Tapping into feelings: Exploring Smartphone Use in Emotion Suppression and

Expression - An ESM Study

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Abstract

Drawing from an intensive longitudinal study with a mixed-methods design involving both experience sampling and passive smartphone monitoring (N = 1315, > 60K data points), this study examines the within-person cross-lagged associations between adults' self-reported use of the smartphone for expressing and suppressing negative emotions and their negative affect. Results show adults rarely report using their smartphone for emotion regulation, for both expressing (3.77% of times) and suppressing negative emotions (6.84% of times). In line with expectations, we found that when individuals experienced an increase in negative affect, they were more likely to report having used their smartphone to regulate negative emotions. However, contrary to expectations, we find no meaningful change in negative affect following the engagement in emotion regulation strategies through smartphone media. Additionally, we investigate the role of passively monitored smartphone activities, namely duration of chats and social media use, and find that such activities do not mediate the association between emotion regulation behaviors and changes in affect. Taken together, these results suggest that media selection drives the association between emotion regulation strategies (through smartphones) and negative affect and that engaging in expression and suppression of emotions via smartphone use might not be beneficial.

Introduction

Smartphones are versatile instruments that people carry close to or on their bodies (Schrock, 2015) and that offer their users 24/7 access to a wide range of mobile applications. Amongst the many uses and affordances of smartphone technology, they can be used as means to expressing - but also suppressing - one's negative emotions. Emotion expression and suppression are frequent emotion regulation strategies employed in everyday life to manage negative emotions. Interestingly, these strategies seem to promote very different outcomes: suppressing emotions is generally understood as a maladaptive emotion strategy that hinders well-being, while expressing emotions is generally associated with beneficial effects (Cameron & Overall, 2018; Chervonsky & Hunt, 2017).

Over the past decade, researchers have considered the role that smartphone use might play in the everyday regulation of psychological states (Wolfers & Schneider, 2021). Smartphones lend themselves well to emotion regulation. After all, their portability, availability and multimediality (Schrock, 2015), affords anytime, anyplace engagement in various activities, ranging from social interaction through mobile messengers to the consumption of entertainment content on mobile video apps. We may thus expect that when people experience negative emotions, they are highly likely to use their smartphone to express or suppress negative emotion (Wolfers & Schneider, 2021). Despite the value of past research in this area, it remains uncertain how frequently people use their smartphone for expressing and suppressing negative emotions, and whether these differential effects on well-being manifest similarly when done via a smartphone. The two primary aims of this study are to explore the prevalence of the use of the smartphone to regulate negative emotions, and to test whether expressing and suppressing negative emotion leads to differential impact on affective well-being.

According to media effects theory, and in line with Internet-Enhanced Self-Disclosure hypothesis (P. M. Valkenburg & Peter, 2007), it is likely that smartphones will be used differently to express and to suppress a negative affective state. Smartphone activities that facilitate social interaction (e.g., mobile messaging) lend greater opportunity for the expression of negative emotions through intimate self-disclosure, whereas in line with theories on mood management (Knobloch-Westerwick, 2013; Reinecke, 2016), passive use of social media may lend greater opportunity for suppressing negative emotions (Escobar-Viera et al., 2018). This presents an interesting possibility: perhaps the differential effects of expressing versus suppressing negative emotions are explained by differential tendencies in smartphone use. It's plausible that individuals inclined to express negative emotions lean towards apps that facilitate social interaction, while those seeking to suppress such emotions may be more oriented toward activities like passive social media engagement. It is then by employing these regulatory strategies within these applications and activities may significantly contribute to the desired affective outcomes. Since this mediating effect has not been previously explored, the third objective of this study is to investigate precisely this aspect.

The present study tackles these research questions by drawing from data collected in an intensive longitudinal study that employed a mixed-methods design. Participants were a large adult group (N = 1315) that provided over 60,000 data points via experience sampling, with a subset 691 individuals additionally providing passively monitored smartphone use data. This high quality dataset enables us to accurately achieve our first aim of better understanding how often people use their smartphone to express and suppress negative emotion in everyday life. Moreover, it enables us to robustly test our additional aims: to explore the complex interplay between these emotion regulation techniques and negative affect over time (shedding light on the

(bi-) directionality of these relationships), and to investigate whether specific smartphone-related activities mediate the associations between smartphone-based emotional regulation and fluctuations in negative affect. Passively monitored smartphone data plays a critical role here, by specifying how participants used their smartphone when they reported using their smartphone to express or suppress negative emotion. By investigating these points, we hope to gain a fuller understanding of smartphone emotion regulation, and whether the type of strategy employed has implications for how well negative emotion gets regulated.

