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Expectations and experiences of screen time, social interaction, and solitude

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ABSTRACT

The current research examined how people forecast and experience screen time, social interaction, and solitude. When participants could freely use their smartphone, they forecasted (Study 1) and experienced (Study 2) better mood for face-to-face conversation, but worse mood for sitting alone. When participants were instructed to engage in specific screen time activities, they forecasted (Study 3) and experienced (Study 4) the best mood after watching television; followed by conversation, texting, and browsing social media (no difference); then sitting alone. Although participants in Studies 1 and 2 ranked conversation as their most preferred activity, participants in Studies 3 and 4 ranked it below television and texting, even though conversation improved mood compared to baseline (Study 4). These findings suggest that people may use their smartphones because they enable them to escape the unpleasant experience of being alone, or because they do not recognize or prioritize the mood benefits of social interaction.

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mood; screen time; smartphone; social interaction; solitude; well-being

Smartphones and other electronic devices represent important opportunities and challenges for well-being. Scholars have suggested that smartphones may negatively impact well-being by displacing time spent with others with more time spent alone (Kushlev & Dunn, 2015; Kushlev, Dwyer, et al., 2019; Turkle, 2011; Twenge, 2017). Yet, smartphones have an undeniable draw – providing an opportunity for distraction and social connection – and account for a large proportion of people’s waking hours. U.S. adults spend nearly four hours a day using their smartphone (Dolan, 2022), less than 40 minutes socializing face-to-face, and about 30 minutes relaxing and thinking¹ (United States Department of Labor, Bureau of the Labor Statistics, 2020). One reason people may use their smartphone so frequently is because they believe it will be a more positive experience than engaging in other activities, such as interacting with a stranger or being alone with their thoughts. But is smartphone use actually more enjoyable than social interaction and solitude, or do people mistakenly believe it to be so? The present research aims to examine how people forecast and experience talking to a stranger, sitting alone with their thoughts, and engaging in different types of screen time.

The underestimated benefits of talking to strangers

People have a fundamental need for social connection (Baumeister & Leary, 1995), so it is no surprise that socializing is rated one of the most enjoyable activities (Kahneman et al., 2004), and setting a goal to spend more time socializing face-to-face may be one way to improve well-being (Rohrer et al., 2018). Happier people are more sociable (Diener & Seligman, 2002; Mehl et al., 2010; Milek et al., 2018), and having more frequent social interactions is associated with greater happiness, well-being, and belongingness – even when interacting with weak ties (Sandstrom & Dunn, 2014b; Sun et al., 2019;

Watson et al., 1992). Previous research has demonstrated that even social interactions with strangers can benefit well-being. For example, coffee shop patrons randomly assigned to engage in conversation with the barista felt happier and more connected compared to those who were told to be as efficient as possible when ordering (Sandstrom & Dunn, 2014a). Similarly, saying “Have a nice day” or “Thank you” to a shuttle driver has been shown to lead to a better mood compared to not engaging with the driver (Gunaydin et al., 2021). Even being acknowledged through eye-contact or smiling from a passerby has led people to feel more connected compared to those who were ignored (Wesselmann et al., 2012).

Unfortunately, the emotional benefits of interacting with strangers are often underestimated. For example, participants in one study felt just as good after interacting with a stranger as participants who interacted with their romantic partner, even though they forecasted interacting with a stranger would be much less enjoyable (Dunn et al., 2007). In a field study of commuters, those assigned to interact with a stranger felt better than those instructed to sit with their thoughts or to commute as normal, even though other commuters expected a more positive experience in solitude (Epley & Schroeder, 2014). People may underestimate the value of conversations with strangers because of worries that the other person will not enjoy the conversation. Yet, these worries decreased after a pleasant conversation with a stranger, suggesting that they were unsubstantiated (Sandstrom & Boothby, 2021; Schroeder et al., 2021).

The aversiveness of solitude

Another reason people may try to avoid spending time alone with their thoughts is that they anticipate its unpleasantness. In past research, participants underestimated their intrinsic motivation (i.e., enjoyment, engagement, interest, lack of boredom) for engaging in a waiting task, forecasting significantly lower intrinsic motivation than they actually experienced after the task (Hatano et al., 2022). Although people may underestimate the benefits of just thinking, people still find it to be unpleasant. For instance, people report feeling less happy while mind-wandering, even if their thoughts are mundane or neutral (Franklin et al., 2013; Killingsworth & Gilbert, 2010), and they feel worse after just thinking compared to engaging in mundane nonsocial activities (Buttrick et al., 2019; Hsee et al., 2010; Wilson et al., 2014). In fact, participants in one study found just thinking to be so aversive that many were willing to self-administer unpleasant electric shocks to distract themselves (Wilson et al., 2014). If participants are willing to use mundane or unpleasant activities as a distraction from being alone with their thoughts, it can be expected that they would be willing to turn to seemingly more desirable activities as well, such as using their smartphone.

The draw of smartphones

Smartphones provide a simple and convenient way for people to avoid seemingly aversive experiences, such as talking to a stranger or just thinking. One reason people may prefer to use their smartphone is because they believe it will be enjoyable. For instance, when asked how they would spend their time if they had five minutes to spare, participants forecasted that they would find it more enjoyable to use their phones or watch television than to think, even though they believed thinking would be a more worthwhile activity (Alahmadi et al., 2017). Another reason people may prefer to use their smartphone is because it enables them to regulate their emotions in both social and nonsocial situations (Pancani et al., 2020). For instance, previous research has shown that loneliness and social anxiety are associated with greater smartphone addiction (Bian & Leung, 2015; Enez Darcin et al., 2016), and proneness to boredom is associated with greater problematic smartphone use (Elhai et al., 2018). Further, having access to a smartphone has been shown to prevent an increase in a stress-related hormone after being ostracized (Hunter et al., 2018), and to decrease anxiety after completing an anxiety-inducing writing task (Panova & Lleras, 2016). Together, these findings suggest that people may use their smartphone to regulate their emotions, which can have both effective and problematic (i.e., addictive) consequences.

