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Effects of a Brief Exposure to Nature or Social Media on Psychological Well-Being

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Abstract

Social media has enhanced our ability to connect with each other globally and continues to grow. However, there are potential negative impacts of social media use, and it is important to identify resources that may buffer this impact, such as exposure to nature. Exposure to nature has been found to reduce stress and increase attention in comparison to urban environments, but it has not been compared to social media. The current study aims to investigate if viewing social media or nature for a brief time affects psychological well-being, social comparisons, future self-identification, and awe. In addition, the current study aims to test whether viewing nature scenes could buffer the effects of viewing social media. Data was collected from 275 participants using a survey on Amazon Mechanical Turk (MTurk). Participants were randomly assigned to view photos of either nature, social media, or social media followed by nature. Participants were then asked to complete a survey questionnaire. A one-way ANOVA was conducted to compare the means of each condition. To further examine the difference between the conditions, Tukey's post-hoc test was conducted. The results of the post-hoc test showed that those exposed to nature scenes had less negative affect compared to those exposed to their social media feeds. A moderation analysis showed that those who spent more time outside experienced decreased negative affect when they viewed social media and nature photos, but those who spent more time outside experienced increased negative affect when viewing social media. Participants that used social media more often experienced lower negative affect. Findings reveal that relations between humans, social media, and nature, are complex. Further research into these reactions and identifying their underlying causes may be beneficial.

Keywords: social media, exposure to nature, negative affect, future self, social comparison, psychological well-being

Effects of a Brief Exposure to Nature or Social Media on Psychological Well-Being

McLuhan (1962) predicted that as technology became more advanced, we would become interconnected and share a single culture, termed a "global village". Technological advances have allowed for social media to connect humanity in the global village that McLuhan foresaw. Social networks have allowed us to connect with one another across the world. Recent data from the Pew Research Center (2021) shows that approximately 70% of Americans use Facebook daily while Instagram is the most popular social media platform among emerging adults ages 18-29, 71% of whom use the platform. However, social media is not necessarily beneficial for psychological well-being. A previous study has shown that college students are experiencing an increase in loneliness, lower psychological well-being, and problems with depression and anxiety; such problems are more common among students that are more active on social media compared to their peers (Kalpidou et al., 2011). These findings show that young adults may be more prone to experiencing negative effects due to social media.

Frequent social media users may compare themselves to photos designed to gain "likes". These social comparisons can negatively impact psychological well-being, especially in young adults who are constantly thinking about their future self (Bixter et al., 2020; Boer et al., 2021). As people compare themselves to others on social media, they may fulfill shortsighted goals and become distanced from their future self. This may lead to long-term repercussions; future self-identification, the perception of one's future self, may be negatively affected by consistent social media usage (Bixter et al., 2020).

Given the potential negative impact of social media use on psychological well-being, social comparisons, and future self-perceptions, it is important to identify resources that may buffer this impact. One potential buffer may be exposure to nature. Nature, as something that has

been shown to be beneficial for well-being across multiple contexts and cultures, may mitigate the potentially negative effects of social media (Chang et al., 2020; Mayer et al., 2009). Exposure to the natural world could make people forget about social media and its negative effects, leading to fewer comparisons to others, a broader experience, and improved future self-identification.

Social Comparison Theory and Social Media

According to Festinger (1954), people make a social comparison when an objective and clear benchmark is not readily available. If this is not possible, they may compare themselves to others who are similar to them (Festinger, 1954). Social media is a breeding ground for social comparison. Social networking sites allow anyone to maintain a seemingly perfect image; this can foster an environment in which people may be more likely to compare themselves to others (Midgley et al., 2021). However, social media use is not always bad, nor is it without complexity. A recent study conducted during the COVID-19 pandemic indicated those feeling lonely or anxious used social media to actively cope with the situation (Cauberghe et al., 2020). Another study on social media use and happiness found that those who use social media less often or not at all were happier than those using it frequently (Twenge, 2019). Instagram users were more likely to engage in social comparison if they followed more strangers (Lup et al., 2015). Those who engaged in "Instagram broadcasting", or posting photos actively to gain followers, as opposed to browsing content or actively engaging with others' content, were more likely to engage in social comparison (Yang, 2016).

Engaging in social comparison may negatively impact psychological well-being, especially in adolescents and young adults that tend to use social media more often (Boer et al., 2021). While on social media, people tend to compare themselves to others that only post the best aspects of their life (Midgley et al., 2021). When people see images of others who they

perceive as being better at something than they are, they may begin comparing themselves to a standard that is extremely selective. A systematic literature review found that social comparisons play a major role in depression and anxiety within social networks, and those that lack social support are more likely to compare themselves to others (Seabrook et al., 2016). It is important to find ways to reduce the negative outcomes of comparisons when they occur on social media given the rapid growth of social media and frequent social comparisons.

Future Self-Identification and Social Media

During the time when adolescents and young adults are thinking about their future, they are immersed in social media. It is vital to understand how future self-identification relates to social media use. Future self-identification involves how vividly one sees their future, how related one feels to their future self, and how positively one views their future (Bixter et al., 2020). These interdependent components of future self-identification have been shown to predict future outcomes including psychological well-being, academic performance, self-control, and visual imagery of the future (Bixter et al., 2020). The development of future self-identification, and its subsequent consequences, is especially applicable in adolescents and young adults, or emerging adults, many of whom are still developing their conceptualization of the future and are more open to learning about the world as their personality develops (Bleidorn & Schwada, 2017).

In comparison to other age groups, emerging adults who have a longer, more goal-oriented future time perspective, or can think further into the future and have goals for their future, may use the internet more often, perhaps because emerging adults are attempting to work towards their goals more persistently using technology (Przepiorka et al., 2019; Zimbardo & Boyd, 1999). On the contrary, social media use can lead to a more shortsighted view of the

future. Constantly scrolling through social media can lead one to ignore tasks or lose track of time (Turel et al., 2018). Those who have low future self-identification may engage in temporal discounting, in which they value choices that are better in the moment than in the future (McCue et al., 2019). Procrastination and poor savings choices are specific examples of poor intertemporal decision-making (Ersner-Hershfield, 2009; Hershfield et al., 2011; Sirois & Pychyl, 2013). Although social media may cause negative effects, it is possible that a restorative experience that broadens one's viewpoint can improve future self-identification.

