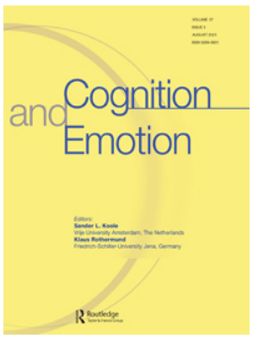

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Social media's influence on momentary emotion based on people's initial mood: an experimental design

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ABSTRACT

Can you think of a meme that made you laugh or a political post that made you angry? These examples illustrate how social media use (SMU) impacts how people feel. Similarly, how people feel when they initiate SMU may impact the emotional effects of SMU. Someone feeling happy may feel more positively during SMU, whereas someone feeling sad may feel more negatively. Using an experimental design, we examined whether following SMU, those in a happy mood would experience increases in positive affect (PA) and those in a sad mood would experience increases in negative affect (NA). A large sample of college students (N = 703) were randomly assigned to a happy, sad, or neutral mood induction before SMU. PA and NA were assessed at baseline, post-mood induction, and after SMU. Contrary to hypotheses, after SMU, people in happy moods experienced decreases in PA, and those in sad moods experienced decreases in NA, reflecting SMU having a dampening effect on emotions. PA and NA were significantly lower after SMU compared to baseline and did not vary by condition. How young adults feel when they log onto SMU matters in understanding how SMU impacts PA and NA, but on average, emotional experiences are dampened.

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Emotion; social media; social networking sites; mood induction; attentional bias

Over recent years, social media (SM) has become a significant part of many people's everyday lives. This is especially true among young adults between the ages of 18 and 29 who represent the largest adult group to use SM (Auxier & Anderson, 2021). To date, most research examining SM use (SMU) and psychological wellbeing has focused on depression and anxiety. Relatively little work has examined how SMU is associated with people's momentary emotion. We propose that examining relations between emotional experiences and SMU is critical for further elucidating how SMU is associated with psychological wellbeing. We used an experimental design to induce young adults into either a happy, sad, or neutral mood before SMU, allowing us to examine how initial emotion states were associated with the emotional impact of SMU.

Few would argue against the notion that people experience a variety of emotions during SMU. For example, we might feel happy seeing memes, angry in response to reading oppositional political messages, and sad when we see a post from a friend about a death in their family. The literature investigating associations between SMU and momentary emotions is in its nascency, and findings have been mixed. For instance, in laboratory-based studies, SMU predicts low levels of PA and high levels of NA compared to using other websites (e.g. Berry et al., 2018; Yuen et al., 2019). However, not all evidence shows these patterns. Lin and Utz (2015) found that positive emotions are more prevalent than negative emotions while reading Facebook posts. Similarly, in an experience sampling study, Yin et al. (2021) found that engaging in SMU is contemporaneously associated with diminished levels of NA. Other research has found that the effects of SMU on momentary emotions appear to differ between individuals. In an experience sampling study, Beyens

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et al. (2020) found that contemporaneous associations between SMU and affect differed between participants, such that some had a tendency to feel better after SMU while others felt worse, with authors stressing the need for future work to explore individual differences that may be driving these findings.

One factor that has yet to be empirically examined is understanding whether how people feel when they start using SM impacts the effect of SMU on people's momentary emotion. Indeed, the Differential Susceptibility to Media Effects Model proposes a reciprocal theoretical model in which people's mood states encompass part of their susceptibility to the effects of media use, broadly defined. Specifically, the model proposes that people's moods influence their emotional responses to media exposure, which influences their moods the next time they choose to engage in media use (Valkenburg & Peter, 2013). Although not theorised in this model, it is possible that these effects on emotion and mood are driven by how people engage in media when in different moods. For example, on SM, those in a sad mood may seek out or attend to negative SM stimuli. Consequently, SMU may lead to increases in momentary NA. Those in a happy mood may attend more closely to positive content, leading to increases in momentary PA. These hypotheses are consistent with the mood congruent attentional bias, a well-studied phenomenon that suggests people are more inclined to attend to stimuli in their environment that match their current mood (Becker & Leinenger, 2011). If the mood congruent attentional bias applies to a SM context, we would expect SMU to have the effect of making people feel worse at some times and better at others depending on their initial mood state. However, how initial mood specifically contributes to the emotional effects of SMU have yet to be examined.