Unfortunately, smartphones can also displace in-person interactions that are beneficial for well-being. For example, pairs of strangers in a waiting room randomly assigned to have access to their phones interacted less and exhibited fewer genuine Duchenne smiles than participants who did not have access to their phones (Kushlev, Hunter, et al., 2019). Similarly, when participants were looking for a building on campus, those randomly assigned to carry their phone asked fewer people for directions and felt less socially connected than those who did not carry their phone (Kushlev et al., 2017). Thus, people may mistakenly believe that using their smartphone is more enjoyable than other worthwhile activities, such as face-to-face social interaction or solitude.

The present research

Previous findings suggest that people may prefer their smartphone over solitude and talking to a stranger because they – perhaps mistakenly – expect these activities to be aversive. However, previous research has not directly compared how people expect to experience these different activities, or how they actually experience these activities. Across four studies using a within-person experimental design, the present research aims to examine people's expectations and experiences of engaging in screen time, having a face-to-face conversation with a stranger, and being alone with their thoughts. Because people tend to find solitude aversive and they underestimate the benefits of interacting with strangers, we hypothesized that participants would *forecast* screen time as the most enjoyable, followed by talking to a stranger, and then being alone with their thoughts. However, because people often report enjoying social interactions with strangers more than expected, we hypothesized that participants would *experience* talking to a stranger as the most enjoyable, followed by screen time, and then being alone with their thoughts.

We recognize that screen time is a broad construct that can encompass work, social, and/or leisure activities ranging from passive to active engagement. To address this concern, we first used a more ecologically valid operationalization in which participants were told to use their smartphone as they desired (Studies 1 and 2), thereby allowing us to examine how people forecast and experience using their smartphone as they naturally would. We then used a narrower operationalization by instructing participants to engage in three specific screen time activities – texting, browsing social media, and watching television (Studies 3 and 4) – which allowed us to better understand how people forecast and experience specific types of non-work, smartphone-related activities. Each study was approved by the researcher's university institutional review board before data collection. Below, we report each study's sample determination, measures, manipulations, and exclusions.

Study 1: forecasted smartphone use

Participants

Three-hundred and twenty-four volunteer participants were recruited from public areas on a university campus in the Northeastern United States. The sample size was confined to collection in a single semester. People were eligible to participate in the study if they were over the age of 18 years and on campus at the time the study was conducted. Six participants were excluded for incomplete data and four were excluded because they reported being 17 years old, despite indicating that they were at least 18 years old on the consent form. The final sample included 314 (58.9% female) participants. The average age of the sample was 20.42 years ($SD = 3.12$) and ranged from 18 to 47. The sample was predominately White (69.7%), followed by 15.3% Asian, 6.7% Black, 3.2% Hispanic, 1.0% Pacific Islander, 0.3% Native American, 3.5% were of another racial/ethnic background, and 0.3% did not report their race/ethnicity. We conducted a sensitivity power analysis (G*Power 3; Faul et al., 2007) of a repeated measures analysis of variance (ANOVA) with 95% power ($\alpha = .05$) for each dependent variable, given our final sample size ($N = 314$). We were able to detect omnibus effects of $\eta^2 = .01$ for positive affect ($r = .31$; $\varepsilon = .99$) and negative affect ($r = .34$; $\varepsilon = .98$), and a simple effect of $d = 0.20$.

Procedure and materials

Participants provided electronic informed consent prior to starting the study. Participants imagined that they were participating in a laboratory experiment and the experimenter asked them to engage in three different counterbalanced activities for seven minutes each: (1) “sit alone by yourself” and “just think” (instructions adapted from Wilson et al., 2014), (2) “talk with another participant of this study who you do not know” (instructions adapted from Epley & Schroeder, 2014), and (3) “use your phone however you would like.” Participants were instructed that no technology could be used when sitting alone or having a conversation.²

After imagining each activity, participants forecasted their positive and negative affect using items from the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The measure consisted of four items that capture positive affect (engaged, interested, happy, and excited) and four items that capture negative affect (bored, irritable, sad, and anxious). Participants indicated the extent to which they expected to feel each emotion on a sliding scale ranging from 0 (*Not at all*) to 100 (*Extremely*). Because these factors are orthogonal dimensions of mood, rather than direct opposites of each other (Watson et al., 1988), the positive affect ($\alpha = .81-.84$) and negative affect ($\alpha = .58-.67$) items were averaged separately to create scale totals with higher scores indicating greater affect.³

After imagining all three activities, participants were asked to rank the scenarios in order of their anticipated preference from their most (first) to their least (third) preferred by dragging them into their desired order. Lower scores indicate better ranking. Finally, participants reported demographic information and were thanked for their participation.

Results

Analyses were conducted using IBM SPSS, version 25. See Table 1 for summarized results of reported affect for Studies 1–4. Detailed statistical results (including post hoc results) are provided in the supplemental materials.⁴ In Study 1, a repeated-measures ANOVA revealed a main effect of activity on forecasted positive affect, $F(2, 314) = 141.80, p < .001, \eta_p^2 = .31$, and negative affect, $F(1.96, 314) = 50.95, p < .001, \eta_p^2 = .14$. Pairwise comparisons with a Bonferroni correction for multiple tests revealed that participants forecasted that having a face-to-face conversation with a stranger would elicit the most positive affect, followed by using their smartphone, then sitting alone (Figure 1a). They also forecasted that sitting alone would elicit the most negative affect, followed by having a face-to-face conversation with a stranger and using their smartphone (no difference). Furthermore, a test of Friedman’s two-way analysis of variance by ranks revealed that when participants ranked the activities, they forecasted preferring to have a face-to-face conversation with a stranger, followed by using their smartphone, then sitting alone, $\chi^2(2, N = 314) = 74.98, p < .001$. See Table 2 for summarized results of rank-ordered preference for Studies 1–4.