Regulating Emotions with Media

Emotion regulation refers to the process of modifying one's affective states in accordance with a goal, where the goal may be the alteration of the affective state itself (for instance, regulating one's sadness to feel less sad) or an external goal (e.g., hiding how one truly feels because these feelings are situationally inappropriate) (Gross, 2015). Various emotional regulation strategies exist, but arguably the two most prominent are emotional expression, which concerns efforts to share emotions with others, and emotional suppression, which refers to efforts to hide emotions from others or oneself (Cameron & Overall, 2018; Chervonsky & Hunt, 2017). Expressing emotions is generally linked to beneficial outcomes for individual health and (social) well-being, because it promotes interpersonal closeness and social support (Cameron & Overall, 2018; Rimé et al., 2020). In contrast, suppressing emotions is often linked to negative outcomes like more negative affect and lower self-esteem (Brans et al., 2013; Heiy & Cheavens, 2014). Hence, emotion expression is often considered as an adaptive and beneficial emotion regulation strategy, while suppression tends to be considered as maladaptive.

For many decades now, psychologists have advanced understanding of the underlying psychological states that drive people to (digital) media use (Knobloch-Westerwick, 2013;

Reinecke, 2016). In terms of affective states, mood management theory - a theory loosely built on Festinger's theory of selective exposure (Festinger, 1957) - posits that media consumption is very often driven by an underlying motivation to optimize one's mood (Zillmann, 1988). As people are very aware that media technology offers the possibility of immediate gratification, it comes as no surprise that amid low mood they will frequently orient attentional resources towards such opportunities, often at the expense of overarching personal goals (e.g. Halfmann et al., 2023).

Yet, although mood and emotion are similar in that they are both affective states with physiological correlates that can be communicated, expressed and regulated (Larsen, 2000), they are also conceptually differ. Emotions tend to be shorter-lived and intense affective episodes attached to a specific cause or target, whereas moods are less intense and more gradual, background experiences (Gross, 2015; Larsen, 2000). While both affective experiences that can be altered through media use, mood management research focuses more strongly on the process by which the use of entertainment media (e.g., music) alters (or sometimes maintains) the valence and/or arousal of subjective affect to gradually achieve a more optimal, desired mood state (e.g. Knobloch-Westerwick, 2013; Reinecke, 2016).

Alternatively, the use of media to regulate emotions focuses more strongly on the process by which individuals actively use media, among others to deploy attention elsewhere, or to deal (or cope) with negative emotions after they have been experienced (Schramm & Cohen, 2017). Following the process model of emotion regulation, the use of media to express one's emotions, then, can be classified as such focused-response behavior that occurs after experiencing negative emotions (Gross, 2015): After all, media can serve as instruments (or coping tools) via which emotion expression is both performed and - resultantly – achieved (Wolfers & Schneider, 2021) But suppression is also a focused response that may be achieved and performed through the use of media: After all, through the use of media, individuals might keep themselves constantly busy, thereby successfully avoiding having to feel or express the emotion. For example, applying Riva (2016) two-dimensional model of emotion regulation to the use of media to cope with social exclusion, Lutz and colleagues (2023) explain how the goal of socially excluded individuals' media use can be to approach the emotion, for instance by sharing their experience of social exclusion with other users. On the other hand, media may also be used to avoid the exclusion experience altogether, for instance, by distracting themselves from this painful, negative emotional state. In the current study, we thus approach emotion expression and emotion suppression as two distinct, yet independent strategies of emotional regulation that can be performed and achieved through the use of the smartphone, where both strategies may be evoked by negative affect, but the former strategy of expression being more effective at reducing negative affect than the latter strategy of emotion suppression.

RQ1: How frequently are smartphones used to express and suppress negative emotions?