The primary aim of the current investigation is to determine how people's initial moods are associated with their post-SMU emotion. To this end, participants were randomly assigned to a happy, sad, or neutral mood condition before SMU. We hypothesized that people's moods would be amplified over the course of SMU, such that participants in the happy condition would experience increases in PA after SMU, and participants in the sad condition would experience increases in NA after SMU. We hypothesize that these emotional changes may be due in part to the activities in which they engage when on SM, but we do not directly test this in the present study.

Methods

Participants

A total of 703 students (64.9% women, 34.8% men, and 0.3% nonbinary) at a Midwestern university participated in the study. Participants ranged in age from 18 to 23 years ($M = 19.24$, $SD = 1.15$). Regarding race, participants identified as follows: White (54.9%), Asian (27.4%), African American or Black (10.4%), Multiracial (6.67%), and American Indian or Alaska Native (0.58%). Interested individuals completed an audio check; if they failed it, they were not eligible to participate ($n = 3$). The sample size was determined to examine hypotheses that were part of the parent study, findings of which are presented elsewhere (see Tuck & Thompson, 2023).

Procedure

All procedures and protocols for this online study were approved by the university's Institutional Review Board. After participants read and agreed to an informed consent, they were navigated to a page with experimental instructions. Participants were then randomly assigned to one of three mood conditions: Happy, sad, or neutral.

Our procedures for the mood induction were adapted from Ribeiro et al. (2019). We used music with free recall in which participants wrote about an emotional memory while listening to emotionally congruent music empirically validated to elicit the desired emotion (Zhang et al., 2014). Combining free recall of emotional events with music has been shown to be one of the most robust mood induction procedures (Robinson et al., 2012). Participants in the happy and sad mood conditions received the following instructions:

> Next, you will be listening to music while writing about the most **HAPPY** [SAD] past experience you can think of. You do not need to write well or even in complete sentences. Reexperience the event as vividly as possible. Please think about how you felt at the time the event occurred, what led to these feelings, and whether the event elicited thoughts or fantasies that increased their good [bad] feeling.

Those in the neutral condition received the following instructions: "Next, you will be listening to white noise while writing about what a TYPICAL START OF THE DAY looks like for you".

Following the mood induction, participants were instructed to use their own SM on any device of

their choosing. Although they were asked to limit their use to Facebook, Instagram, Twitter, Snapchat, Reddit, Tumblr, and LinkedIn (use of multiple sites was allowed), they were told they could engage in any activities they wanted to on these platforms except for direct messaging. These platforms encompass (a) sites in which people in one's online network are people whom one is likely to know "in real life" or (b) sites in which there is a significant focus on both consuming *and* commenting on content. We excluded sites for which most individuals in one's online network are unlikely to know one another in real life and for which there is not a significant focus on consuming *and* commenting on content (e.g. TikTok, YouTube). This decision was twofold. First, we wanted to clearly differentiate SM-specific experiences (e.g. viewing a friend's story) from other types of online entertainment (e.g. simply watching videos) to understand how SM specifically influences emotion (e.g. versus watching videos more broadly). Second and relatedly, we wanted to exclude sites on which only one activity can truly be engaged (i.e. watching videos on TikTok) to capture more variability in SM engagement. In addition, sites that are strictly text/communication based (e.g. Facebook Messenger) were excluded since direct text communication is not unique to SM. After three minutes, a chime rang to direct participants back to the study. Quatlrics tracked the time it took participants to return to the survey following each SMU portion. All participants returned to the survey after each SMU portion within one minute.

Finally, participants completed a series of self-report measures presented in a random order. These measures related to the larger investigation and included questionnaires related to personality, psychopathology, and experiences related to the COVID-19 pandemic (Tuck & Thompson, 2021). Participants received research credit for their participation.