Discussion

Overall, participants forecasted that they would enjoy and prefer a face-to-face conversation with a stranger the most, followed by using their smartphone, then sitting alone. These findings do not support our hypothesis that participants would expect using their smartphone to be more enjoyable than having a face-to-face conversation with a stranger. Further, these findings contradict previous research claiming that smartphones are anticipated to be preferred to social interactions. One explanation for this finding is that participants were asked to indicate their forecasted enjoyment of these activities in succession, and to actively compare these activities so they could rank their preference. By actively weighing the costs and benefits of these different activities, participants may have given more consideration to how they have previously felt when engaging in these activities, and as such, may have remembered the benefits of talking to

Table 1. Means, Standard Deviations, and Confidence Intervals of Affect Forecasts and Experiences for Studies 1–4.

Activity	Positive Affect		Negative Affect	
	<i>M</i> (<i>SD</i>)	95% CI	<i>M</i> (<i>SD</i>)	95% CI
Study 1: Forecast (<i>n</i> = 314)				
Alone	28.94 (20.99) ^c	[26.61, 31.27]	31.90 (19.27) ^a	[29.77, 34.04]
Conversation	51.81 (20.45) ^a	[49.54, 54.08]	22.20 (14.09) ^b	[20.64, 23.76]
Smartphone	32.98 (20.35) ^b	[30.72, 35.24]	22.01 (15.58) ^b	[20.28, 23.74]
Study 2: Actual Experience (<i>n</i> = 210)				
Alone	30.19 (19.68) ^c	[27.51, 32.87]	26.64 (14.10) ^a	[24.72, 28.56]
Conversation	61.35 (18.14) ^a	[58.88, 63.82]	10.48 (10.50) ^c	[9.05, 11.91]
Smartphone	41.83 (19.39) ^b	[39.19, 44.47]	19.31 (13.71) ^b	[17.44, 21.17]
Study 3: Student Forecast (<i>n</i> = 271)				
Alone	29.83 (20.51) ^c	[27.38, 32.28]	34.37 (22.12) ^a	[31.72, 37.02]
Conversation	51.83 (22.13) ^a	[49.18, 54.48]	23.53 (15.36) ^b	[21.69, 25.37]
Social Media	39.90 (20.94) ^b	[37.39, 42.40]	24.70 (18.06) ^b	[22.54, 26.86]
Texting	44.21 (24.66) ^b	[41.26, 47.16]	24.11 (18.11) ^b	[21.95, 26.28]
Television	55.14 (24.02) ^a	[52.27, 58.01]	15.52 (14.26) ^c	[13.82, 17.23]
Study 3: MTurk Forecast (<i>n</i> = 356)				
Alone	42.45 (27.73) ^d	[39.56, 45.34]	33.62 (24.16) ^a	[31.10, 36.14]
Conversation	57.58 (24.56) ^{bc}	[55.02, 60.14]	26.27 (22.04) ^b	[23.97, 28.56]
Social Media	58.70 (25.16) ^b	[56.07, 61.32]	21.78 (23.17) ^c	[19.36, 24.19]
Texting	55.46 (26.16) ^c	[52.73, 58.18]	24.24 (23.90) ^{bc}	[21.75, 26.73]
Television	64.52 (22.43) ^a	[62.18, 66.86]	18.95 (22.02) ^d	[16.66, 21.25]
Study 4: Actual Experience (<i>n</i> = 107)				
Baseline	52.25 (20.12) ^{bc}	[48.40, 56.12]	22.03 (14.11) ^{ab}	[19.32, 24.73]
Alone	37.19 (22.21) ^e	[32.94, 41.45]	23.56 (16.99) ^a	[20.31, 26.82]
Conversation	57.68 (21.51) ^a	[53.56, 61.81]	10.84 (9.96) ^d	[8.93, 12.75]
Social Media	44.22 (22.26) ^d	[39.95, 48.49]	18.77 (15.43) ^{bc}	[15.81, 21.73]
Texting	47.56 (23.95) ^{cd}	[42.97, 52.15]	16.56 (14.58) ^c	[13.77, 19.36]
Television	54.62 (22.74) ^{ab}	[50.27, 58.98]	11.12 (11.78) ^d	[8.86, 13.38]

Note. Values for a particular measure in a particular study with different superscripts are significantly different from one another. Superscripts are listed in decreasing value with “a” as the highest value. All mean differences between groups are significant at the $p = .042$ level or lower. *M* = Mean, *SD* = Standard deviation, CI = Confidence Interval, MTurk = Amazon’s Mechanical Turk.

strangers. This could be contrasted with one’s day-to-day life, where a person’s decision to use their smartphone is made automatically, and other activities (like talking to strangers) are not considered.

However, participants did forecast and rank sitting alone as the least desirable activity. This finding supports our hypothesis and is in line with previous research suggesting that being alone with one’s thoughts is an aversive experience. In the present context, this finding is important because it may suggest that one reason why people engage in screen time is that it allows them to avoid solitude. To test our second hypothesis, Study 2 examines how people *experience* smartphone use, having a face-to-face conversation with a stranger, and sitting alone with their thoughts.