We answer this exploratory question by reporting on the prevalence of these behaviors as captured in our experience sampling study.

RQ2: What are the momentary and lagged associations between negative affect and the use of the smartphone to express and suppress negative emotions?

Based on existing literature showing that expression is a healthier strategy than suppression, for our second research question, we expect to find, at the within-person level and while controlling for negative affect at the previous time point, the following: *H1:* There will be a negative lagged effect of smartphone use for emotion expression on negative affect, meaning that the more the smartphone is used for expressing negative emotions, the greater the decrease in negative affect will be.

H2: There will be a positive lagged effect of smartphone use for emotion suppression on negative affect, meaning that the more the smartphone is used for suppressing negative emotions will lead to relative increases in negative affect.

H3: There will be a positive lagged effect of negative affect on emotion expression.Meaning that individuals report using their smartphone for negative emotions expression more after they have felt more negative affect at the previous time point.

H4: There will be a positive lagged effect of negative affect on emotion suppression. Individuals report using their smartphone for negative emotions suppression more when they have felt more negative affect at the previous time point.

Chatting versus Social Media Use

Smartphones are versatile instruments that people carry close to or on their bodies (Schrock, 2015) and that offer their users 24/7 access to a wide range of mobile applications, of which the use can be potentially leveraged for expressing - but also suppressing one's negative emotions. Hence, following Meier & Reinecke (2021) taxonomy of computer-mediated communication, although the coping instrument may be one smartphone device, this device may house different communication channels via which this coping might be actually achieved, and each of these channels may carry specific affordances making them more or less suitable for emotion expression/suppression (see also Lutz et al. (2023) and Wolfers and Schneider (2021)

for a more elaborate discussion of Meier & Reinecke's taxonomy in relation to the use of media for coping with emotions).

Two particular types of mobile applications that may play a differential role in the emotion regulation process are mobile messaging and mobile social media use. Although mobile messaging and mobile social media use are sometimes considered as representing one overarching category of social media use (e.g. Beyens et al., 2021), messengers and social media differ in crucial respects (see Hall (2018) for a detailed discussion on this matter), and these differences may be relevant in the context of the two main emotion regulation strategies focused on in the current study.

Notably, exchanging messages is at the heart of mobile messaging, with these exchanges occurring predominantly with one's close ties (Hall et al., 2023). Although messaging is also possible on social media platforms, these are typically used to connect with a broader audience. Hence, the 'direct messaging' features of social media are adjacent to other forms of engagement (e.g., posting content, browsing, viewing content reels) that take place on the platform and that are situated in the broader public arena of the social network that one is connected to (Bayer et al., 2020). Because mobile messengers predominantly focus on mediated social interactions, time spent on these messengers is likely to represent such engagement. For social media platforms, however, we know from prior passive monitoring studies that the majority of time spent on them is dedicated to what is colloquially termed as 'passive use' (Metzger et al., 2018; Valkenburg et al., 2022), namely not really engaging in social interactions, but rather passively 'consuming' social media contents.

Computer-mediated communication in the form of (mobile) messaging has not only been found to be the most often used form of mediated communication, it is also a modality of communication associated with beneficial outcomes, such as increased social connectedness and decreased loneliness (Hall et al., 2023). A plausible explanation for this positive association between messaging and these outcomes is given by the Internet-Enhanced Self-Disclosure Hypothesis (Valkenburg & Peter, 2007), which posits that the unique affordances of mobile messaging contribute to users engaging in more frequent intimate self-disclosure, which is in turn known to promote social well-being. In the context of emotion regulation, the strategy of emotion expression can be considered to require intimate self-disclosure as sharing one's negative emotions with (an-)other person(s) is likely an act that involves showing one's vulnerability. This may make mobile messaging especially well-suited to the goal of emotion expression, aiding individuals to reappraise their emotions and feel better.