Potential Benefits of Exposure to Nature

Although social media may cause myopia, previous studies suggest that exposure to nature can lessen temporal discounting behaviors (Kao et al., 2019). This implies that viewing nature scenes affects future self-perspectives. Furthermore, nature can remind a person that there is more to life than materialism (Joye et al., 2020). Exposure to nature may counteract the negative effects of social media by making materialistic images seen on social media seem less important relative to the beauty and wonder of nature (Joye et al., 2020). Research has shown that spending time in a natural environment, or simply seeing photographs or watching videos of natural environments, helps to lessen stress, improve cognition, increase social cohesion, increase positive affect and decrease loneliness (Cauberghe et al., 2020; Groenewegen & de Vries, 2012; McMahan & Estes, 2015; Ulrich et al., 1991). It is possible that a brief exposure to nature can broaden people's perspectives, remind them of the beauty of nature, and increase well-being with consequent benefits for future self-identification and lessening of social comparisons.

The biophilia hypothesis suggests, from an evolutionary perspective, humans have an innate tendency to connect with nature (Kellert & Wilson, 1993; Wilson, 1984). A global study

on the biophilia hypothesis examined photos of nature posted worldwide using Google API, applications that communicate with Google and provide analytic data, revealing that nature was associated with fun, relaxation, and recreation (Chang et al., 2020). Additionally, those in countries rated higher on the Global Happiness Scale were more likely to spend time in nature (Chang et al., 2020). Studies that test beneficial effects of nature have often utilized urban environments as a comparison to natural environments, and some studies have compared these effects in online and offline contexts. Mayer and colleagues (2009) compared groups in urban and nature environments in both an offline and virtual format. It was found that nature increased positive affect and the ability to reflect both online and offline (Mayer et al., 2009). However, this difference was stronger when people saw nature offline (Mayer et al., 2009). Another study compared 360-degree videos of nature and urban environments to slideshows of nature and urban environments (Mostajeran et al., 2021). The findings showed that stress was reduced with exposure to natural stimuli, in comparison to urban stimuli, regardless of format (Mostajeran et al., 2021). Due to its potential benefits, nature is already being explored in urban design, gameplay, and some forms of therapy for cognitive restoration and stress reduction (Meidenbauer et al., 2020; Reetz et al., 2021). These studies suggest the potential value of identifying ways to utilize nature for health benefits in different, more accessible contexts.

The Current Study

Nature has positive effects, and although it has been studied in many ways, prior research has not compared nature and social media. The current study aims to answer the following research questions: (1) Does viewing social media or nature impact psychological well-being, future self-identification, social comparisons, or awe? (2) Does a brief exposure to nature buffer the potentially negative effects of a brief exposure to social media on psychological well-being,

future self-identification, social comparisons, or awe? (3) Does social media use moderate the relationship between the experimental manipulation and one or more outcome variables? (4) Does time spent outside moderate the relationship between the experimental manipulation and one or more outcome variables? It is hypothesized that awe-inducing nature would generally cause higher psychological well-being, future self-identification, awe, and lower social comparisons. Also, exposure to nature will buffer the potentially negative effects of social media on psychological well-being, future self-identification, awe, and social comparisons.

Methods

Participants

Approval was obtained from the Institutional Review Board (IRB) at Arizona State University. The study consisted of 275 participants recruited via Amazon Mechanical Turk (MTurk) between September through October of 2021. Participants were given the option to complete a fully online study for $3.00 in compensation. This study took approximately 30 minutes to complete. Participants were recruited via MTurk due to the platform's participant diversity and convenience. Participants were invited to complete the study if they (a) had access to a computer and cell phone or other device, (b) were between the ages of 18-25, (c) were active Instagram users (i.e., use of Instagram for at least ten minutes per week), and (d) live and/or reside in the United States. In the MTurk system, participants were required to have a 98% Human Intelligence Task (HIT) approval rate (i.e., 98 out of 100 HITs were approved), and had to have completed 100 HITs. A HIT is a task that can be completed in exchange for money on MTurk and does not necessarily have to be a survey. These metrics were chosen to increase data quality based on prior literature and current standards in the field (Peer et al., 2014). After data collection, for participants who provided multiple responses with the same MTurk ID (n = 4

participants; *n* = 8 responses), the second response was excluded. Participants who did not meet demographic criteria (*n* = 50), pilot tested the survey before it was launched or as part of the first group of participants on MTurk (*n* = 15) or failed to pass an attention check (*n* = 28) were excluded from data analyses.

Data analyses included 182 participants, the majority of whom had a four-year degree (40.1%), were part of the middle class in terms of household income (42.5%), identified as female (69.2%), and were White/European American (70.3%). Please refer to Table 1 for all demographics collected. Participants were randomly assigned to view nature photos (*n* = 60), social media (*n* = 60), or both social media and nature photos (*n* = 62).

Measures

Nature Photos

Photos of nature were found on stock photos or were taken by the researcher; photos were excluded if they had people or buildings. These photos were chosen based on their ability to evoke awe, as determined based on perceptual vastness, color, and complexity of each picture. Pictures were chosen to represent numerous types of natural environments. None of the photos had copyright restrictions. The location where the photo was taken and a brief description of the photo itself was curated by the researchers and shown to participants while the photo was shown. Participants were instructed to view each photo, read the description below the photo, and imagine the location. An example photo and description is shown in Figure 1.

The Dispositional Positive Emotion Scale – Awe Subscale

For purposes of this study, we used scales that had already been validated whenever possible. Awe was measured with a subscale from the Dispositional Positive Emotion Scale (Shiota et al., 2006) which consists of seven subscales that have either five or six items:

contentment, joy, pride, love, compassion, amusement, and awe. The authors of this scale reported that the Cronbach's alpha of the awe subscale was .78 (Shiota et al., 2006). This self-report measure asks participants to rate their level of agreement with each statement using a Likert scale from 1 (*Strongly disagree*) to 7 (*Strongly agree*). An example of one of these statements is: "I see beauty all around me." This subscale was used specifically to check for the effect of the different experimental conditions on awe, which is not an emotional state that is measured by the PANAS or any other measures. Awe from the Dispositional Positive Emotions Scale (DPES) had a Cronbach's alpha of $\alpha = .85$ in the current sample.

