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Full-length Research Article

Does mindless scrolling hamper well-being? Combining ESM and log-data to examine the link between mindless scrolling, goal conflict, guilt, and daily well-being

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Abstract

This manuscript presents findings from a preregistered mixed-method study involving 67,762 ecological momentary assessments and behavioral smartphone observations from 1,315 adults. The study investigates (a) momentary associations between mindless scrolling, goal conflict, and guilt over smartphone use, and (b) whether guilt experiences during the day culminate into lower well-being. Results indicate that individuals experienced more guilt over their smartphone use when they had mindlessly scrolled for a longer period and that experienced goal conflict partially mediated this relationship. Daily analyses revealed that mindless scrolling was also associated with small negative changes in well-being, and this relationship was partially mediated by guilt experienced over the same day. Individuals with less self-control were more prone to experiencing goal conflict after mindlessly scrolling. These findings indicate that although mindless scrolling may seem a relatively harmless media behavior, it may have both momentary and downstream negative implications for well-being.

Lay Summary

Have you ever found yourself mindlessly scrolling through your social media (SM) feed, only to later feel bad because you thought you could have spent your time doing something better? Our research investigates this phenomenon by examining the associations between mindless scrolling, feelings of guilt over smartphone use, goal conflict, and well-being. During two weeks, a group of 1,315 adults received six questionnaires per day while their smartphone activity was being monitored. Our study found that, after spending more time mindlessly scrolling, people tend to feel more guilty about their smartphone use. The feeling that such time could have been spent on other relevant goals partially explains this relationship. Additionally, people with lower self-control seem to struggle more with this. Interestingly, we found that people feel less well on days where they mindlessly scroll more. Although mindless scrolling may seem a relatively harmless behavior, our findings thus suggest that it may have negative psychological consequences that we need to better understand.

Keywords: social media, mindless scrolling, behavioral data, guilt, goal conflict.

The psychological repercussions of social media use (SMU) have been subject to scientific inquiry for decades. Nonetheless, extant evidence is inconsistent (see Valkenburg, Meier, et al.'s (2022) recent umbrella review). To overcome this "status quo," one recent development in the field is to focus more strongly on subjective experiences accompanying SMU (Ernala et al., 2022; Lee et al., 2021; Vanden Abeele, 2021) as these appear more predictive of health and well-being outcomes (Hall, 2017; Lee & Hancock, inpress). One such experience is mindlessly scrolling, which users describe as a passive act of SM consumption, without goal or purpose, and is often accompanied by reduced awareness of the time spent in this activity or the content being consumed (Baym et al., 2020). Mindless scrolling, then, is opposed to "mindful" SMU, which is characterized by intent and present awareness (e.g., Bauer et al., 2017).

To date, research focusing explicitly on mindless scrolling is mostly qualitative in nature (e.g., Baughan et al., 2022; Lupinacci, 2021; Schellewald, 2021). While it shows how mindless scrolling is often evaluated as time spent "wastefully" (Baym et al., 2020, p. 2; Ytre-Arne et al., 2020, p. 1724), it leaves potential short- and long-term psychological repercussions largely unknown. We know from prior work on (entertainment) media use, however, that people can feel guilty over media behavior, often because they believe it conflicts with other goals (Hofmann et al., 2013). These guilt experiences can hamper recovery (Reinecke et al., 2014), and, when strong and/or frequent, might be detrimental to well-being (Kim et al., 2011).

Drawing from intensive longitudinal data collected in a mixed-method study in a large adult sample (N = 1,315) with more than 60,000 data points, this work investigates whether this is also true for mindless scrolling. We examine whether the mindless scrolling experience shows a generalizable, real-time association with guilt over smartphone use that is mediated by goal conflict and whether this guilt experience, in turn, has downstream implications for affective well-being. Additionally, building on the theoretical assumption that digital well-being experiences are person and context specific (Vanden Abeele, 2021), we examine the moderating role of self-control as a trait preventing SM self-control failure and goal conflict (Du et al., 2018), and being at work as a situational boundary condition that may make mindless scrolling less tolerated (Hofmann et al., 2012).

