variable and the second used reaction time for correct responses as the outcome variable. Experimental condition is a categorical variable that was dummy coded, using the IG Post condition as the reference category. We hypothesized that Instagram use intensity would moderate the negative relationship between Instagram-posting condition and poorer working memory outcomes, such that higher Instagram use intensity would result in poorer working memory task outcomes.

Our third aim to investigate the possible role rumination plays on the relationship between posting condition and poorer working memory outcomes was also addressed using two moderation analyses. In both analyses, experimental condition was used as the independent variable and Ruminative Responses Scale scores as the moderator. Accuracy (d') was used as the outcome variable in the first moderation analysis, and reaction time for correct responses was used as the outcome variable in the second analysis. We hypothesized that rumination would moderate the relationship between selfie-posting condition such that higher rumination scores would result in poorer working memory task outcomes. Moderation analyses in Aim 2 and Aim 3 were completed in IBM SPSS Statistics (Version 28) using the macro PROCESS (Andrew F. Hayes, Ohio State University, Columbus, OH).

Results

Aim 1

Before investigating whether Instagram use intensity was positively related to rumination and cognitive failures, we first examined the contribution of demographic factors including

gender, education, and age. For rumination, we found significant differences in Ruminative Response Scale scores for gender ($F(2,98)= 4.89$, $p = .009$, $\eta^2 = .091$) with higher scores for female ($M = 51.24$, $SD = 14.25$) than male ($M = 40.86$, $SD = 11.78$), or participants identifying with another gender ($M = 45.6$, $SD = 10.74$). We also found significant differences in education ($F(7,94)= 2.07$, $p = .05$, $\eta^2 = .13$), as well as a significant correlation between rumination and age ($r = -.25$, $p = .011$). When controlling for gender, education, and age, we found that Instagram use was not associated with rumination ($\beta = 0.41$, $p = .684$).

We then moved on to test whether Instagram intensity was associated with the Cognitive Failures Questionnaire (CFQ). We found a significant difference in CFQ scores for gender ($F(2,98)= 5.67$, $p = .005$, $\eta^2 = .104$), with higher scores for participants identifying as other ($M = 50.8$, $SD = 21.78$) in comparison to female ($M = 47.87$, $SD = 17.2$) and male participants ($M = 34.19$, $SD = 3.16$). We also found a significant effect of education ($F(7,94)= 3.39$, $p = .003$, $\eta^2 = .201$) on CFQ scores. There was no significant correlation between CFQ scores and age ($r = -0.17$, $p = .083$). Accounting for gender and education, Instagram intensity was not significantly associated with the CFQ ($\beta = .006$, $p = 0.952$). Altogether, neither Hypothesis 1.1 nor 1.2 under Aim 1 regarding significant associations between Instagram use intensity, rumination and cognitive failures were supported.

Aim 2

We found significant differences in gender per experimental condition ($\chi^2(4) = 14.57$, $p = .006$) and included it as a covariate in further analyses. The IG post condition was comprised of 14 female, 1 male, and 0 participants identifying as another gender. The Selfie condition consisted of 20 female, 2 male, and 2 participants identifying as another gender. The Report condition was comprised of 13 female, 12 male, and 1 participant identifying as another gender.

We found no significant effect of education ($\chi^2(10) = 6.94$, $p = .731$) or age ($F(2,63) = 2.38$, $p = .10$, $\eta^2 = .07$). Working memory task outcomes were defined as reaction time for correct responses as well as the measure of accuracy, d' (Z(Hit Rate) – Z(False Alarm Rate)). There was a trend-level difference between IG post ($M = 2.72$, $SE = 0.36$), Selfie ($M = 1.80$, $SE = 0.23$) and Report ($M = 1.60$, $SE = 0.25$) conditions in accuracy (d') on the working memory task ($F(2, 57) = 4.67$, $p = .052$, $\eta_p^2 = 0.57$). Post hoc pairwise comparisons indicated a statistically significant mean difference between IG Post condition and Selfie condition ($p = .036$) as well as between IG Post condition and Report condition ($p = .013$) demonstrating that participants in the IG Post condition performed better on working memory task accuracy than the Selfie and Report conditions. We did not find a significant effect of IG post ($M = 0.54$, $SE = .034$), Selfie ($M = 0.46$, $SE = .023$), and Report ($M = 0.45$, $SE = .024$) conditions on reaction time for correct responses ($F(2, 57) = 1.63$, $p = .289$, $\eta_p^2 = .404$). These results, while trending significant, do not support Hypothesis 2.1 asserting a detrimental effect of selfie-posting on working memory outcomes.