Iowa-Netherlands Comparison Orientation Measure

Social comparison was measured using the Iowa-Netherlands Comparison Orientation Measure (Gibbons & Buunk, 1999). This scale has been tested in multiple samples in the United States and the Netherlands, in which the Cronbach's alpha ranged from .77 to .85 (Gibbons & Buunk, 1999). Participants were asked how much they agreed with 11 statements on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). A sample statement is, "If I want to find out how well I've done something, I compare what I have done with how others have done." A composite score for the Iowa-Netherlands Comparison Orientation Measure (INCOM) was calculated using the mean of all questions on the scale. Cronbach's alpha for social comparison was $\alpha = .80$ in this dataset.

Positive and Negative Affect Schedule

Affect was measured with the Positive and Negative Affect Schedule (PANAS). The PANAS comprises two 10 item scales that measure positive and negative affect (Watson et al., 1988). Authors of the scale report that, for questions asked in this moment, Cronbach's alpha for positive affect was .89, and for negative affect it was .85 (Watson et al., 1988). Participants were

asked how they feel right now in relation to a list of 20 words, such as “Excited, Inspired, and Enthusiastic” for positive affect, and “Hostile, Afraid, and Upset” for negative affect. Questions are on a 5-point Likert scale from 1 (*Not at all*) to 5 (*Very much*). The Positive and Negative Affect Scale (PANAS) has a total composite score and two subscales; scores were calculated using the sum for each scale. In this dataset, the Cronbach’s alpha showed high reliability for the PANAS ($\alpha = .92$) and each of its subscales. Positive affect had a value of $\alpha = .92$, and negative affect had a value of $\alpha = .96$. Table 2 has further information on the PANAS subscales.

Future Self-Identification

Future self-identification was assessed using a 7-item scale with four subscales to measure how connected a person is to their future self, how vividly and easily they can picture their future, how positively they view their future, and how certain they are about their future (Bixter et al., 2020). Three of these subscales (relatedness, vividness, and positivity) have been correlated at single time points as they each have only two items: for relatedness, $r = .40$, vividness, $r = .80$, and positivity, $r = .48$ (Adelman, 2018). These subscales also demonstrate test-retest reliability in first year college students: for relatedness, $r = .65$, $p < .001$, vividness, $r = .80$, $p < .001$, and positivity, $r = .85$, $p < .001$ (Bixter et al., 2020). Reliability for relatedness has been demonstrated within-subjects, with a reported Cronbach’s $\alpha = .64$, $r(117) = .48$, $p < .001$ (Adelman et al., 2017). To our knowledge, there has not been a previously reported Cronbach’s alpha for the entire future self-identification scale or the vividness or positivity subscales.

Relatedness to the future self is based on two items that ask how similar and connected one feels to their future self in a certain timeframe and is based on prior work by Ersner-Hershfield et al. (2009). In this case, we asked about five years in the future. Participants made a choice based on overlapping circles of the current and future self. Measures for vividness, and

positivity, each of which consist of two items, were assessed on a Likert scale. Certainty only consists of one item and is also measured on a Likert scale. Future self-identification, inclusive of its subscales, has been used to predict how a person visualizes their future, as well as to predict various aspects of psychological well-being and academic achievement (Bixter et al., 2020).

Future self-identification has both a total composite score and four separate subscales (certainty, vividness, positivity, and relatedness). Each score was calculated using the mean of items. The composite score for future self-identification had high reliability of $\alpha = .86$, with moderate reliability for relatedness ($\alpha = .77$) and positivity ($\alpha = .75$), and high reliability for vividness ($\alpha = .90$). Certainty is composed of only one item. Table 3 has further information on the future self-identification subscales.

UCLA Loneliness Scale (8 Questions Revised)

Loneliness was assessed using the shortened UCLA Loneliness Scale created by Hays & DiMatteo (1987) based on the original 20 question scale. In its original development in a college student sample, the Cronbach's alpha was $\alpha = .84$ (Hays & DiMatteo, 1987). Participants were given 8 statements and asked how often they feel this way on a scale of 1 (*Often*) to 4 (*Never*). An example of one of these statements is "I feel isolated from others". We used a single score for the UCLA Loneliness Scale based on the sum of the items. In this dataset, reliability for the UCLA Loneliness Scale (8 Questions Revised) was $\alpha = .87$.

Center for Epidemiologic Studies Depression

Depression was assessed using 20 items from the Center for Epidemiologic Studies (CES-D) designed by Radloff (1977) as a self-report scale for research on depression. For clinical diagnosis, reliability was $\alpha > .85$ across multiple samples (Hann et al., 1999).

Participants were asked to indicate how often they have felt a certain way in response to 20 statements on a scale from 1 (*Rarely*) to 4 (*Most*). An example statement is "I was bothered by things that don't usually bother me". We used a single composite scale for the CES-D based on the sum of all items. Reliability for the CES-D in this dataset had a value of $\alpha = .87$.

Demographics

Basic demographics were collected at the end of the survey for replication in future studies that investigate similar questions. Additional demographics that were hypothesized to be relevant to the study and to current research in cyberpsychology and environmental psychology were included. To address exploratory questions in this study, we used self-report data from demographic questions that asked "In the past week, on average, approximately how much time per day do you spend on social media?" on a scale ranging from 1 (*Less than 10 minutes*) to 6 (*Over 5 hours*), and "How often have you spent time outside for at least 30 minutes, not working (e.g. jogging, walking, etc.), on average over the past three months?" on a scale ranging from 1 (*Not at all*) to 5 (*Daily*).

Procedures

Participants were redirected to a Qualtrics survey from Amazon Mechanical Turk, where they first read a consent form. Following the completion of the informed consent process, participants were randomly assigned to one of three groups: nature, social media, or social media followed by nature (SMN). Participants in the nature group scrolled through 12 curated nature photos for 25 seconds each. Participants in the social media group were instructed to scroll through their own Instagram feed for five minutes. Participants in the SMN group were first instructed to scroll through social media and then viewed pictures of nature. Next, participants were directed to complete a self-report battery of questionnaires assessing affect, loneliness, awe,

social comparisons, social media use, depression, and future self-identification. Finally, participants were debriefed and provided with the researcher's email address if they had further questions. Figure 2 illustrates the study design.