Positive and negative affect

Participants reported their momentary affect three times during the study: Baseline, post-mood induction, and post-SMU. We assessed momentary PA and NA using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), which is a 20-item measure that consists of ten positively valanced and ten negatively valanced emotion terms. Responses are scored from 1 (*very slightly* or *not at all*) to 5 (*extremely*). Consistent with past research (Watson et al., 1988), this scale demonstrated internal consistency of items ranging from good to excellent (PA: αs = .91–.93; NA: αs = .86–.89).

Results

Analysis summary

All analyses were conducted in R Data Analysis Software (R Core Team, 2022). Data and scripts for the current un-pre-registered analyses are available through the Open Science Foundation at https://osf.io/emgxt/. First, to measure changes in PA and NA across timepoints and between conditions, we conducted two mixed analyses of variance (ANOVAs) with PA (ANOVA 1) and NA (ANOVA 2) as the dependent variable, condition as the between-subject factor, and time as the within-subject factor. There was a significant interaction effect between mood condition and timepoint on PA, $F(2, 1367) = 47.00$, $p < .001$, $\eta_p^2 = .12$ and NA, $F(2, 1360) = 38.60$, $p < .001$, $\eta_p^2 = .10$. This indicates that timepoint had a different effect on people's ratings, depending on which condition they were in. Post-hoc analyses were conducted via pairwise *T*-tests with a Bonferroni adjusted alpha level of .002 per test. Figure 1 illustrates mean PA and NA scores for each condition across timepoints. Descriptive statistics and correlations for PA and NA at baseline, post-mood induction, and post-SMU can be found in Table 1.

We conducted sensitivity power analyses using G*Power3 (Faul et al., 2007) for the two mixed ANOVAs testing our main hypotheses, one each for predicting PA and NA across time and between

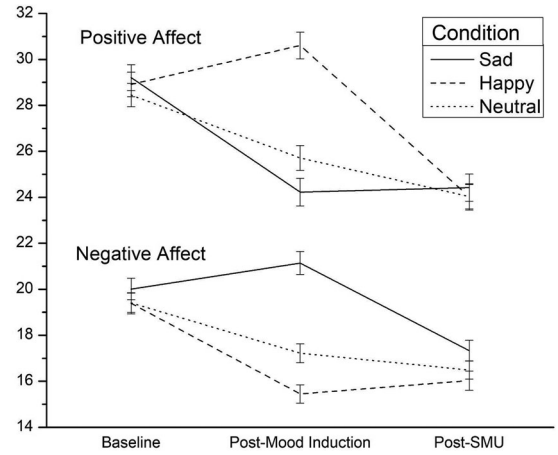

Figure 1. Changes in PA and NA across timepoints for each condition.

Table 1. Means, standard deviations, and pearson correlations for PA and NA at each timepoint by condition.

Variable	M	SD	1	2	3	4	5	6
Happy Condition								
1. PA Baseline	28.91	8.20	–					
2. NA Baseline	19.39	7.06	.23	–				
3. PA Post-Mood Induction	30.61	8.82	.78	.18	–			
4. NA Post-Mood Induction	15.45	6.08	.12	.76	.08	–		
5. PA Post-SMU	24.02	8.71	.67	.19	.67	.24	–	
6. NA Post-SMU	15.45	6.08	.18	.71	.22	.75	.25	–
Sad Condition								
1. PA Baseline	29.21	8.61	–					
2. NA Baseline	20.01	7.24	.16	–				
3. PA Post-Mood Induction	24.22	9.20	.73	.22	–			
4. NA Post-Mood Induction	21.14	7.62	.17	.74	.17	–		
5. PA Post-SMU	24.42	9.00	.73	.30	.76	.27	–	
6. NA Post-SMU	17.33	6.88	.16	.68	.29	.75	.33	–
Neutral Condition								
1. PA Baseline	28.45	7.88	–					
2. NA Baseline	19.41	6.40	.12	–				
3. PA Post-Mood Induction	25.71	8.29	.76	.11	–			
4. NA Post-Mood Induction	17.22	6.28	.16	.79	.17	–		
5. PA Post-SMU	24.03	8.17	.66	.11	.73	.26	–	
6. NA Post-SMU	16.49	6.19	.20	.71	.24	.77	.25	–