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From passive SMU to mindless scrolling

Mobile SM platforms have become increasingly popular over the past decades, showing growing user numbers and an overall increase in daily time spent on platforms *per* user (Vogels et al., 2022). With this growing popularity, a substantial field of research has developed, investigating the psychological effects of SMU on well-being (Meier & Krause, 2022; Valkenburg, van Driel, et al., 2022; Verduyn et al., 2017).

However, early research failed to produce consistent results on whether SM was beneficial or harmful to individual well-being. This led scholars to differentiate two types of SMU (Valkenburg, van Driel, et al., 2022; Verduyn et al., 2022): passive SMU, which does not involve social interaction (e.g., scrolling, profile browsing, and reading posts), and active SMU, which does involve social exchange (e.g., direct messaging, posting or sharing, commenting). Purportedly, active SMU would promote positive outcomes by satisfying the human need to connect, while passive SMU would not, while potentially eliciting negative emotion due to a heightened tendency to socially compare (Valkenburg, van Driel, et al., 2022; Verduyn et al., 2017, 2022).

To date, however, evidence supporting the active/passive model remains inconclusive, leading researchers to challenge it (e.g., Escobar-Viera et al., 2018; Valkenburg, Beyens, et al., 2022; Verduyn et al., 2015). Theoretically, researchers criticize the crude distinction between two broad categories, as these may not capture important behavioral and experiential differences *within* them (Meier & Krause, 2022). For instance, within passive SMU, mindlessly scrolling through reels arguably differs from lurking on a friend's profile. Moreover, the idea of passive SMU is in itself conceptually challenging, as traditional communication theories (Hall, 1980) argue that reception of media content is never a strictly passive process (Valkenburg, Beyens, et al., 2022), while on the other hand, "likes," "comments," and "shares" may not be as active as we think; after all, as Baym et al. (2020) state, "technological processes of liking, commenting, and retweeting have become mechanistically embodied in buttons […]", "producing ways of acting which are both voluntary and involuntary, conscious and unconscious" (p. 2).

Scholars have recently argued that a way out of this theoretical conundrum may be to focus not only on behavior, but also on the subjective experiences associated with it (e.g., Vanden Abeele, 2021): These may shape people's general mindset toward certain media uses, and in that way impact the psychological repercussions they hold. For example, Hall (2017) found that experience rather than actual messaging frequency predicted well-being outcomes, and in a recent mixed-methods study, Ernala et al. (2022) found that passively monitoring Facebook use only predicted well-being negatively for those who believed Facebook to be bad for them and society. Similarly, Lee and Hancock (inpress) found such SM mindsets to predict well-being outcomes better than traditional behavioral measures. The focus on mindless scrolling in this study fits with the above approach: It moves beyond a mere focus on behavior (i.e., scrolling) by adding an experiential dimension to it (i.e., mindless).

Conceptualizing and operationalizing mindless scrolling

"Mindless scrolling" is a term that emerged around 2015 in response to growing concerns over SM users rapidly scrolling through content with seemingly low engagement. Users paint mindless scrolling as a "dissociative experience" that fully absorbs one in the moment (Baughan et al., 2022) but is often regretted later when feeling disappointed and frustrated over having "wasted time" and having let oneself get sucked "down the rabbit hole" (Baym et al., 2020; Lee et al., 2021).

Common design features in most SM platforms explain why users may easily get caught mindlessly scrolling: The infinite scroll and pull/swipe-to-refresh feature, in combination with a dynamically updated SM feed, guarantee an instantaneous and never-ending gratification of hedonic needs (van Koningsbruggen et al., 2017). This conditions the user to *continue* consumption by rapidly flicking through content, often without goal, purpose, and awareness (i.e., *mind*-less; Baughan et al., 2022; Baym et al., 2020).