Results

Preliminary Analysis

Only complete scores were used; incomplete scores for an item were dropped[1]. Table 4 contains further descriptive statistics on each main psychometric scale, including the number of participants who completed each scale within each condition. Analyses were conducted using SPSS version 25.

Two-tailed, pairwise Pearson correlations and descriptive statistics of scales were conducted as preliminary analyses to measure the association between potential moderators and variables of interest before testing for a causal relationship. For all correlations and descriptive statistics, see Table 5. Below are the results for each hypothesis that was tested.

A one-way ANOVA with three levels was used to test for differences between groups. The main effect of the experimental manipulation on nine out of ten variables tested was not statistically significant. Tukey's HSD for multiple comparisons was run on all outcome variables to adjust for the effect of multiple dependent variables; negative affect remained the only variable to differ significantly. Table 6 contains further information regarding the difference in means and standard deviation for each of the outcome variables between and within groups.

A main effect of condition was found for negative affect, $F(2, 177) = 3.56$, $p = .03$, partial $\eta^2 = .04$. Those who saw nature only experienced the lowest mean negative affect (M =

[1] Heterogeneity and normality were checked across the total sample and within each group. No transformations were performed.

15.61, *SD* = 9.17), those who viewed social media only experienced the highest mean negative affect (*M* = 19.66, *SD* = 9.69), and those in the SMN condition had a mean negative affect that was between those who only viewed social media and those who only viewed nature (*M* = 16.08, *SD* = 8.25).

Tukey's HSD for multiple comparisons found that the mean value of negative affect was statistically different between the nature only condition and the social media only condition, p = .04, 95% CI = [-7.99, -.11].

Tukey's HSD for multiple comparisons found that the mean value of negative affect was marginally different between the social media only and SMN conditions, p = .08, 95% CI = [-.31, 7.47]. There was no significant difference between the nature only and SMN conditions. Figure 3 displays the difference in negative affect across condition.

Exploratory Analysis

Exploratory analyses conducted post hoc used the PROCESS Macro version 3.4.1 in SPSS to test for potential moderators of the impact of the experimental manipulation on one or more outcome variables that were found to be statistically significantly different between groups, establishing a main effect of X on Y. Model 1 with the multi-categorical option in PROCESS with a 95% CI was used. PROCESS created dummy codes of 0 and 1 for categorical variables with one group acting as a reference. Continuous variables were mean centered. Figures were used to display simple slopes, as suggested by Hayes & Rockwood (2017).

There were no interaction effects found for self-reported social media use over the past week and the experimental manipulation on negative affect. There was a statistically significant main effect of frequency of social media use (on average, per day over the past week) on negative affect, $F(5, 174) = 2.63$, p = .03, R^2 = .07. Those who used social media more often

were less likely to experience negative affect in all conditions, β = -1.90, $t(174)$ = -2.12, p = .04. There were also statistically significant main effects for the contrast between social media and nature conditions, β = 4.07, $t(174)$ = 2.47, p = .02 and between social media and SMN conditions, β = 3.62, $t(174)$ = 2.22, p = .03, but there was no significant main effect between the SMN and nature conditions. Figure 4 and Table 7 display the statistics for these main effects on negative affect in further detail.

There was a statistically significant crossover interaction between self-reported time spent outside (on average, per week over the past 3 months) and the experimental manipulation on negative affect, β = 3.20, $t(174)$ = 2.26, p = .03. There were main effects for the contrast between the social media and nature conditions, β = 3.96, $t(174)$ = 2.40, p = .02 and the SMN and social media conditions, β = 3.48, $t(174)$ = 2.13, p = .034, but there was no significant difference between the SMN and nature conditions. Those who spent more time outside and who were exposed to social media expressed higher negative affect, whereas those who spent more time outside and were exposed to the SMN condition had lower negative affect. Figure 5 and Table 8 describe the crossover interaction in further detail.

Discussion

Our findings revealed that those who viewed their social media feed had higher negative affect compared to those who viewed photos of nature, but there was no difference between groups for any other outcome variables. While this was consistent with prior research and our hypothesis, the specific reason for negative affect being the only outcome variable to differ between groups is currently unknown. As a state scale, negative affect is prone to manipulation;

however, other state scales did not differ between groups[2]. Although it differed significantly between groups, negative affect had a small effect size, and this may have differed due to random chance.

This study had mixed findings regarding whether nature acts as a buffer between social media exposure and negative affect. There was a marginal difference between viewing social media and viewing social media followed by nature, but difference was not statistically significant. This indicates that the effects of the nature and SMN conditions may be similar, as hypothesized, but requires further research to be conclusive.

The current study found that daily social media use did not moderate the impact of social media on negative affect, but that there was a main effect of daily social media use on negative affect. Those who used social media more often tended to experience lower negative affect in all conditions and may benefit from the use of social media to some degree. There was no statistically significant interaction implying that viewing nature photos did not significantly decrease negative affect for those who used social media, but main effects between conditions suggests that those who use social media more often in their daily lives may also benefit from viewing nature photos.

There was a crossover interaction between time spent outside and the experimental manipulation on negative affect. Those who spent more time outside tended to experience less negative affect when viewing social media followed by photos of nature, but they experienced more negative affect when viewing social media alone. This indicates that those who spend time

[2] The cause of emotion and its purposes have been consistently debated and researched. Emotion being caused as a response to a stimulus is generally agreed upon by researchers; however, what is occurring between the stimulus and its elicited emotional response is disagreed upon and requires further research (See Moors, 2009 for a review).

outside more often and choose to use social media may benefit from viewing photos of nature in an online context.

Limitations and Future Directions

The results of the current study must be considered in lieu of multiple limitations. The current study was conducted fully online, and all data was self-reported. Specific to those who viewed social media in either the SMN or social media only condition, although attention checks were utilized for those who viewed Instagram, and participants reported having an Instagram account, it was not possible to know whether participants truly scrolled through their social media feed for five minutes.