To address Hypothesis 2.2, two moderation analyses were conducted to determine whether Instagram intensity moderated the relationship between experimental condition and working memory performance. The first moderation analysis was run with d' as the dependent variable, experimental condition as the independent variable and Instagram intensity as the moderator, and the results were not significant ($F(6, 58) = 1.59$, $p = .165$, $R^2 = .142$), suggesting that Instagram intensity did not moderate the relationship between experimental condition and working memory accuracy. Interaction effects between Instagram intensity and our dummy coded experimental condition variables were non-significant (p values > .10). The second moderation analysis was run with the reaction time for correct responses as our dependent

variable, experimental condition as our independent variable, and Instagram intensity as the moderator. The results revealed that Instagram intensity did moderate the relationship between experimental condition and reaction time ($F(6, 58) = 2.94$, $p = .014$, $R^2 = .23$). The interaction term for Instagram intensity*Selfie condition was statistically significant ($t(58) = -2.49$, $p = .016$). As shown in Figure 1, simple slopes reveal that participants in the Selfie condition had significantly faster reaction times than IG Post condition ($b = -.093$, $t(58) = -2.87$, $p = .006$) at 1 *SD* above the mean of Instagram intensity. There was a trend-level statistically significant difference between IG post condition and Report condition showing that participants in the IG Post condition had slower reaction times for correct responses than those in the Report condition ($b = -.061$, $t(58) = -1.95$, $p = .057$) at 1 *SD* above the mean of Instagram intensity. There were no statistically significant differences between experimental conditions at 1 *SD* below or at the mean of Instagram intensity scores (p values > .10). This moderation analysis demonstrates partial support for Hypothesis 2.2, the interaction between Instagram use intensity and Selfie condition was significant, Instagram use intensity was a negative moderator on the relationship between experimental condition and reaction time for correct responses. At higher levels of Instagram use intensity, the Selfie condition was significantly faster than the IG Post condition, while the Report condition was marginally faster.