Study 2: experienced smartphone use

Participants

Two-hundred and thirteen participants were recruited from a student subject pool at a Northeastern United States university. The sample size was confined to collection in a single semester. Participants were compensated with partial course credit. Three participants were excluded due to incomplete data, resulting in a final sample of 210 (70.0% female) participants. The average age of the sample was 18.67 years ($SD = 1.04$) and ranged from 18 to 26. The sample was predominately White (62.4%), followed by 20.7% Asian, 6.1% Hispanic, 5.6% Black, 3.8% reported another race/ethnicity, and 1.4% did not report their race/ethnicity. We conducted a sensitivity power analysis (G*Power 3; Faul et al., 2007) of a repeated measures ANOVA with 95% power ($\alpha = .05$) for each dependent variable, given our final

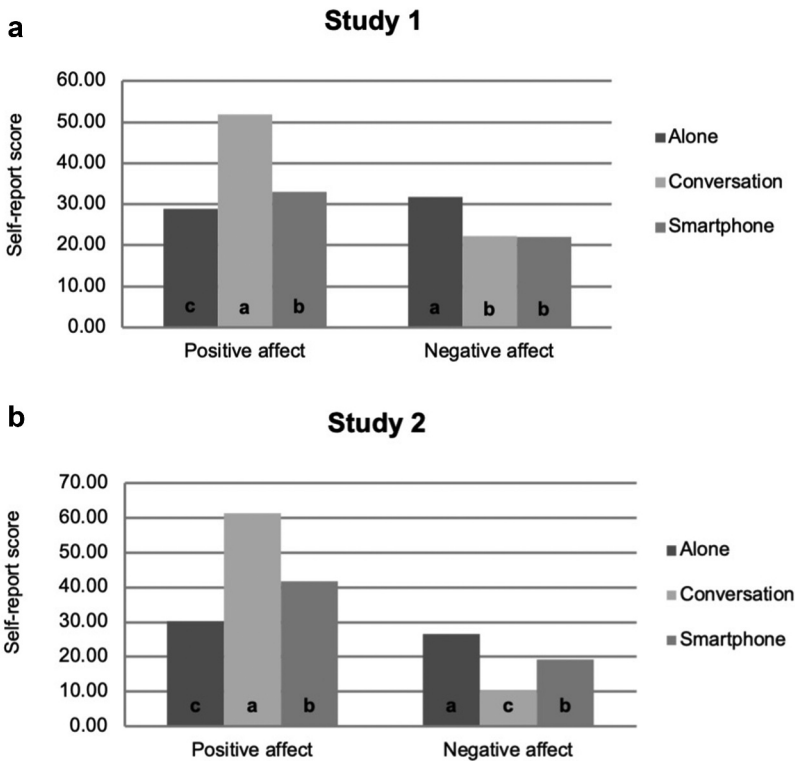


Figure 1. Positive and Negative Affect for Studies 1 and 2. Forecasted (a) and experienced (b) positive and negative affect after sitting alone, having a face-to-face conversation with a stranger, and using their smartphone. Within each measure, bars with different letters are significantly different from one another. Letters within each bar are listed in decreasing value with “a” as the highest value. All mean differences between groups are significant at the $p = .042$ level or lower. Standard error bars depicting between-subject variability are *not* included in this graph because this data is within-subjects.

Table 2. Means and Standard Deviations of Activity Rankings for Studies 1–4.

Activity	Study 1 Forecast ($n = 314$)	Study 2 Actual Experience ($n = 210$)	Study 3		Study 4 Actual Experience ($n = 107$)
			Student Forecast ($n = 271$)	MTurk Forecast ($n = 356$)	
Alone	2.36 (0.79) ^c	2.75 (0.54) ^c	3.76 (1.35) ^d	3.46 (1.44) ^c	4.25 (1.15) ^c
Conversation	1.68 (0.79) ^a	1.45 (0.66) ^a	3.65 (1.37) ^d	4.04 (1.25) ^d	2.98 (1.36) ^b
Smartphone	1.96 (0.72) ^b	1.80 (0.60) ^b	—	—	—
Social Media	—	—	3.07 (1.17) ^c	2.82 (1.28) ^b	3.31 (1.14) ^b
Texting	—	—	1.98 (1.12) ^a	2.50 (1.12) ^{ab}	2.36 (1.17) ^a
Television	—	—	2.54 (1.21) ^b	2.17 (1.10) ^a	2.10 (1.17) ^a

Note. Lower score indicates higher ranking. Values in a column with different superscripts are significantly different from one another. Superscripts are listed in increasing value with “a” as the lowest value for that column. All mean differences between groups are significant at the $p = .038$ level or lower. MTurk = Amazon’s Mechanical Turk.

sample size ($N = 210$). We were able to detect omnibus effects of $\eta^2 = .01$ for positive affect ($r = .64$; $\epsilon = .96$) and negative affect ($r = .61$; $\epsilon = .97$), and a simple effect of $d = 0.25$.

Materials and procedure

Participants provided written informed consent prior to starting the laboratory study.⁵ Using the instructions from Study 1, participants completed three counterbalanced activities for seven minutes each: (1) “sit alone by yourself” and “just think,” (2) “talk with someone who you do not know,” and (3)

“use your phone however you would like.” The conversation partner was drawn from a pool of 10 research assistants who were instructed to converse with the participant as they naturally would about any topic.

After engaging in each activity, participants reported their current positive affect ($\alpha = .79-.83$) and negative affect ($\alpha = .43-.60$)⁶ with the same measures used in Study 1. Participants ranked the activities from their most preferred (first) to their least preferred (third) using the same method as in Study 1. Finally, participants reported demographic information and were thanked for their participation.