Some limitations were deliberate, or necessary choices. There was no neutral control group; as we chose to explore nature as a potential buffer to social media, we instead utilized a manipulation that would test this with a third condition. In addition, since this study only had post-test measures, it is possible that nature was not beneficial; rather, the absence of social media resulted in fewer social comparisons or other negative effects that may have been caused by social media. Because this study occurred during the COVID-19 pandemic and was designed for the purpose of being remote, it was not possible to test whether direct exposure to nature would mitigate any negative impacts due to social media use; the effectiveness of a virtual presentation of nature is mixed, and this method of presentation is a limitation. Our sample was limited to the United States due to the novel nature of this research and the specific demographics we wished to know more about before expanding our research. We chose to ask participants to scroll through their own social media feed as this would be more relatable, however, this meant that some participants could experience a positive social media feed comparative to other participants. We recruited participants that used Instagram actively for at

least ten minutes per week, which is not very frequent usage for the emerging adult age group. While this allowed us to understand more about the effect of daily social media use on a brief exposure to social media or nature, future studies may recruit participants that use social media more frequently.

The results of the current study also have multiple potential implications. This study adds to prior literature suggesting that social media may or may not be harmful, especially in certain conditions or certain groups of people, and that the effects of social media are complex (Midgley et al., 2021; Twenge, 2019). The findings also add to literature showing that nature is beneficial in comparison to urban environments, even when viewed online (Mayer et al., 2009; Mostajeran et al., 2021). The effects of the nature condition on negative affect and in moderation analyses suggest the possibility that a more salient intervention, such as using virtual reality or physically going outside, may help buffer against potentially negative effects of social media use on negative affect. It is also important to note that there was no evidence that viewing photos of nature was harmful, so its usefulness should be explored further.

Due to the potential lack of effectiveness of this manipulation, and the possibility that our significant findings occurred due to random chance, replication studies are necessary to confirm these findings. Beyond this, future studies may explore potential moderators that have not been investigated yet, such as socioeconomic status, proximity to greenspace, connectedness to nature, how individuals use social media and what content they view (e.g., active vs. passive social media use), and religiosity. Future studies might also utilize more diverse samples and different research methodologies to understand the underlying motives for certain people to utilize social media despite its potentially negative effects, and to determine how interventions may be designed in a better way for social media users.

Key Takeaways

The current study showed a complex relationship between social media and nature that suggests further research is necessary to understand how the two affect one another and human cognition. Negative affect was statistically significant between those who viewed nature and those who viewed social media in an experimental manipulation. However, negative affect was the only outcome variable that differed significantly between groups, and it had a small effect size which should be taken into consideration when interpreting these results. Spending time outside frequently in one's daily life was associated with higher negative affect after viewing social media; viewing photos of nature seemed to be necessary to counteract the potential negative effects of social media for those who enjoy spending time outside. Those who use social media more often in their daily life compared to those who use social media less did not experience a difference in negative affect after viewing social media. Overall, those who use social media more often experienced less negative affect. Further research should be conducted into whether interacting with nature, in both online and offline contexts, specifically helps buffer against the negative effects of social media, and if so, what the underlying reason for this might be.

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Tables

Table 1

Demographics

	Nature		Social Media - Nature		Social Media		Full Sample	
	n	%	*n*	%	*n*	%	*N*	%
Sex								
Female	37	61.7	45	72.6	44	73.3	126	69.2
Male	23	38.3	15	24.2	15	25	53	29.1
Other			2	3.2	1	1.7	3	1.7
Age								
19	1	1.7			3	5.1	4	2.2
20			1	1.6	1	1.7	2	1.1
21	2	3.3	1	1.6	2	3.4	5	2.8
22	1	1.7	5	8.1	1	1.7	7	3.9
23	10	16.7	14	22.6	8	13.6	32	17.8
24	15	25	8	12.9	19	32.2	42	23.3
25	30	50	33	53.2	25	42.4	88	48.9
Highest educational level								
Less than high school					1	1.7	1	0.5
High school graduate	5	8.3	5	8.1	6	10	16	8.8
Some college	15	25	15	24.2	11	18.3	41	22.5
2 year degree	2	3.3	5	8.1	2	3.3	9	4.9
4 year degree	28	46.7	19	30.6	26	43.3	73	40.1
Professional degree	9	15	17	27.4	13	21.7	39	21.4
Doctorate (or equivalent)	1	1.7	1	1.6	1	1.7	3	1.6
Socioeconomic Status (household income)								
Working Class	12	20.3	8	12.9	7	11.9	27	14.9
Lower Middle Class	14	23.7	11	17.7	12	20.3	37	20.4
Middle Class	23	39	31	50	23	39	77	42.5
Upper Middle Class	9	15.3	12	19.4	13	22	35	19.3
Upper Class	1	1.7			4	6.8	5	2.8
Race/Ethnicity								
Caucasian/White/European American	39	65	42	67.7	47	78.3	128	70.3
East Asian/Asian American/Southeast Asian/Pacific Islander	5	8.3	4	6.5	3	5	12	6.6
Hispanic/Latino(a)/Chicano(a)/Latin American	8	13.3	4	6.5	2	3.3	14	7.7
South Asian/Indian	2	3.3			3	5	5	2.7
Middle Eastern/Arab/Arab American			2	3.2			1	0.5
Native American/Alaska Native	2	3.3	8	12.9	1	1.7	5	2.8
Black/African American/African/West Indian	2	3.3	1	1.6	4	6.7	14	7.7
Two or more of these	2	3.3	1	1.6			3	1.7

Table 2

Descriptive Statistics of Positive and Negative Affect Subscales

	Nature		Social Media - Nature		Social Media		Full Sample					
Scale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*N*	Range	Items	Cronbach's alpha
Positive Affect	33.16	9.29	31.30	10.32	31.28	9.34	31.89	9.65	175	10-50	10	0.92
Negative Affect	15.61	9.17	16.08	8.25	19.66	9.69	17.1	9.17	180	10-50	10	0.96