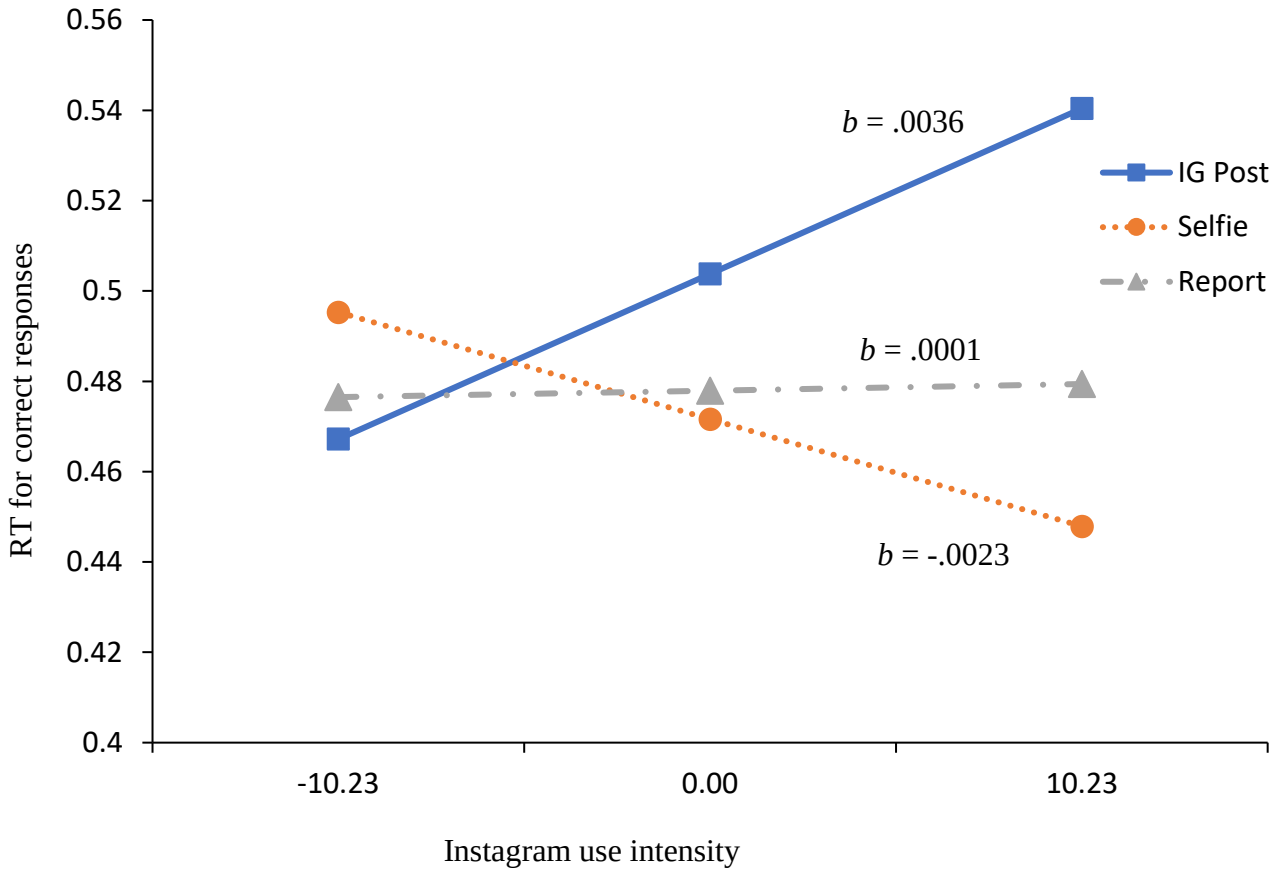
Aim 3

To determine whether rumination moderated the relationship between experimental condition and working memory performance, we conducted two moderation analyses. In the first moderation analysis, d' was the dependent variable, experimental condition was the independent variable and RRS score was the moderator variable. The model was not significant ($F(6, 58) =$

1.88, p = .10, R^2 = .16). Interaction effects between RRS scores and our dummy coded experimental condition variables were also not significant (p values > .10)

Figure 1

Instagram Intensity Modifying Reaction Time for Correct Responses



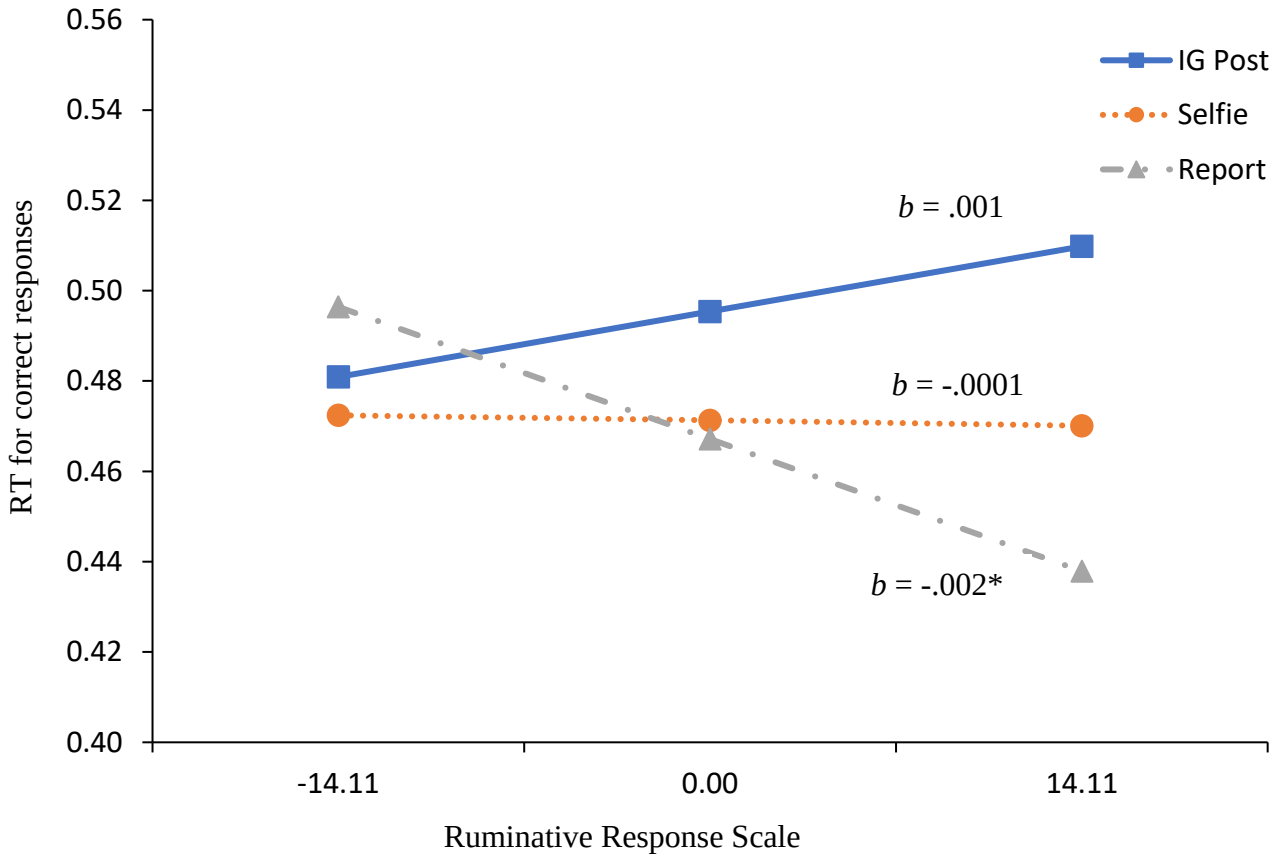
Note. At higher levels of Instagram use intensity, the IG Post condition was significantly slower than the Selfie condition (p = .006). The IG Post condition was marginally slower than the Report condition (p = .057).