Social media use, on the other hand, is often associated with enjoyment in the moment, (Beyens et al., 2021). Studies show that the gratifications derived from social media use, make social media into a powerful distractor (Siebers et al., 2022a, 2022b). Moreover, research also suggests that people turn specifically to social media to distract themselves from negative emotions (Hoffner & Lee, 2015). Hence, if people want to suppress or avoid the negative emotions they are experiencing, social media use is a potential behavior individuals can turn to. However, while this avoidant behavior may work to not 'feel' the negative emotions in the moment, not dealing with them may lead individuals to continue experiencing them more strongly. Moreover, social media use often comes with the feeling of having wasted time afterwards (Baym et al., 2020). Research also suggests that especially when individuals report mindlessly scrolling on social media, they feel guilty over their smartphone use (author, under review). Hence, the social media use might even aggravate any negative emotional experience by

adding negative feelings over the social media use itself. We examine the above theses in this study, by asking:

RQ3: Does objectively observed smartphone use mediate the association between using the smartphone for emotion regulation and changes in negative affect?

We specifically expect, at the within-person level and controlling for negative affect at the previous time point, that:

H5: Mobile messaging mediates the association between using the smartphone for emotion expression and changes in negative affect, with greater use of the smartphone for emotion expression positively predicting messaging, and the latter predicting a decrease in negative affect at the subsequent time-point.

H6: Social media use mediates the association between using the smartphone for emotion suppression and the change in negative affect, with greater use of the smartphone for emotion suppression positively predicting social media use, and the latter predicting an increase in negative affect at the subsequent time-point.

Methods

This study used an intensive-longitudinal research design, combining experience sampling (ESM) and digital observations of smartphone use behavior (i.e., log-data). Data collection took place between October and December of 2022. The sample was recruited in the context of a broader research project planned to last approximately 18 months. In total, we collected 67,762 ESM data points from 1,315 individuals; for 26,708 (39.4%) of these data points we had matching log-data (i.e., log-data covering the period the ESM questions referred to: *'Since the previous questionnaire received...'*). The institutional review board of [university]

gave ethical clearance to conduct this study. All materials, data, and scripts needed to replicate this work are available in an <u>OSF repository</u>.

Participants and Procedure

Participants were recruited from the general population in collaboration with a national newspaper. The newspaper advertised the project over a two-week period. Interested persons could register on our website after completing an eligibility check confirming they were at least 18 years old and owned a smartphone. Participants' involvement was incentivized by providing them with a personalized report (from collected data) of their digital media use and digital well-being, and free access to public dissemination events where societal insights from the project and beyond were shared.

Following website registration, participants were directed to a separate website to receive further information and instructions to download an app(s) and participate. Of the 3065 registered participants, 1449 individuals actually participated. All participants installed an app designed to send ESM questionnaires. Android users were asked to additionally install an app to track their log-data (screen time, app activity and notifications). Following app installation, participants provided informed consent and completed a short (approximately 10 min) intake questionnaire that measured variables such as gender, age, as well as other factors not of direct relevance for this study.

We included participants with a minimum completion rate of eight ESM questionnaires, retaining 1315 participants for the current study, of whom 691 (52.5%) were Android users who contributed at least 8 log data points. The final analytical sample of this study thus consists of 1315 adults aged between 18 and 82 years ($M_{age} = 38.9$). Of these, 812 identified as female, 484 as male, and 16 as non-binary or were not willing to share gender information. -

Participants received experience sampling questionnaires according to a mixed sampling scheme that contained semi-random and fixed elements. Specifically, during 14 days participants received 6 short questionnaires per day, between 07:30 hrs. and 22:45 hrs. Each notification was randomly scheduled within one of six 90-minute time slots throughout the day (i.e., notification 1 between 07:30 hrs and 09:00 hrs). Time windows within which notifications were sent to participants were separated by a period of at least 1 h 15 min and at most 4 h 15 min. Following the initial notification, each ESM questionnaire remained available to the participant for 45 min. On average, ESM responses were separated by 2 h 44 min (SD = 12 min). A reminder was sent out if the questionnaire had not been responded to 30 minutes after the initial notification.

Measures

This study uses only time-variant variables (ESM questions and log-data). For the six ESM questionnaires that were sent out each day, the stem *"Since getting up this morning..."* was presented for the morning questionnaire, while the stem *"Since the previous questionnaire..."* was presented for all others. The median time taken to complete ESM questionnaires was 93 seconds, with a completion rate of 60.7%. Although the full ESM questionnaire contained between 23 and 33 items (depending on conditional items and moment of the day), here we describe the specific measures included in this study.