Table 3

Descriptive Statistics of Future Self-Identification Subscales

	Nature		Social Media - Nature		Social Media		Full Sample					
Scale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*N*	Range	Items	Cronbach's alpha
Certainty	4.88	1.39	4.89	1.49	5.28	1.14	5.02	1.36	182	1-7	1	
Relatedness	4.47	1.47	4.72	1.35	4.96	1.11	4.72	1.33	180	1-7	2	.77
Positivity	5.58	1.00	5.67	.95	5.76	.95	5.67	.96	181	1-7	2	.75
Vividness	4.68	1.46	4.73	1.59	5.03	1.21	4.81	1.43	181	1-7	2	.90

Table 4

Descriptive Statistics of Scales

	Nature		Social Media - Nature		Social Media		Full Sample					
Scale	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*N*	Range	Items	Cronbach's alpha
Dispositional Positive Emotions Scale - Awe	5.03	1.33	5.20	1.10	5.02	.97	5.08	1.14	182	1-7	6	.85
UCLA Loneliness Scale	18.37	6.34	18.61	6.01	18.83	4.69	18.61	5.69	180	8-32	8	.87
Iowa Netherlands Comparison Orientation Measure	3.47	.64	3.53	.68	3.54	.57	3.51	.63	180	1-5	11	.80
Center for Epidemiologic Studies - Depression	38.84	13.92	39.77	12.50	40.64	12.72	39.77	12.98	176	20-80	20	.87
Positive and Negative Affect	48.20	14.63	47.38	14.04	50.65	15.38	48.72	14.66	173	20-100	20	.92
Future Self-Identification	4.96	1.04	5.01	1.07	5.25	.88	5.07	1	178	1-7	7	.86

Table 5

Correlation Table

Variable	*N*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Positive Affect	175	31.85	9.66	—											
2. Negative Affect	180	17.02	9.13	**.22****	—										
3. Awe (DPES)	182	5.08	1.14	**.47****	.08	—									
4. UCLA Loneliness Scale	180	18.59	5.7	**-.28****	**.17***	-.12	—								
5. Social Comparison (INCOM)	180	3.51	.63	.08	.00	.12	.07	—							
6. Depression (CESD)	176	39.73	13.01	-.13	**.55****	-.02	**.55****	.08	—						
7. Future self-certainty	182	5.02	1.36	**.47****	.09	**.51****	**-.24****	.11	**-.25****	—					
8. Future self-relatedness	180	4.72	1.33	**.45****	**.26****	**.32****	**-.25****	.10	-.09	**.49****	—				
9. Future self-positivity	181	5.67	0.96	**.36****	-.12	**.44****	**-.18***	**.18***	**-.27****	**.63****	**.30****	—			
10. Future self-vividness	181	4.81	1.44	**.41****	.12	**.42****	**-.17***	**.18***	**-.15***	**.62****	**.54****	**.62****	—		
11. Time spent outside (per week over the past 3 months)	182	3.14	1.16	**.43****	.09	**.29****	**-.19****	-.10	**-.15***	**.23****	**.33****	**.24****	**.24****	—	
12. Time spent on social media over the past week	182	4.23	1.32	**.20****	-.13	**.18***	-.04	.11	-.08	.04	.04	.12	.13	**.21****	—

Note: Time spent outside is scored from 1 (*Not at all*) to 5 (*Daily*). Time spent on social media is scored from 1 (*Less than 10 minutes*) to 6 (*Over 5 hours*).

Table 6

One Way Analysis of Variance

	Nature		Social Media - Nature		Social Media							
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	SS	df	Mean Square	F	Sig.	Partial Eta Squared
Future self certainty	4.88	1.39	4.89	1.49	5.28	1.14	6.374	2	3.19	1.75	.18	.01
Future self relatedness	4.47	1.47	4.72	1.35	4.96	1.11	7.210	2	3.61	2.07	.13	.02
Future self positivity	5.58	1	5.67	.95	5.76	.95	.986	2	.49	.528	.60	.00
Future self vividness	4.68	1.46	4.73	1.59	5.03	1.21	4.359	2	2.18	1.06	.35	.01
Depression (CESD)	38.84	13.92	39.77	12.5	40.64	12.72	93.583	2	46.79	.275	.76	.01
Social Comparisons (INCOM)	3.47	0.64	3.53	.68	3.54	.57	.199	2	.10	.249	.78	.00
UCLA Loneliness Scale	18.37	6.34	18.61	6.01	18.83	4.69	6.307	2	3.15	.096	.91	.00
PANAS Negative Affect Subscale	15.61	9.17	16.08	18.25	19.66	9.69	582.349	2	291.17	3.56	**.03***	.04
PANAS Positive Affect Subscale	33.16	9.29	31.3	10.34	31.28	9.34	134.383	2	67.19	.719	.49	.01
Awe (DPES)	5.03	1.33	5.2	1.1	5.02	.97	1.359	2	.679	.520	.595	.00

Table 7

Moderator Analysis: Condition by Social Media Use on Negative Affect

Effects	*β*	SE	95% CI		*t*	*p*	*R*	R^2
			LL	UL				
Constant	15.59	1.17	13.28	17.89	13.34	.00	.27	.07
Social Media Use	-1.9	.9	-3.67	-.13	-2.12	.04		
1: Social Media vs. Nature	4.07	1.65	.82	7.34	2.47	.02		
2: SMN vs. Nature	.45	1.63	-2.77	3.67	.28	.78		
3: SMN vs. Social Media	3.62	1.63	.4	6.85	2.22	.03		
Categorical 1 x Social Media Use	1.91	1.22	-.49	4.32	1.57	.12		
Categorical 2 x Social Media Use	.8	1.28	-1.72	3.32	.63	.53		
Categorical 3 x Social Media Use	1.11	1.28	-1.31	3.53	.90	.37		

Note: PROCESS uses dummy variables to code for categorical variables, such as condition. To get the SMN x Social Media Use information, condition was recoded and run through the same model a second time.