Our second moderation for this aim used reaction time for correct responses as the dependent variable, experimental condition as the independent variable, and RRS score as the moderator. The model was significant (F(6, 58) = 2.70, p = .022, R^2 = .22). The interaction term for RRS*Report condition was statistically significant (t(58) = -2.05, p = .044). As shown in

Figure 2, simple slopes reveal that at 1 *SD* above the mean of RRS scores, participants in the Report condition were significantly faster than IG Post condition (b = -.072, $t(58)$ = -2.37, p = .021). Participants in the IG Post condition who have higher levels of rumination had slower reaction times to correct responses. There was no statistically significant difference between IG Post condition and Selfie condition (p = .14) at 1 *SD* above the mean of RRS scores. There were no statistically significant differences between experimental conditions at 1 *SD* below or at the mean of RRS scores (p values > .10).

Figure 2

Rumination Modifying Reaction Time for Correct Responses



Note. At higher levels of Rumination, the IG Post condition was significantly slower than the Report condition (p = .021).
* p < .05

The moderation analysis using reaction time for correct responses as our dependent variable and rumination as the moderator offers partial support for Hypothesis 3.1. The interaction between rumination and Report condition was statistically significant. At higher levels of rumination, participants in the Report condition were significantly faster than those in the IG Post condition.

Discussion

While we neither found statistically significant associations between Instagram use intensity, cognitive failures, and rumination, nor a statistically significant influence of experimental condition on reaction time for accurate responses, we did find a trend-level difference between experimental conditions for accuracy on the working memory task. Specifically, we found that those in the IG post condition scored higher on the accuracy measure (d') than the other two conditions. When we ran moderation analyses with reaction time as the outcome variable and Instagram use intensity as the moderator, we found a statistically significant model indicating that, at higher levels of Instagram use intensity, participants in the Selfie condition responded significantly faster for correct trials than the IG Post condition, and the Report condition was trending significance in the same direction when compared with the IG post condition. Based on our preliminary data, this suggests that although participants in the IG Post condition trended towards higher accuracy, they also seemed to have longer reaction times to correct responses when Instagram use intensity was higher when compared to the Selfie condition.

We saw similar reaction time results in Aim 3 when investigating rumination as a moderator in the relationship between selfie-posting on Instagram and working memory task

outcomes. At higher levels of rumination, participants in the IG Post condition performed significantly slower than participants in the Report condition. The Ruminative Responses Scale is a trait-level measurement of rumination, so we cannot say that higher rumination was induced by experimental manipulation, we can only say that individuals in the IG post condition with a higher tendency to ruminate responded more slowly. This performance deficit in reaction time was revealed at both high levels of Instagram use intensity and rumination. One possible interpretation is that, while Instagram intensity has no significant relationship with rumination (see Aim 1), participants who are highly invested in Instagram and also have a higher tendency to ruminate could be somewhat occupied ruminating over the selfie they just posted on Instagram, resulting in slower reaction times for correct responses.