Results

A repeated-measures ANOVA revealed a main effect of activity on experienced positive affect, $F(1.91, 210) = 313.05, p < .001, \eta_p^2 = .60$, and negative affect, $F(1.95, 210) = 179.88, p < .001, \eta_p^2 = .46$. Pairwise comparisons with a Bonferroni correction for multiple tests revealed that participants experienced the most favorable affect (highest positive affect, lowest negative affect) when having a face-to-face conversation with a stranger, followed by using their smartphone, and sitting alone elicited the least favorable affect (lowest positive affect, highest negative affect; [Figure 1b](#)). A Friedman test of activity rankings revealed that participants preferred having a face-to-face conversation with a stranger, followed by using their smartphone, then sitting alone, $\chi^2(2, N = 210) = 190.66, p < .001$.

Discussion

In Study 2, participants enjoyed and preferred having a face-to-face conversation with a stranger the most, followed by using their smartphone, and then sitting alone. This finding supports our hypothesis and is in line with previous research suggesting that people like social interactions with strangers and dislike being alone with their thoughts.

One advantage of Studies 1 and 2 is that participants forecasted or experienced using their smartphone as they typically would, which likely included switching between activities – such as texting, using social media, or browsing the internet. However, this study design combined activities that may have little or nothing to with each other (e.g., work, social, and/or leisure activities), which may make these findings less clear and more difficult to interpret. For instance, texting a friend may be an active and desirable smartphone activity, whereas replying to an e-mail may be an active but aversive activity. As a result, participants may have forecasted or engaged in activities that were aversive or unpleasant, thereby making talking to a stranger a better alternative. To address this concern, we conducted two additional studies (Studies 3 and 4) that separately compared three desirable smartphone-related activities – texting, social media use, and watching television – to having a face-to-face conversation with a stranger and sitting alone. However, given the nuanced ways in which people can engage in these different types of activities, we did not make specific hypotheses as to how they would compare to each other.

Study 3: forecasted texting, social media, and television

Participants

Two samples of participants were recruited for the third study. First, 271 volunteer participants (69% female) were recruited from public areas on a university campus in the Northeastern United States (referred to as “student sample”). The sample size was confined to collection in a single semester. Individuals were eligible to participate in the study if they were over the age of 18 years and on campus during recruitment. The average age was 20.16 years ($SD = 2.00$) and ranged from 18 to 33. The sample was predominately White (73.4%), followed by 15.5% Asian, 4.8% Black, 1.5% Hispanic, 0.7% Pacific Islander, 3.3% reported another racial/ethnic background, and 0.7% did not report their race/ethnicity. We conducted a sensitivity power analysis (G*Power 3; Faul et al., 2007) of a repeated measures

ANOVA with 95% power ($\alpha = .05$) for each dependent variable, given our final sample size ($N = 271$). We were able to detect omnibus effects of $\eta^2 = .01$ for positive affect ($r = .41$; $\varepsilon = .96$) and negative affect ($r = .42$; $\varepsilon = .91$), and a simple effect of $d = 0.22$.

To help strengthen ecological validity with a non-student sample, 356 participants (55.6% male) living in the United States were recruited online through Amazon's Mechanical Turk (MTurk; referred to as "MTurk sample"). The sample size was limited by compensatory resources and participants received \$0.50 for their participation. The average age was 35.62 years ($SD = 11.14$) and ranged from 19 to 68. The sample was predominately White (62.6%), followed by 19.9% Asian, 7.6% Black, 4.8% Hispanic, 3.4% Native American, and 1.7% were another racial/ethnic background. We conducted a sensitivity power analysis (G*Power 3; Faul et al., 2007) of a repeated measures ANOVA with 95% power ($\alpha = .05$) for each dependent variable, given our final sample size ($N = 356$). We were able to detect omnibus effects of $\eta^2 = .004$ for positive affect ($r = .66$; $\varepsilon = .89$) and $\eta^2 = .003$ for negative affect ($r = .76$; $\varepsilon = .88$), and a simple effect of $d = 0.19$.

Materials and procedure

Participants provided electronic informed consent prior to starting the study. Participants in both samples imagined that they were participating in a laboratory experiment and the experimenter asked them to engage in five different counterbalanced activities for ten minutes each: (1) "sit alone by yourself" and "just think," (2) "talk with another participant of this study who you do not know," (3) "text anybody you want," (4) "watch a television show of your choice," and (5) "browse your social media platforms" like "Twitter, Facebook, and Instagram." In the conversation and sitting alone scenarios, participants were instructed that they were not allowed to use technology. In the texting, television, and social media scenarios, participants were instructed to not use the technology for any other purposes. In the social media scenario, participants were instructed to not use the direct messaging features to engage in a private conversation.

After imagining each activity, participants completed the same measures of positive affect ($\alpha_{\text{student}} = .82-.90$; $\alpha_{\text{MTurk}} = .84-.90$) and negative affect ($\alpha_{\text{student}} = .63-.74$; $\alpha_{\text{MTurk}} = .81-.90$) as in Studies 1 and 2. Participants ranked the activities from their most preferred (first) to their least preferred (fifth) using the same method as in Studies 1 and 2. Finally, participants reported demographic information and were thanked for their participation.

Results

A repeated-measures ANOVA revealed a main effect of activity on forecasted positive affect for both the student sample, $F(3.85, 271) = 69.39$, $p < .001$, $\eta_p^2 = .20$, and the MTurk sample, $F(3.56, 356) = 67.40$, $p < .001$, $\eta_p^2 = .16$. There was also a main effect of activity on forecasted negative affect for the student sample, $F(3.65, 271) = 54.27$, $p < .001$, $\eta_p^2 = .17$, and the MTurk sample, $F(3.53, 356) = 55.00$, $p < .001$, $\eta_p^2 = .13$.