While mindless scrolling initially required the physical act of scrolling (i.e., flicking, clicking, swiping, or pulling), most major platforms now also offer content *reels:* short, algorithmically curated streams of videos, images, and/or audio that auto-play (e.g., Tiktok reels, Instagram reels, and Facebook shorts), offering the experience of "going down the rabbit hole" without even having to physically interact with the interface (Woolley & Sharif, 2022). Nonetheless, the term mindless scrolling has persisted (e.g., Baym et al., 2020), and we use it here to describe the consumption of algorithmically curated SM contents in a rapid, consecutive manner, without any goal or purpose, and in a reduced awareness state.

Defining mindless scrolling as behavior that is experienced as goal-less and mindless has methodological implications: SM consumption remains a necessary precondition for mindless scrolling to take place. However, measuring SMU in a valid, generalizable, and reliable way is methodologically challenging (Meier & Krause, 2022); accounting for subjective experience adds another layer of complexity on top.

One increasingly common approach to overcoming the limitations of self-report measurements of technology use (e.g., recall, social desirability, and common method bias; Parry et al., 2021), is to rely on behavioral measures of SMU (Meier & Krause, 2022; Parry et al., 2022). In this study, we augment those with dynamic measurements of how SM use is subjectively experienced, asking individuals how much of their time on SM was spent mindlessly scrolling. We thus combine self-reports with behavioral observations of digital activity (log-data) to look into the effects of a particular subjective experience (mindless scrolling) associated with a (objectively observable) behavior (SMU).

To the best of our knowledge, this is the first study attempting to systematically measure mindless scrolling using this approach. Hence, the first aim of this work is to report on the prevalence of mindless scrolling when combining self-reports with log-data (*log-self-report* measure) and comparing it to a self-report measure only (RQ1). The main focus of our study, however, lies in exploring the associations between mindless scrolling, guilt, and well-being.

Mindless scrolling, guilt, and well-being

Guilt is a self-conscious emotion: it is inherently intrapersonal, moral, and characterized by negative self-evaluation (Sznycer, 2019). Over the past decades, the relationship between guilt and hedonic media consumption (e.g., television viewing and video gaming) has been repeatedly established, showing evidence for a "spoiled pleasure" effect[1] (Hofmann et al., 2013;

Reinecke et al., 2014; Reinecke & Meier, 2021). Given the hedonic and accessible nature of SM, it is unsurprising that this effect is also found for SMU (e.g., Halfmann et al., 2021; Reinecke & Meier, 2021), as the "sweet temptation" of going down the rabbit hole of cute cat videos may come with the "bitter aftertaste" of feeling guilty over the consumption experience (Hofmann et al., 2016, p. 1). A reason for this is people appraising their SM consumption experience negatively, whereby they draw from mental models (or subjective construals) built upon past experience, normative beliefs, et cetera (Lee et al., 2021). It is clear that such negative appraisals of mindless scrolling are plentiful and show a general undertone of finding the behavior a waste of time (Baughan et al., 2022; Baym et al., 2020).

While 'spoiled-pleasure' guilt over media use may seem fairly harmless and perhaps even adaptive—indeed, guilt can be a powerful motivator to adjust behaviors in accordance with values and goals (Lewis, 2008)—research shows that it can also hamper the recovery potential of media use (Reinecke et al., 2014). Especially when guilt experiences are frequent and strong, individuals may increasingly consider themselves as weak for not being capable of bringing behavior in line with values and goals. Such repeated negative self-evaluations may ultimately hamper mental health and well-being (Kim et al., 2011). It is therefore important to examine whether mindless scrolling is associated with guilt in the short term (H1) and whether these guilt experiences might build up, having an accumulated effect on affective (daily) well-being[2] (H2):

> H1: At the momentary (within-person) level and controlling for guilt at the prior time point, time spent mindlessly scrolling is positively associated with guilt over smartphone use.

> H2: At the daily (within-person) level and controlling for well-being reported on the previous day, time spent mindlessly scrolling is negatively associated with daily affective well-being, with experienced guilt mediating this association.