Emotion regulation via the Smartphone. We measured the extent that participants used their smartphone as means of regulating their negative emotions by expressing them to others, and by suppressing them. To do so we posed the following questions to participants six times per day: "Since [...] I used my smartphone to express my negative emotions to others.", and "Since [...] I used my smartphone to suppress my negative emotions." to which they responded on a Likert scale ranging from 1 ("Not at all true") to 7 ("Absolutely true"). Participants' responses

were, on average, quite low (expression: M = 1.52, SD = 0.64; suppression: M = 1.82, SD = 0.78). The measures showed an intraclass correlation (ICC) of .38 for expression and .46 for suppression, indicating that 38%, respectively 46% of variation existed at the between-person level.

Negative Affect. Negative affect was measured by averaging the scores of two separate mood items, covering anxiety and feeling down: "*Since* [...] *I felt anxious*", and "*Since* [...] *I felt down*", which were responded to on a scale ranging from 1 ("*Not at all true*") to 7 ("*Absolutely true*"). The resulting composite negative affect score had a mean across participants of M = 2.15 (*SD* = 0.7), with an intraclass correlation of .59.

Smartphone Use Variables. Using the timestamps of the smartphone log data, we computed the time spent on chat media apps between ESM beeps. These quantities represent the amount of time participants spend on a specific type of activity (e.g. in social media apps), in the time between surveys (or since they wake up for the first questionnaire of the day). We computed the time spent on chat applications (i.e. WhatsApp, Telegram, etc) in between beeps. On average, participants spent 211.55 seconds in chat apps (SD = 292.02). For social media apps (Instagram, Facebook, twitter, etc), participants spent 244.44 seconds (SD = 319.18).

Analytical Procedures and Strategy

Statistical analyses were performed in R (R Core Team 2022) and the packages *lavaan* (Rosseel, 2012), *lmer4* (Bates et al., 2015) and *mediation* (Tingley et al., 2014). Because we are mainly interested in effects at the within-person level (level 1), we person-standardized level 1 variables (Enders & Tofighi, 2007). We additionally report centered coefficients, following the same procedure as with the standardized ones.

Hypotheses 1-4 were tested with a multilevel cross-lagged model that included negative affect, expression, and avoidance. This approach helped us disentangle the effects' directionality while accounting for the nested structure of the data (within individuals) by means of a level 2 intercept (Hamaker et al., 2015). We assessed the general fit of the model by examining fit indices, including RMSEA, CFI, TLI, and SRMR. We considered the overall fit of the model to be acceptable when RMSEA <.05, CFI >.90, TLI >.90, and SRMR <.05. Once good fit was observed, we examined the parameters and considered them to be of meaningful effect size when |beta| > .05, following previous work using comparable methodologies to study social media effects (Beyens et al., 2021; Siebens et al., 2022a). Syntax used for this model can be found on the study OSF page. A visual depiction of this model can be found in *Figure 1*.

Figure 1.



Random Intercept Cross-lagged model covering RQ2.

Note. Visual representation of the statistical model fitted to answer RQ2, at the within-person level. The model included random intercepts for all variables (not shown in the picture) and all within-person variables where within-person standardized/centered. Effects from lagged expression on suppression and its reverse were not included in the model based on theoretical considerations.

Hypotheses 5 was tested by means of a multilevel mediation model in which negative affect was predicted by expression and with time spent on chat apps as a mediator, while controlling for previous (lagged) negative affect. Hypothesis 6 followed the same logic, but with avoidance as the main IV and time spent on social media apps as the mediator.

Results

Bivariate correlations for the key study variables, both at the within and between-person levels, can be found in *Table 1*.

Table 1

Bivariate between and within-person correlations of study variables.

Variable	expression	suppression	negative affect	chat time	SMU
expression	1.00***	0.73***	0.56***	0.29***	0.20***
suppression	0.24***	1.00***	0.71***	0.16***	0.20***
negative affect	0.23***	0.31***	1.00***	0.06	0.18***
chat time	0.12***	0.05***	0.02***	1.00***	0.19***
SMU	0.04***	0.11***	0.04***	0.04***	1.00***

Note. Significant codes: *** indicates p < .001, ** indicates p < .01. Within-person correlations are shown in the lower side of the diagonal and between-person correlations are shown on the upper side.