Pairwise comparisons with a Bonferroni correction for multiple tests revealed that both samples forecasted that watching television would elicit the most favorable affect (highest positive affect, lowest negative affect) and that sitting alone would elicit the least favorable affect (lowest positive affect, highest negative affect; Figures 2(a, b)). Specifically, participants in the student sample forecasted the *highest* positive affect for watching television and having a face-to-face conversation with a stranger (no difference), followed by texting and using social media (no difference), then sitting alone. Students also forecasted the *lowest* negative affect for watching television; followed by having a face-to-face conversation with a stranger, texting, and using social media (no difference); then sitting alone. Participants in the MTurk sample forecasted the *highest* positive affect for watching television; followed by using social media, having a face-to-face conversation with a stranger, and texting (no difference); then sitting alone. MTurkers also forecasted the *lowest* negative affect for watching

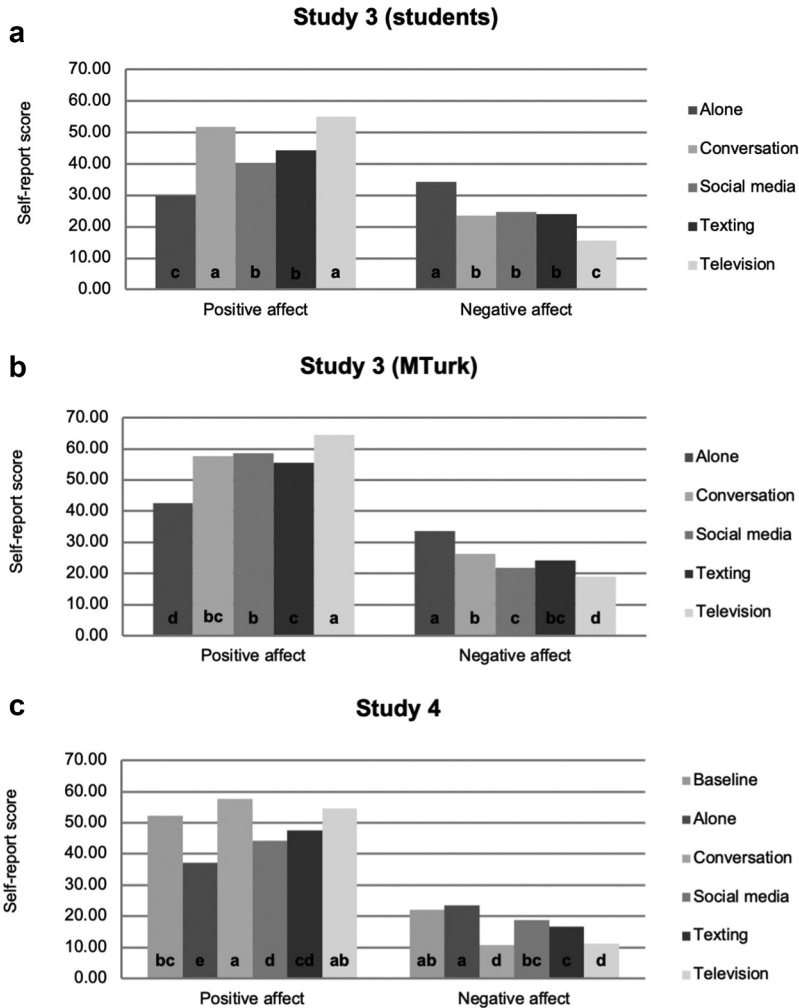


Figure 2. Positive and Negative Affect for Studies 3 and 4. Forecasted (a and b) and experienced (c) positive and negative affect after baseline (c only), sitting alone, having a face-to-face conversation with a stranger, using social media, texting, and watching television. Within each measure, bars with different letters are significantly different from one another. Letters within the bars are listed in decreasing value with “a” as the highest value. All mean differences between groups are significant at the $p = .042$ level. Standard error bars depicting between-subject variability are *not* included in this graph because this data is within-subjects. MTurk = Amazon’s Mechanical Turk.

television; followed by using social media, texting, and having a face-to-face conversation with a stranger (no difference); then sitting alone.

Finally, results from a Friedman test revealed that watching television, texting, and using social media were ranked as the most preferred activities, and having a face-to-face conversation with a stranger and sitting alone were ranked as the least preferred by both the student sample, $\chi^2(4, N = 271) = 244.95, p < .001$, and the MTurk sample, $\chi^2(4, N = 356) = 322.78, p < .001$.

Discussion

Participants in both samples forecasted that they would enjoy watching television the most; followed by having a face-to-face conversation with a stranger, using social media, and texting; and sitting alone as the least enjoyable activity. However, when asked to rank these activities, participants forecasted to

prefer watching television and texting, followed by using social media, having a face-to-face conversation with a stranger, and sitting alone as the least preferred. These findings partially support our hypothesis and previous research suggesting that people expect screen time to be more enjoyable than having a face-to-face conversation with a stranger.

As in Study 1, sitting alone was forecasted and ranked as the least desirable activity. This finding further supports our hypothesis and previous research suggesting that being alone with one's thoughts is an aversive experience, which may lead people to engage in screen time to escape solitude. To test our second hypothesis, Study 4 examines how people *experience* different screen time activities compared to having a face-to-face conversation with a stranger and sitting alone with their thoughts.