Table 8

Moderator Analysis: Condition by Time Spent Outside on Negative Affect

Effects	*β*	SE	95% CI		*t*	*p*	*R*	R^2
			LL	UL				
Constant	15.67	1.17	13.36	17.97	13.39	.00	.27	.07
Time Outside	.63	1	-1.33	2.6	.64	.53		
1: Social Media vs. Nature	3.96	1.65	.7	7.22	2.4	.02		
2: SMN vs. Nature	.48	1.63	-2.74	3.71	.3	.77		
3: SMN vs. Social Media	3.48	1.63	.26	6.7	2.13	.03		
Categorical 1 x Time Outside	1.61	1.41	-1.17	4.38	1.15	.25		
Categorical 2 x Time Outside	-1.59	1.42	-4.4	1.21	-1.12	.26		
Categorical 3 x Time Outside	3.2	1.42	.4	6	2.26	.03		

Note: PROCESS uses dummy variables to code for categorical variables, such as condition. To get the SMN x Social Media Use information, condition was recoded and run through the same model a second time.

Figures

Figure 1

An overhead photo of Horshoe Bend in Page, AZ and a description of the photo

Note. Often referred to as part of the Grand Canyon, Horseshoe Bend is a gorgeous view and is located along the Colorado River near Page, AZ. A view only accessible by flight, the path of the water encircling the stone makes it seem as though a mountain has risen out of the deep blue depths.

Figure 2

Study Design and Order of Presentation

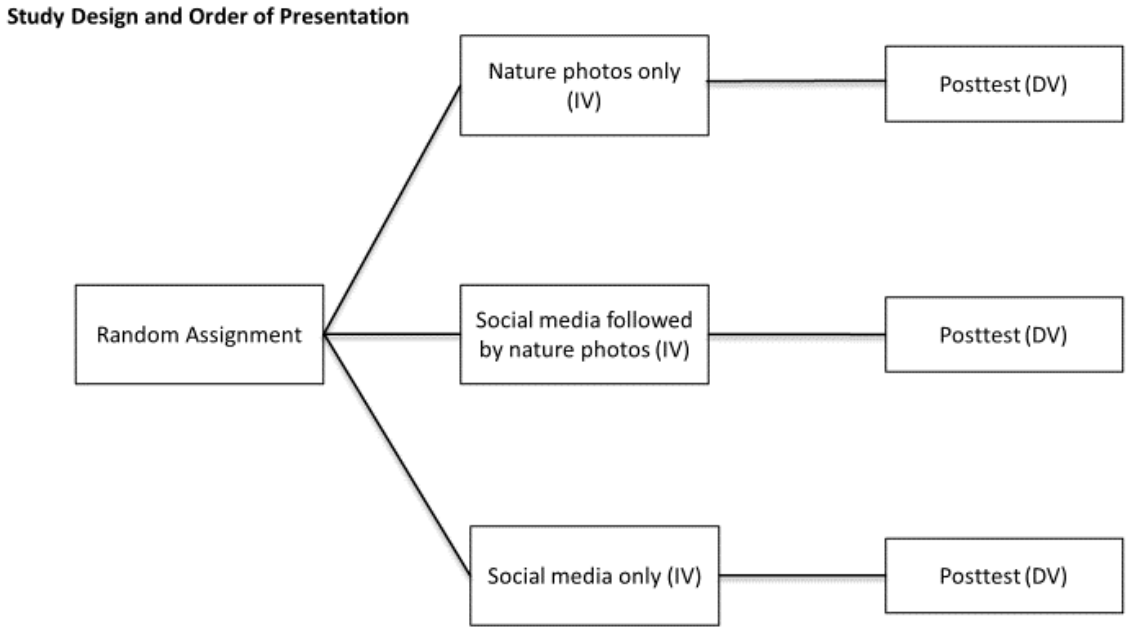
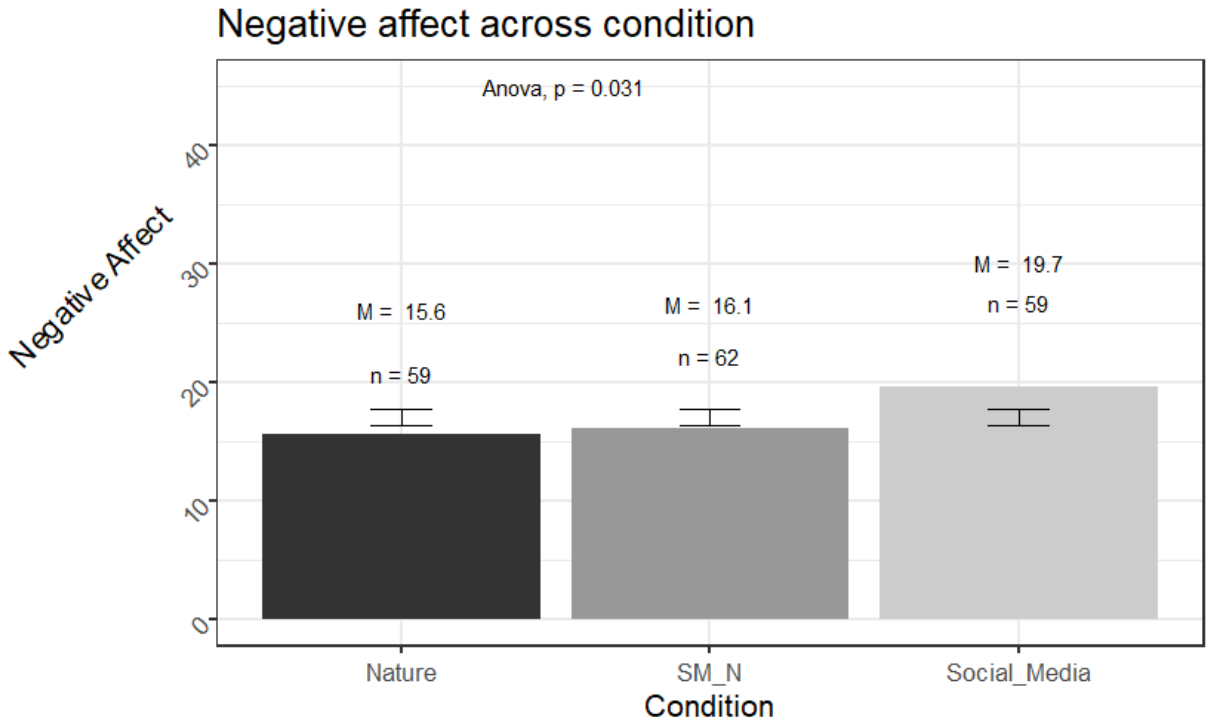