Descriptives on Emotion Regulation Strategies

Our first research aim was to better understand how often people engage in emotion regulation via their smartphone. In only 3.77% of the collected questionnaires (2,549 questionnaires) participants reported it being at least 'rather true' that they had expressed negative emotions using their smartphone since the previous questionnaire they received. For avoiding negative emotions, this was 6.84% of the questionnaires (4,627 questionnaires). In sum, when it comes to emotion expression and emotion suppression, we found the latter to be the more common strategy. *Table 2* shows the full distributions of responses in relation to both emotion regulation items.

Table 2

True

Absolutely True

	E	xpression	Su	Suppression		
Response	Total	%	Total	%		
Not True at all	48,785	72.18%	41,817	61.87%		
Not True	12,457	18.43%	14,509	21.47%		
Rather not True	2,981	4.41%	4,631	6.85%		
Neither True, nor False	812	1.2%	2,000	2.96%		
Rather True	1.406	2.08%	3,168	4.69%		

Frequency of responses of emotion regulation items.

897

246

Note. Distribution of responses to the emotion regulation items measuring expression and suppression in our ESM study.

1.33%

0.36%

1,159

300

1.71%

0.44%

Cross-Lagged associations between ER strategies and Negative affect

Our second research question, encompassing hypotheses 1-4, concerned the cross-lagged associations between the two smartphone-based emotion regulation strategies and changes in negative affect. To investigate these hypotheses, a random intercept cross-lagged panel model was fitted. The overall fit of the model was good, with CFI = .99, TLI = .93, RMSEA = .049, and SRMR = .015. Contrary to our prediction (H1) that expression would have a negative effect in

the next measurement of negative affect controlling for previous negative affect, results showed a very small (beta = .02, 95% CI = [0.01, 0.03]) but positive effect of expression on negative affect at the next time point. The effect of avoidance was also very small but positive (beta = 0.02, 95% CI = [0.02, 0.04]), in line with our second prediction (H2). In contrast, we see that the 'media selection' effects (from negative affect to expression and avoidance in the next time point) are larger in size. Negative affect had a positive effect on both expression (beta = 0.11, 95% CI = [0.10, 0.12]) and avoidance (beta = 0.11, 95% CI = [0.11, 0.12]) at the later time point. Full model output is available in *Table 3*.

Table 3

Parameter estimates of RI-CLPM for RQ2.

Effect	b	beta	SE	95% CI
Negative affect ~ Negative affect (lag)	0.42	0.43	0.00	[0.42, 0.44]
Negative affect ~ Expression (lag)	0.02	0.02	0.00	[0.01, 0.03]
Negative affect ~ Avoidance (lag)	0.02	0.03	0.00	[0.02, 0.04]
Expression ~ Expression (lag)	0.22	0.22	0.00	[0.21, 0.23]
Expression ~ Negative affect (lag)	0.12	0.11	0.00	[0.10, 0.12]
Avoidance ~ Avoidance (lag)	0.20	0.20	0.00	[0.19, 0.21]
Avoidance ~ Negative affect (lag)	0.14	0.11	0.00	[0.11, 0.12]

Note. Main parameter estimates of the RQ2 mode. All estimated parameters were significant at level .001. General fit indices: CFI = .99, TLI = .93, RMSEA = .049, and SRMR = .015.

Mediation of observed smartphone use

The mediation models fitted to investigate our third research questions and test hypotheses 5-6 showed that the observed associations between the emotion regulation strategies and changes in negative affect showed no significant mediation effect of the smartphone use variables. For the H5 model, we see that the effect of expression through time spent on chat apps is not significant (*beta* = 0.00, 95% CI = [0.00, 0.00]), so the effect from expression to negative affect (change) is almost entirely a direct effect (*beta* = 0.11, 95% CI = [0.14, 0.17]). In the case of the H6 model, the mediated effect of SMU was also not significant (*beta* = 0.00, 95% CI = [0.00, 0.00]), while the total and direct effect were significant (*beta* = 0.17, 95% CI = [0.16, 0.18]). Full model output is available in *Table 4*.