Study 4: experienced texting, social media, and television

Participants

One-hundred and seven participants (59.8% male) were recruited from a student subject pool at a Northeastern United States university. The sample size was confined to collection in a single semester. Participants were compensated with partial course credit. The average age was 19.32 years ($SD = 1.94$) and ranged from 18 to 32. The sample was predominately White (70.1%), followed by 12.1% Asian, 9.3% Black, 3.7% Hispanic, and 4.7% were another racial/ethnic background. We conducted a sensitivity power analysis (G*Power 3; Faul et al., 2007) of a repeated measures ANOVA with 95% power ($\alpha = .05$) for each dependent variable, given our final sample size ($N = 107$). We were able to detect omnibus effects of $\eta^2 = .01$ for positive affect ($r = .79$; $\epsilon = .92$) and negative affect ($r = .75$; $\epsilon = .80$), and a simple effect of $d = 0.35$.

Materials and procedure

Participants provided written informed consent prior to starting the study. Participants entered the laboratory and completed baseline measures of positive and negative affect using the same materials as in Studies 1–3 (see Footnote 5). Using the instructions from Study 3, participants completed five counterbalanced activities for seven minutes each: (1) “sit alone by yourself” and “just think,” (2) “talk with another participant of this study who you do not know,” (3) “text anybody you want,” (4) “watch a television show of your choice” (via Netflix), and (5) “browse your social media platforms” like “Twitter, Facebook, and Instagram.” The conversation partner was a participant in a different study in our lab. Thus, each participant had a different conversation partner with whom they could converse about any topic.

After engaging in each activity, participants reported their current positive affect ($\alpha = .85$ – $.89$) and negative affect ($\alpha = .52$ – $.69$) with the same measures used in Studies 1–3 and at baseline. Participants ranked the activities from their most preferred (first) to their least preferred (fifth) using the same method as in Studies 1–3. Finally, participants reported demographic information and were thanked for their participation.

Results

A repeated-measures ANOVA revealed a main effect of activity on positive affect, $F(4.59, 107) = 43.22$, $p < .001$, $\eta_p^2 = .29$, and negative affect, $F(4.02, 107) = 36.98$, $p < .001$, $\eta_p^2 = .26$). Pairwise comparisons with a Bonferroni correction for multiple tests revealed that having a face-to-face conversation with a stranger and watching television elicited the most favorable affect (highest positive affect, lowest negative affect), and sitting alone elicited the least favorable affect (lowest positive affect, highest negative affect; Figure 2c). Specifically, participants reported the *highest* positive affect after having a face-to-face conversation with a stranger and watching television (no difference); followed by texting and using social media (no difference); then sitting alone. Participants also reported the *lowest*

negative affect after having a face-to-face conversation with a stranger and watching television (no difference); followed by texting and using social media (no difference); then sitting alone.

When compared to baseline, having a face-to-face conversation with a stranger led to the most favorable affect by *increasing* positive affect and *decreasing* negative affect. Watching television and texting did not change positive affect but *decreased* negative affect. Finally, using social media and sitting alone *decreased* positive affect but did not change negative affect.

In contrast to the reports of experienced affect, results from a Friedman test revealed that participants preferred watching television and texting, followed by having a face-to-face conversation with a stranger and using social media, then sitting alone, $\chi^2(4, N = 107) = 123.46, p < .001$.

Discussion

Participants enjoyed having a face-to-face conversation with a stranger and watching television the most, followed by texting and using social media, and then sitting alone. Further, having a face-to-face conversation with a stranger improved overall mood (increased positive affect and decreased negative affect) compared to baseline. Even after experiencing the most favorable affect while having a face-to-face conversation with a stranger, participants preferred watching television and texting over having a face-to-face conversation with a stranger and using social media, and reported sitting alone as their least preferred activity. These findings partially support our hypothesis and previous research suggesting that people enjoy having a face-to-face conversation with a stranger more than screen time. However, it seems that even when people enjoy talking to a stranger, they still may not prefer it over screen time.

As in Study 2, sitting alone was experienced and ranked as the least desirable activity and overall worsened participants' mood compared to baseline. This finding further supports our hypothesis and previous research suggesting that being alone with one's thoughts is an aversive experience that people may try to avoid by turning to their screens.

General discussion

Although smartphone use often displaces social interaction in daily life, researchers are just beginning to explore people's expectations for and experiences of using one's smartphone compared to social interaction and solitude. On the one hand, the present research suggests that solitude is less desirable than engaging in smartphone-related activities. Participants in Studies 1 and 3 forecasted that sitting alone would be less enjoyable than using their smartphone as desired, watching television, texting, using social media, and having a face-to-face conversation with a stranger, and participants in Studies 2 and 4 experienced sitting alone as the least enjoyable of these activities. These findings are in line with previous research demonstrating that being alone with one's thoughts is an aversive experience (e.g., Wilson et al., 2014), especially when not freely chosen (Nguyen et al., 2022). In the context of daily life, this finding suggests that one reason why people may use their smartphone is because it allows them to escape the unpleasant experience of being alone with their thoughts.

On the other hand, the current findings comparing smartphone-related activities to social interaction are less clear. Contrary to our prediction, participants in Studies 1 and 3 forecasted face-to-face conversation with a stranger to be more enjoyable than smartphone-related activities, even though they also ranked texting, watching television, and using social media as preferable (Study 3). In Studies 2 and 4, participants experienced having a face-to-face conversation with a stranger as the most enjoyable activity, and it improved mood compared to baseline (Study 4). Despite this, participants in Study 4 still ranked watching television and texting as preferable to having a face-to-face conversation with a stranger. These results suggest that although face-to-face social interaction is beneficial for mood, people may not recognize or prioritize this information when actively deciding which activities they prefer.