The role of goal conflict, work context, and self-control

To further explore mechanisms responsible for the negative appraisal of mindless scrolling as a "waste of time," we zoom in on two core elements comprising the mindless scrolling experience, namely a lack of goal-direction and a reduced state of awareness.

Scrolling without a goal: goal conflict

Guilt is elicited when behavior conflicts with personal standards and goals, while the behavior is seen as personally controllable (Reinecke & Meier, 2020; Sznycer, 2019). People may especially experience this when time displacement occurs, that is, when media behavior takes time away from engaging in more beneficial or productive activities (Halfmann et al., 2021, Gilbert et al., 2022) or when behavior causes procrastination (Reinecke & Hofmann, 2016), that is, hampers them in initiating another task or activity more conducive to achieving goals.

Experiences of goal conflict are prevalent when using SM, especially when mindlessly scrolling. As a participant in Baughan et al. (2022) describes, SMU " … *becomes mindless* when I realize this breadth of topics is not meaningful to me, and perhaps it makes me feel bad that I'm wasting this time doing something that […] actually has no bearing or is not meaningful to my life" (p. 7). Users often evaluate the content consumed when mindlessly scrolling as meaningless (Lee et al., 2021, p. 6), and therefore feel it is time "not spent productively but rather wastefully" (Baym et al., 2020, p. 2). There is also ample theoretical work on media and guilt (Reinecke & Meier, 2020) as well as empirical evidence (Gilbert et al., 2022; Halfmann et al., 2021) that shows goal conflict plays a prominent role in explaining the relation between SMU and their negative effects (Gilbert et al., 2022; Halfmann et al., 2021). Following, we hypothesize that perceived goal conflict mediates the association between mindless scrolling and guilt (H3):

> H3: At the momentary (within-person) level and controlling for prior guilt, perceived goal conflict mediates the association between mindless scrolling and guilt over smartphone use.

It is likely that greater goal conflict over mindless scrolling occurs in certain contexts. For instance, when relaxing after a busy workday, mindless scrolling may be appraised differently than when there is an urgent task to attend to. Accounting for such context-specificities is important in order to grasp the nuances of media effects (Vanden Abeele, 2021). In this study, we examine one such context-specific factor likely relevant in the context of mindless scrolling, namely whether one is at work or not. After all, work is a context in which role demands place clear constraints on individual behavior, and it is one of the main activities displaced by SMU (Hall et al., 2019). Hofmann et al. (2012) note for instance that "being at work presents obstacles for many desires, compared to being at home or elsewhere," because "hardly any employers tolerate sleeping or relaxing on the job" (p. 1333). Consequently, people may experience greater goal conflict over mindless scrolling when at work (H4):

> H4: At the momentary (within-person) level, the association between mindless scrolling and goal conflict is stronger when individuals are at work than when they are not.

Scrolling mindlessly: reduced awareness

In addition to the lack of purpose, users also describe mindless scrolling as characterized by reduced awareness (i.e., *mind*-less). In fact, it is this reduced awareness that likely causes people to continue their SMU, despite considering it meaningless and in conflict with their values and goals (Bayer et al., 2016).

It is relevant to make a difference here between behavior initiation and execution. People may intend to use SM—for instance, because they feel exhausted (or bored) and desire some hedonic pleasure to recover (or escape boredom). When highly aware of this intent, that is, when mindful over SMU, this can be considered goal-directed behavior (Hefner & Freytag, 2023). In reality, however, SMU is often habitual, resulting from an automated response to external cues and internal states triggering the behavior as an automated response to the stimulus (Bayer et al., 2022). For example, while

exhaustion and boredom might have originally served as mental states leading individuals to consciously seek out SM, because of the learnt association with these platforms' social, informational, and awareness rewards, feeling tired or bored may over time come to automatically trigger a SM checking habit. When users already access the platform with the reduced awareness that comes with habitual behavior, they may be easy targets for the design architecture of contemporary SM platforms, falling prey to the rabbit hole effect of consuming one piece of content after the other.