groups. These assumed an alpha of .05 and power of .80 (conventional estimates) for three independent groups measured three times. Correlations among repeated measures of PA (and NA) were calculated by averaging the correlations between reported PA (and NA) from baseline to post-mood induction and from post-mood induction to post-SMU across all three mood induction conditions. This yielded average correlations among repeated measures equal to .74 for PA and .76 for NA. Results showed sensitivity to detect a minimum effect size (partial eta squared) of 0.04 for both PA and NA, which is considered between a small and medium effect.

Manipulation check

Conditions did not differ by age, $F(2, 700) = 2.72$, $p = .067$ or gender, $F(2, 700) = 0.13$, $p = .875$. Further, conditions did not differ by reported levels of PA ($F(2,695) = 0.40$, $p = .668$) or NA ($F(2,695) = 0.52$, $p = .596$) at baseline. Following the mood manipulation, reported emotions changed as follows: In the happy condition, mean level PA significantly increased ($t(231) = 4.61$, $p < .001$), and mean level NA significantly decreased ($t(231) = -13.03$, $p < .001$). In the sad condition, mean level PA significantly decreased ($t(235) = -11.74$, $p < .001$), and mean level NA significantly increased ($t(235) = 3.26$, $p = .001$). In the neutral condition, mean levels of PA and NA each significantly decreased closer to zero ($t(234)_{PA} = -7.45$, $t(234)_{NA} = -8.09$, $ps < .001$). Together, each of the three mood inductions successfully influenced emotions in expected directions.

Emotion change following SMU

In the happy condition following SMU, PA significantly decreased ($t(231) = -14.12$, $p < .001$), whereas decreases in NA were not significant ($t(231) = 2.00$, $p = .047$). These findings contrast our hypothesis that PA would be amplified over the course of SMU in the happy condition. In the sad condition following SMU, NA significantly decreased ($t(235) = -11.33$, $p < .001$), whereas decreases in PA were not significant ($t(235) = 0.50$, $p = .620$). These findings are inconsistent with our hypothesis that NA would be amplified over the course of SMU in the sad condition. In the neutral condition following SMU, PA significantly decreased ($t(234) = -4.25$, $p < .001$), whereas decreases in NA were not significant ($t(234) = -2.65$, $p = .009$).

Overall, mean levels of PA ($t(231)_{happy} = -10.82$, $t(235)_{sad} = -11.32$, $t(234)_{neutral} = -10.23$) and NA ($t(231)_{happy} = -9.89$, $t(235)_{sad} = -7.32$, $t(234)_{neutral} = -9.41$) significantly decreased from baseline to post-SMU in all three conditions ($ps < .001$). That is, for all conditions, PA and NA did not return to baseline levels following SMU. Instead, they were significantly lower compared to baseline levels of PA and NA. Following SMU, reported levels of PA ($F(2,700) = 0.16$, $p = .851$) and NA ($F(2,700) = 2.41$, $p = .091$) did not differ between conditions, suggesting that on average, people felt the same after engaging in SMU.

Discussion

In the current investigation, we utilised a mood induction paradigm to examine whether people's initial mood states influence the emotional impact of SMU. We hypothesized that due to a mood congruent attentional bias (Becker & Leinenger, 2011), SMU would amplify how people feel. Specifically, we expected that after SMU, participants in a happy mood would feel higher levels of PA, whereas participants in a sad mood would feel higher levels of NA. Contrary to predictions, our findings showed that following SMU, participants in a happy mood experienced a decrease in PA, and those in a sad mood experienced a decrease in NA. Further, participants' levels of PA and NA were significantly diminished post-SMU compared to their baseline, suggesting these effects were not just participants' moods returning to baseline levels.