Strengths, limitations, and future directions

Across all four studies, we used a repeated-measures design that allowed us to compare within-person differences in mood, as well as how people consciously rank screen time, social interaction, and solitude. This design is a strength because it provides insight into the information people may be weighing when making decisions in their daily lives. For example, our findings demonstrate that even when people report being in a better mood after having a conversation, they may not prioritize this information when actively deciding whether to use their smartphone, talk to a stranger, or sit in silence. This finding is in line with other research suggesting that people may avoid talking to strangers because they are worried that the other person would not be interested (Sandstrom & Boothby, 2021; Schroeder et al., 2021). However, the repeated-measures design may also be a limitation because it may have contributed to demand characteristics by exposing participants to all conditions. We counter-balanced the conditions to help mitigate this concern, but it is possible that participants guessed the hypotheses early on and, consequently, may have responded in ways that were socially desirable or that they believed confirmed the researchers' hypotheses. Future research could address this concern by using a between-subjects design in which participants are randomly assigned to engage in screen time, social interaction, or solitude.

Another strength of this research is that we used interactions with strangers – rather than known or close others – as a conservative comparison experience. Although interactions with strangers are benign and tend to enhance well-being (Van Lange & Columbus, 2021), people tend to worry about interacting with strangers (Sandstrom & Boothby, 2021; Schroeder et al., 2021) and underestimate their value (Dunn et al., 2007; Epley & Schroeder, 2014), suggesting that people would find conversations with known or close others as *even more* enjoyable than with strangers. However, most of our samples (aside from the MTurk sample in Study 3) were comprised of college students and the (forecasted) strangers were also college students. As a result, participants may have perceived the stranger as a similar other in a setting (college campus) where social interaction is encouraged, leading them to expect or experience the interaction as more enjoyable. To ensure the generalizability of these findings, future research could examine if people still report more enjoyment when interacting with non-similar strangers than when engaging in screen time, especially in situations where social interaction is not the norm.

Despite the strengths of the current research, these findings should be interpreted with consideration for the research's limitations. One limitation is that in the solitude condition, participants were instructed to “sit alone” and “just think.” We had chosen these instructions because they have been used in previous research demonstrating that people do not like to be left alone with nothing to do but think (Wilson et al., 2014). However, by explicitly instructing participants to engage in thinking when doing so is known to be unpleasant, we may have inadvertently made the solitude condition especially unpleasant. Thus, future research interested in how people experience solitude should consider allowing participants autonomy in how they spend this time.

Another limitation of this research is the low internal reliability of the negative affect measure across the four studies ($\alpha = .43-.90$), especially for Study 2 ($\alpha = .43-.60$). We addressed this concern by removing one of the items from the negative affect composite in Study 2, which did not change the pattern or statistical significance of the results (see Footnote 6). In contrast, the positive affect measure had high internal reliability across the four studies ($\alpha = .79-.90$), and the pattern of findings for positive and negative affect were as expected (i.e., when positive affect was higher, negative affect was lower). We believe that despite the low internal reliability of the negative affect measure, these findings are still interpretable and have merit, especially when the results of all four studies are considered. However, future research examining participants' mood after engaging in screen time, social interaction, and/or solitude could use a more reliable negative affect measure that holistically captures the construct.

Overall, our findings suggest that people may engage in screen time in daily life because it allows them to escape the unpleasant experience of being alone with their thoughts, or because they do not recognize or

prioritize the mood benefits of face-to-face social interaction. Future research could test the extensiveness of these conclusions by assessing people's motivations for using their smartphones in daily life. Further, researchers could build on these findings by examining the individual differences that may make screen time especially desirable – such as higher trait loneliness, introversion, or neuroticism – as well as the mechanisms that may lead people to engage in screen time – such as worries about talking to strangers, desire for solitude, or momentarily prioritizing other goals (e.g., to check Twitter to stay up to date on current events). It seems that increasing face-to-face social interaction in lieu of solitary or device-centered activities would be beneficial for well-being, but research should continue to investigate the benefits of face-to-face social interaction and the barriers that may keep people from reaping these benefits in daily life.

Notes

1. The reported statistics are from before the start of the COVID-19 pandemic, as are the data from the present research. However, it is important to note that early reports suggest that people are spending a greater amount of time on technology during the COVID-19 pandemic (Koeze & Popper, 2020).
2. The exact instructions for the activities in Studies 1–4 are available online (<https://osf.io/2kybt/>) and in the supplemental materials.
3. Although not a focus of this paper, participants also reported their forecasted and experienced loneliness in Studies 1 and 2. These data were analyzed and are available online (<https://osf.io/2kybt/>) and in the supplemental materials.
4. If Mauchly's Test of Sphericity was significant, then the assumption of sphericity was violated and a Greenhouse-Geisser correction was used. However, because Greenhouse-Geisser is a conservative correction, when its epsilon was greater than 0.75 the more liberal Huynh-Feldt correction was used (see Table S1).
5. Before engaging in the activities, participants completed additional measures of personality, loneliness, narcissism, and social phobia that have not been analyzed. These survey measures are available online (<https://osf.io/2kybt/>).
6. Because internal reliability of the negative affect scale was low, further examination of the scale revealed that removing the "boredom" item would increase reliability to .57–.66. Thus, we ran all reported hypothesis tests with the "boredom" item removed and found that this item did not change the pattern or statistical significance of the results. Thus, we retained "boredom" in the negative affect composite in all reported statistics. Results with the "boredom" item removed can be found in the supplemental materials (Tables S2 and S4).

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Data availability statement

The data and materials described in this article are openly available online at <https://osf.io/2kybt/>

Open scholarship



This article has earned the Center for Open Science badges for Open Data and Open Materials through Open Practices Disclosure. The data and materials are openly accessible at <https://osf.io/pqsd2>

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