Table 4

Mediation models for RQ3								
Effect	Estimate	95% CI	p-value	Estimate _b	95% CI	p-value		
H5 model: NA ~ communication time (mediator) + ER expression								
Total Effect	0.11	[0.10, 0.13]	0.00	0.16	[0.14, 0.17]	0.00		
Indirect Effect	0.00	[-0.00, 0.00]	0.23	-0.00	[-0.00, 0.00]	0.81		
Direct Effect	0.11	[0.10, 0.13]	0.00	0.16	[0.14, 0.17]	0.00		
Prop. Mediated	0.01	[-0.00, 0.02]	0.23	-0.00	[-0.01, 0.01]	0.81		
H6 model : NA ~ social media use (mediator) + ER avoidance								
Total Effect	0.17	[0.16, 0.18]	0.00	0.19	[0.17, 0.20]	0.00		
Indirect Effect	0.00	[-0.00, 0.00]	0.62	0.00	[-0.00, 0.00]	0.11		
Direct Effect	0.17	[0.16, 0.18]	0.00	0.18	[0.17, 0.20]	0.00		
Prop. Mediated	0.00	[-0.01, 0.01]	0.62	0.01	[-0.00, 0.01]	0.11		

Note. Multilevel mediation models fitted for RQ3. Estimates are either within-person centered (b) or within-person standardized. The mediation model was fitted using the lme4 (Bates et al., 2015) and mediation (Tingley et al., 2014) packages.

Discussion

This article presents the findings of a two-week mixed-methods study on digital emotion regulation, which incorporated mobile experience sampling and behavioral observations of smartphone activity. The study explored how often people engage in two central emotion regulation strategies through their smartphones, namely expressing and suppressing negative emotions. Furthermore, it investigated how engaging in such behaviors was related to fluctuations in negative affect, and whether such processes manifested through specific patterns of smartphone usage behaviors.

Concerning the frequency of individuals' engagement in emotion regulation strategies via their smartphone, we note that in both cases it occurred rarely, with expression happening on only 3.77% of occasions and suppression on 6.84% of occasions. One caveat here is that it is plausible that individuals engage in emotion regulation implicitly or even unconsciously in many everyday situations (Hopp et al., 2011). Another potential factor contributing to our results is that our study sample is mostly composed of adults ($M_{age} = 38.9$), who are not particularly heavy digital media users. It is likely that other populations, including adolescents and young adults, being much heavier and frequent users of smartphone media (Deng et al., 2019; Sevenhant et al., 2021) manifest engaging in such emotion regulation strategies more frequently.

Our first and second hypotheses concerned whether engaging in emotion regulation via smartphone media drives changes in negative affect over time. Although we expected that expression would have a negative effect on negative affect over time (i.e. predict negative affect recovery), we found a very small positive effect, contradicting to our prediction. A potential explanation for this may be that expressing negative, rather than positive emotions, is less beneficial to individual well-being. The fact that expressing emotions through messaging does not have the expected beneficial effect can be also interpreted in line with previous work of (mediated) interpersonal communication. As Hall et al (2023) suggests, chatting is at the bottom of the hierarchy of communication channels in terms of their effect on basic psychological needs, which might be one reason why it is not the most effective channel for emotional expression. In the case of avoidance, and in line with emotion regulation theories and empirical evidence (Cameron & Overall, 2018), we see a very small positive effect on fluctuations in negative affect, showing evidence that it is not an effective way of regulating negative affective states. Collectively, these two effects suggest that engaging in the expression or suppression of emotions via smartphone use may not have a substantial, nor beneficial impact on negative affect.

In line with our expectations, we did find that experienced negative affect predicted later engagement in these two strategies, as outlined in hypotheses 3 and 4. This implies that an increase in negative affect over time leads to subsequent involvement in both expression and suppression via smartphone use. Therefore, and in line with mood management theory, it appears that the media selection effect plays a more pivotal role in the interplay between these variables: People adopt specific smartphone media behaviors (such as expressing or suppressing emotions) as a response to their psychological state (negative affect), rather than the reverse. However, while our design and analyses offer temporal specificity, it is important to acknowledge that it remains an observational study, leaving room for alternative causal pathways to explain the observed results.