The only previous literature we have relating a cognitive benefit to SNS usage are the aforementioned correlations (Alloway & Alloway, 2012; Alloway et al., 2013) and the intervention developed for an older adult sample that had no prior SNS exposure (Myhre et al., 2017). Objective Self-Awareness theory suggests that despite the negative affect that may arise due to becoming self-aware, a mismatch between self and standards may serve as motivation to perform better on simple tasks (Wicklund & Duval, 1971). The results from our participants in the IG Post condition seem to support this possible motivational boost in accuracy performance. Overall, participants in the IG Post condition performed marginally more accurately in the working memory task, but participants with higher levels of Instagram use intensity and higher levels of rumination had significantly slower reaction times after posting a selfie on Instagram. The self-awareness induced from posting a selfie on Instagram may have served as the motivator Wicklund and Duval (1971) said it would, resulting in higher accuracy, albeit with longer reaction times, for participants who are more invested in Instagram and who tend to ruminate

more. Later, researchers discovered that self-awareness has a detrimental effect on performance under high evaluative conditions (Geller & Shaver, 1975; Liebling & Shaver, 1973). Furthermore, researchers found that self-aware participants mobilized higher physiological resources, measured by systolic blood pressure, only when a task was explicitly difficult. This same pattern of physiological effort was not shown in self-aware participants completing an easy task, nor in participants with low self-awareness (Silvia et al., 2010). These findings point to the possibility that the 1-back working memory task may have been too easy or was not evaluative enough to capture a detrimental effect on accuracy performance following Instagram posting.

A variety of factors could have influenced this outcome, chiefly amongst these being a clear self-selection bias. Despite Qualtrics reporting having randomly and evenly assigned participants into each condition, we consistently ended up with a lower sample size for our Instagram posting condition. The COVID-19 pandemic forced data collection online, and the cost of effort in showing up to participate in a study dropped with the convenience of being able to participate from one's own home. Additional recruitment is needed before we're able to make a stronger claim about the relationship between Instagram posting and cognitive outcomes. The difficulty we encountered in Instagram posting compliance is telling in and of itself. It could be that those participants who were assigned to this condition but dropped out were the very participants who may have found themselves in a highly evaluative environment after having posted a selfie on Instagram, enough so that perhaps then Instagram use intensity could have possibly explained a larger portion of the variance in working memory task performance. While recognizing that this can only be conjecture without proper data collection, it is possible that those who dropped out saw the prospect of posting a selfie to their profile as too great of a risk to

their curated, idealized, online self, and refused to take that risk despite being offered compensation to complete the study.

Limitations and Future Directions

The online nature of our data collection necessitated the loss of some experimental control, specifically when it came to experimental manipulation compliance. We intentionally did not instruct participants to switch their Instagram account privacy settings to public or private, in hopes of capturing the effect that their pre-existing Instagram audience may or may not have had on each participant. This meant that if participants in the IG Post condition had private accounts and tagged our lab in their post, although it looked like we could verify compliance on their end, in truth, we were unable to verify full compliance. This same online limitation was evident when it came to the timing in which each participant completed the study. Although we told participants the study took 30-45 minutes, it was evident that many users did not complete the full study in one sitting. When we started to notice this trend, we discussed conducting data analyses including and excluding those participants who took longer than 45 minutes, but there were simply too many for this to be possible. Lastly, an argument could be made regarding the nature of each participant's account. For many users, posting a selfie of themselves may be abnormal behavior, and any effect on working memory task performance or negative self-evaluation could be attributed to concern over doing something out of the ordinary rather than an effect inherent of Instagram posting itself. While the argument certainly has merit, the possible "threat" to self arising from posting a picture of oneself is the very effect we sought to capture. Why does this happen and how strong of an effect is it?

In terms of future directions, it would be interesting to design a study to examine Instagram posting in a manner that is more consistent with each participant's pre-existing

Instagram posting behavior, and this may very well be feasible in a post-pandemic, in-person lab setting in which researchers will have higher levels of control. Additionally, future investigations should not only consider other social networking sites usage, but other cognitive measures as well in order to acquire a more complete understanding of whether social networking sites influence cognitive outcomes. Lastly, physiological data could be very insightful in understanding the effect of Instagram selfies on self and cognitive outcomes, and this should be investigated in future research.

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