Findings suggest that SMU has the effect of dampening the intensity of the affect people most strongly feel. Our findings, although inconsistent with our hypotheses, offer insight into the mixed literature regarding associations between SMU and momentary emotions. When young adults are in a positive mood state prior to SMU, SM may have a putatively negative influence on PA, but when they are in a negative mood state prior to SMU, SM may have a putatively positive effect on NA. Consistent with this dampening interpretation, participants in the neutral condition experienced a decrease in PA post-SMU, but no changes in NA. This may be because PA was salient in this condition, as participants reported higher levels of PA than NA. Taken together, when people initially felt good, SMU made them feel less good, and when people initially felt bad, SMU made them feel less bad.

Anvari et al. (2022) have argued it is important to consider effect sizes in light of their practical meaningfulness and generalizability to everyday life contexts. Our findings, which showed a medium size effect, are quite meaningful given the frequency with which young adults use SM in their everyday lives, the accumulation of which could lead to recurrent changes in emotion. Of course, it will be important to assess the extent to which moods are associated with how SMU impacts people's momentary emotions in daily life using methods such as ecological momentary assessment (EMA) to examine the size of observed effects in naturalistic settings.

At face value, we cannot say whether feeling lower levels of PA and NA was adaptive or maladaptive for individual participants. That depends on participants' emotion regulation goals, which describe individuals' desired emotional states (e.g. English et al., 2017). Based on our findings, SMU may be maladaptive for those wanting to maintain or increase their PA, but SMU may be beneficial for those wanting to decrease their elevated NA or PA. These findings highlight the utility of SMU as a form of digital emotion regulation, or using digital technology to intentionally influence emotion (e.g. Smith et al., 2022). Although prior work has demonstrated individuals engage in SMU as a form of digital emotion regulation broadly, our findings offer initial insights into the ways in which individuals may engage with SMU to reach desired emotion states.

It is possible that one of the functions SMU served in the current study was that of distraction. That is, SMU may have pulled people's attention away from what they were thinking and feeling and towards other, external stimuli. Distraction has been shown to result in emotional dampening effects (i.e. decreases in PA and NA; Quoidbach et al., 2010), consistent with the effects observed in the current study. There are many other forms of external distraction, such as watching TV or playing a game. Watching TV is associated with elevated feelings of relaxation and detachment, with similar findings for other forms of leisure activities (Kuykendall et al., 2020). Consequently, a limitation to the current investigation is that we do not know how engagement in SMU compares to engagement in other forms of distraction. Though our findings provide evidence that SMU dampens people's emotions, future research should directly compare its effects to other activities to determine whether the observed emotional effects are unique to SMU engagement.

More broadly, the topic of SMU as a form of emotion regulation is an interesting one that warrants future exploration. Although we predicted that the mood congruent attentional bias would result in SMU amplifying people's initial mood states, it could be reasonably argued that SMU should have the effect of making participants feel broadly better if they use SMU to regulate their emotions. Indeed, this could be because people are most likely to regulate their emotions for prohedonic reasons in general (i.e. to feel more positively and less negatively; e.g. English et al., 2017). In the present study, we did not ask participants to engage in SMU to regulate their

emotions (although some may have done so). Given this, future research would benefit from instructing participants to engage in SMU with the specific goal of influencing their emotions in particular ways or examining how participants in different moods use SM to regulate their emotions.

While the current study found that, on average, SMU has an emotionally dampening effect, it will be important for future research to investigate variables to further clarify the factors that drive individual differences in how SMU impacts people's moods. We think that examining the role of depressive psychopathology could be fruitful. Those with major depressive disorder experience high levels of NA, which may be less susceptible to the emotional dampening effects of SMU because emotions are more intense in this population, in that they are often more resistant to change (e.g. Oosterwegel et al., 2001).