Figure 3

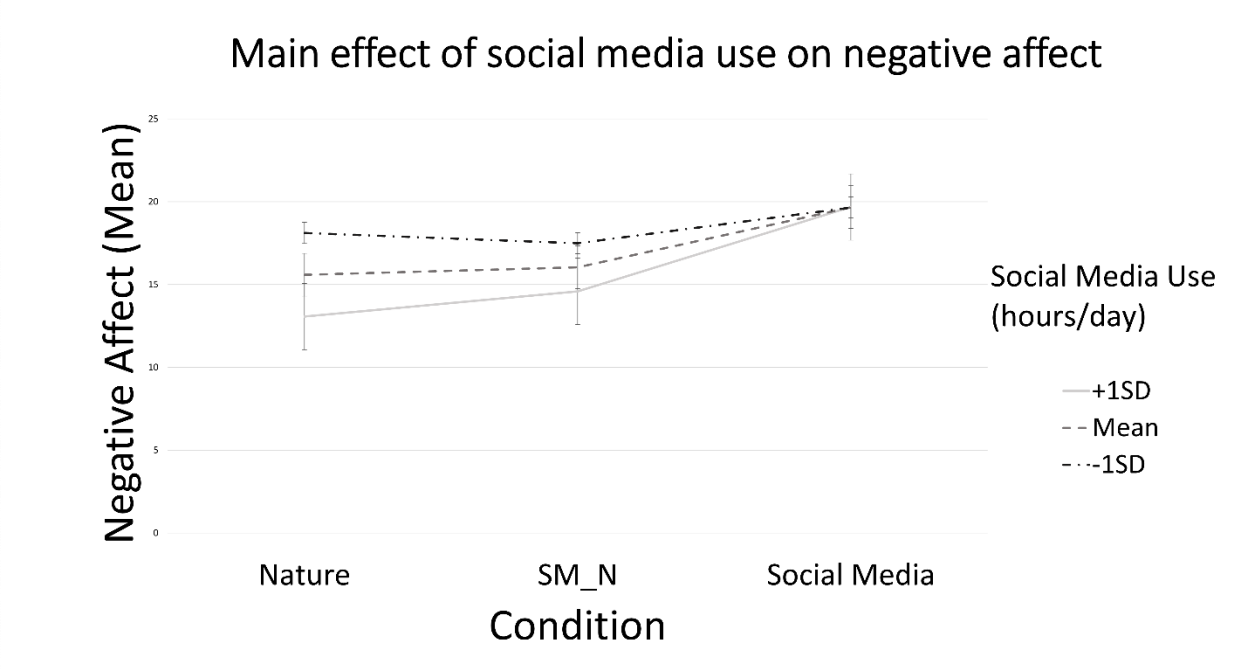
Negative affect across condition



Note. Means, number of participants, and standard error bars for negative affect across each condition.

Figure 4

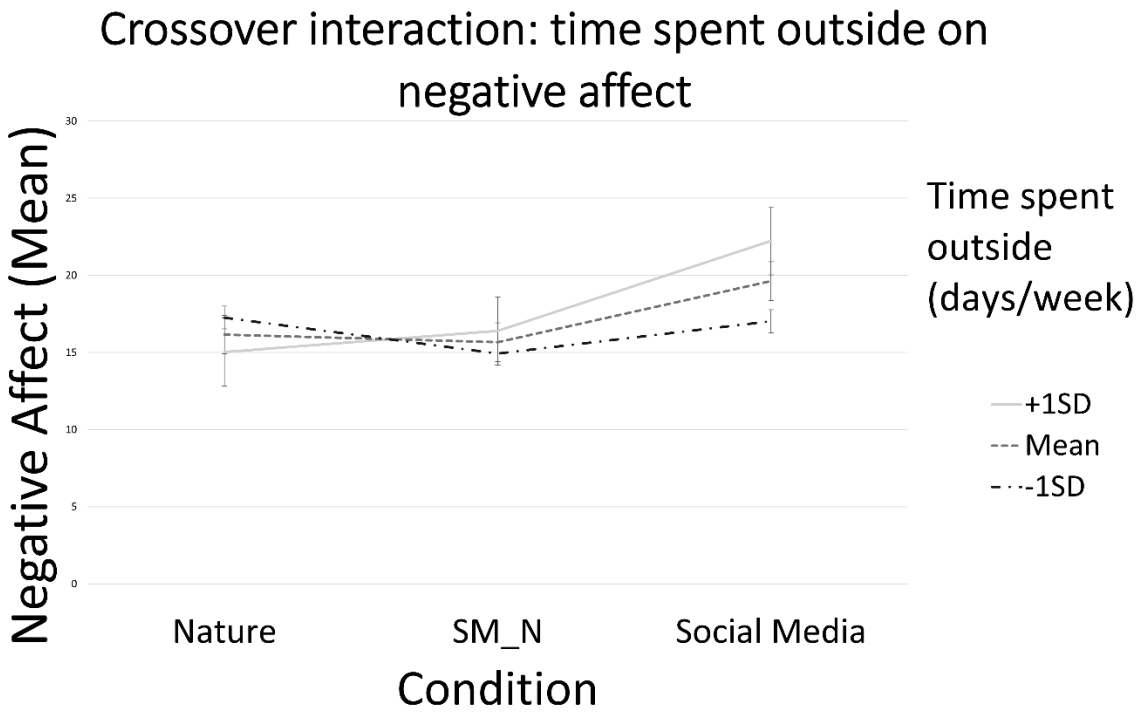
Main effect of social media use on negative affect



Note. Output from PROCESS Macro is plotted as simple slopes with -1 standard deviation, the mean, and +1 standard deviation. Overall, when people tended to use social media more often (+1SD), they experienced less negative affect than those who use social media less (-1SD).

Figure 5

Crossover interaction of time spent outside on negative affect



Note: Output from PROCESS Macro is plotted as simple slopes with -1 standard deviation, the mean, and +1 standard deviation. When people spent more time outside than average (+1SD), they expressed more negative affect after viewing social media whereas when they viewed social media and nature photos, they experienced less negative affect; the opposite is true of those who spent less time outside than average (-1SD).

Appendix A

Open Materials

All images and other materials can be accessed online at https://osf.io/ca53n/.