One ultimate objective of this study was to investigate the role of objectively measured smartphone behaviors in emotion regulation. This involved testing whether the amount of time allocated to particular activities, most notably the use of communication apps or general social media apps, served as mediators in the relationship between various emotion regulation strategies and changes in negative affect. Our data did not support our fifth and sixth hypothesis, revealing that the observed associations between emotion regulation strategies and negative affect could not be explained by these smartphone usage variables. By looking at the correlation between these variables (*Table 1*), we see that the smartphone use variables have a significant within-person correlation with the emotion regulation strategies, but the associations with negative affect are very small (social media duration: r = .04, chat duration: r = .02), which might explain why we did not find significant mediation effects. Methodologically, these findings suggest that the categorization of app usage into broad types may lack the granularity needed to capture the intricate psychological processes associated with emotion regulation. This aligns with previous critiques of collapsed measures of screen time, as discussed in prior research (Kaye et al., 2020). Theoretically, this can be understood within a broader argument that has been recently claimed in the digital media-effects field: Actual media behaviors often prove to be less predictive of psychological outcomes compared to the experiential aspect associated with a particular usage episode (Ernala et al., 2022; Lee et al., 2021). In this scenario, this suggests that individuals may not necessarily intensify their smartphone usage when they are feeling particularly sad or anxious. Instead, it is mainly the underlying intention behind their usage that changes.

Limitations and Future Directions

This study is not exempt from limitations. First, we acknowledge that our measurement approach to emotion regulation strategies is limited in that it assumes that people are aware when they engage in such emotion regulation behaviors, and that they can hence recall them in the following hours when they respond to each ESM survey. Such assumption, as previous work on emotion regulation shows, might not always hold (Gyurak et al., 2011). However, as it remains extremely challenging to capture automatic emotion regulation processes based on self-report and ESM measurements, we opted to keep the focus on the more explicit aspect of emotion regulation. A related, important caveat of our study is that we did not control for individuals' perceptions of emotion regulation via other modalities of communication, most notably via faceto-face interaction. Controlling for this instance, we would expect that both the prevalence and effects of such strategies increase.

Secondly, while our choice to incorporate the duration of chat apps and social media apps was based on both theoretical and practical considerations, it can pose challenges. This is because social media platforms are sometimes used for private messaging, essentially functioning as chat apps, which can sometimes blur the boundaries between the underlying media activities we intend to capture with these categorizations (Hall, 2018). However, we argue that this possible conflation of activities is minor, as prior studies employing log-data have demonstrated that the majority of individuals' time spent on social media is dedicated to passive activities (Metzger et al., 2018; Valkenburg et al., 2022). Alternative, future work could incorporate ESM items asking about time spent chatting or communicating vs other activities. Additionally, we only relied on data from smartphones to construct these quantities, whereas it is possible that people engage in many of said activities via other devices. For instance, during working hours, it is likely that many individuals utilize WhatsApp or Telegram in their laptop rather than in their smartphone.

Furthermore, this study did not consider individual differences in how people engage in emotion regulation strategies through smartphone media. Based on recent calls on digital media effects research to consider individual variability (Beyens et al., 2021; Valkenburg et al., 2021), future research should explore the person-specific factors that contribute to explaining interindividual variability in how people use smartphones to regulate their emotions. For instance, heavy smartphone users might be more likely to engage in such strategies, while individuals with more self-regulation skills might do so less.

Conclusion

The findings of this work reveal that adults overall rarely use their smartphone for expressing and suppressing negative emotions. However, there is a pronounced media selection effect indicating that individuals resort to digital emotion regulation in moments of heightened negative affect. The act of engaging in these strategies appears to have a minimal impact on their emotional state. This suggests that these digital emotion regulation behaviors might not be as effective in altering or improving negative affect. Finally, we saw that the role that although specific smartphone use behaviors (captured through log-data) were linked to the examined emotion regulation strategies, these behaviors did not predict changes in affect, indicating that these behaviors in themselves have little predictive value.

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