As has been suggested by others (e.g. Kross et al., 2021), it is also important to consider *how* individuals use SM and how this may be associated with changes in PA and NA. Based on how PA and NA changed after SMU, we think individuals likely engaged in different activities on SM depending on their initial mood. For example, those in the sad condition likely engaged in mood-boosting SM activities since they were the only condition whose NA decreased. Indeed, we think a strength of the current study is that people were given the flexibility to engage in any type of SMU activity (except direct messaging) across a host of platforms of their choosing, meaning they were given the freedom to engage in a large range of SMU activities that we predict are representative of what people do on SM in their everyday lives.

A limitation to this study is we did not collect information on what people did on SM in the current study (e.g. SMU activities engaged in, platform(s) used). Although we considered recording participants' SMU during the study, we decided against this direction for a few reasons. First, ethical concerns arose (e.g. saving pictures of people in participants' SM networks who did not consent to be in the study). Second, we were concerned that recording participants' SMU would influence their online behaviour. Third, even if we recorded participants' SMU, observer-ratings would be quite limited. For example, if a participant viewed a picture of someone they follow, it would be impossible to discern whether they were engaging in social comparison. Of course, we could have had participants view the recordings of their use and report on their intentions, for example, or have them self-report on their SMU. However, there were no empirically validated scales to measure different types of SMU across a host of different platforms at the time this study was conducted (Trifiro & Gerson, 2019).

Our research team has developed and validated a self-report measure of SMU with college students. It is called the Social Media Use Scale (SMUS) and assesses people's SMU over the past week across a wide-range of platforms (Tuck & Thompson, 2023). It includes four subscales: Image-based (e.g. monitoring likes), comparison-based (e.g. body comparison), belief-based (e.g. sharing opinions), and consumption-based (e.g. aimlessly scrolling) SMU (Tuck & Thompson, 2023). More recently, we conducted an experiment in which participants were instructed to engage in each of the four types of SM represented in the SMUS to examine how each impacted their momentary emotion. We found that the four types of SM had differential effects. For instance, engagement in comparison-based SMU led to worsening of how people felt (i.e. increased NA and decreased PA), whereas consumption-based SMU led to improvements in people's emotions (i.e. decreased NA, increased PA). We suspect many, if not most, of the participants in the present study engaged in more than one type of SMU however, so we cannot map these findings on to the ones presented in the present paper. Future researchers could code participants' SMU based on these four SMU types to examine how initial mood state influences which types of SMU people engage in and how SMU activity type is related to changes in emotion.

A limitation of the present study was that it utilised a young adult sample only. However, by doing so, we captured effects among adults who use SM the most (Auxier & Anderson, 2021). We do not expect results to differ among young adults from other universities or those not attending college because SMU is ubiquitous among young adults (Auxier & Anderson, 2021). Regardless, the generalizability of our findings to these groups as well as middle-aged and older adults remains unclear. It is possible that SMU is more emotionally stimulating for those who use SM infrequently (i.e. older adults) compared to those who use these sites multiple times a day (i.e. young adults). In addition, research shows that as people age, they increasingly prioritise positive emotion-related goals (Carstensen, 2006). This may mean that older adults are more likely to use SM to amplify PA

and diminish NA, regardless of their initial mood state. It is important for future research to examine how SMU impacts the emotions of people across the adult lifespan.

Our design of only allowing participants to engage in SMU for three minutes is both a weakness and a strength of the study. It was a strength in that the observed effects likely resulted from SMU, not from environmental distractions or time passing. However, this short amount of time spent on SM means that participants were exposed to relatively little SM stimuli compared to if they had used SM for a longer time. Although we do not expect that prolonged exposure to SM stimuli would itself mitigate the emotional dampening effects we found, future research should directly test this.

In sum, the present study elucidates how initial mood and SMU impact how young adults feel. On the one hand, our findings suggest that how people feel before they use SM is important in understanding *how* SMU impacts their feelings. Participants feeling elevated happiness experienced decreases in PA, and participants feeling elevated sadness experienced decreases in NA. On the other hand, our results suggest that how people feel before they use SM is not important in understanding the cumulative impact on their momentary emotions, at least over a relatively short time period of SMU. That is, regardless of people's initial moods, SMU had an emotional dampening effect on average, across the SMU time period.

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