Similar to how context matters, certain personality traits may increase or protect against the risk of succumbing to mindlessly scrolling. One is self-control. As experimental evidence shows, individuals lower on self-control have greater difficulty regulating their SMU, hence being more prone to experiencing goal conflicts (van Koningsbruggen et al., 2017). Such goal conflicts resulting from SMU are also understood as a form of self-control failure (Du et al., 2018), an experience that is presumably less likely to occur among people high in self-control, as they can more effectively regulate their actions in line with their values and goals. In the context of mindless scrolling, individuals with higher self-control will likely engage in mindless scrolling at more appropriate times (when, say, it won't conflict with other personal goals) and be better able to disengage from mindless scrolling when they recognize it as conflicting.

Moreover, Schneider et al. (2021) consider self-control part of a global orientation to life, seeing it as "comprehensible, manageable, and meaningful" (p. 4). This potentially also shapes the mental models used to appraise mindless scrolling as a goal conflict (i.e., seeing it less as a problem for achieving goals in life). It is important to note here, that Schneider et al. (2021) consider mindfulness and meaningfulness as adjacent traits that together form a sense of coherence that is overall health-promoting; the recent evidence on mindfulness as a protective force against the negative effects of SMU (e.g., Bauer et al., 2017) therefore serves as additional, indirect support for the potential buffering role of self-control. Hence, we hypothesize (H5):

> H5: At the momentary (within-person) level, the association between mindless scrolling and goal conflict is stronger for individuals with lower self-control than those with higher self-control.

To conclude, we present a visual overview of the theoretical associations examined in this study in Figures 1 (momentary level) and 2 (day-level):

Method

This study used an intensive-longitudinal research design, combining (a) survey data with (b) experience sampling (ESM) and (c) 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 that will last approximately 18 months. In total, we collected 67,762 ESM datapoints from 1,315 individuals; for 26,708 (39.4%) of these datapoints we had matching log-data (covering the period the ESM questions referred to: "since the previous questionnaire received … "). The institutional review board of Ghent University gave ethical clearance.

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, where interested persons could register on our website after completing an eligibility check confirming they were at least 18 years old and owned a smartphone. Participant 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 registration, participants were directed to a separate website to receive further information and instructions to download the relevant app(s) and participate. Of the 3,065 registered participants, 1,449 individuals began participation. All participants installed m-Path to complete all questionnaires (Mestdagh et al., 2023). Android users were asked to additionally install a separate app to track their smartphone behavior (log-data: screen time, app activity, and notifications). Participants were then asked to provide informed consent and were presented with an intake questionnaire. This questionnaire measured variables such as gender, age, and self-control, as well as other factors not of direct relevance for this study (see full questionnaire in our OSF repository).

Based on a set of preregistered decision rules (see preregistration), we retained 1,315 participants for this study, of whom 691 (52.5%) were Android users who contributed at least eight datapoints. The final analytical sample of this study thus consists of 1,315 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 not willing to share gender information.

Participants received six experience sampling questionnaires each day over the course of 14 days, between the hours of 07:30 and 22:45. Each questionnaire was randomly scheduled within one of six 90-min timeslots throughout the day (i.e., questionnaire 1 between 07:30 hr and 09:00 hr). Time windows within which questionnaires were sent to participants were separated by a period of at least 1 hr 15 min and at most 4 hr 15 min. Following the initial notification, a reminder was sent after 30 minutes. Each ESM questionnaire remained available to the participant for 45 minutes. On average, ESM responses were separated by 2 hr 44 min ($SD = 12$ min). See the preregistration document for further details.

Measures

This study uses one time-invariant variable assessed during the intake questionnaire and several time-variant variables (ESM and log-data).

Time-invariant (non-ESM) variables

Self-control

We measured trait self-control in the intake survey using the Dutch adaptation of the Brief Self-Control Scale (13-item scale: Helmerhorst et al., 2011), which included 13 Likert items with responses ranging from 1 ("*Not at all*") to 5 ("*Very much like me*"). The scale showed good reliability in our sample, with a Cronbach alpha of .81. Average trait self-control across participants was 2.99 ($SD = 0.54$).

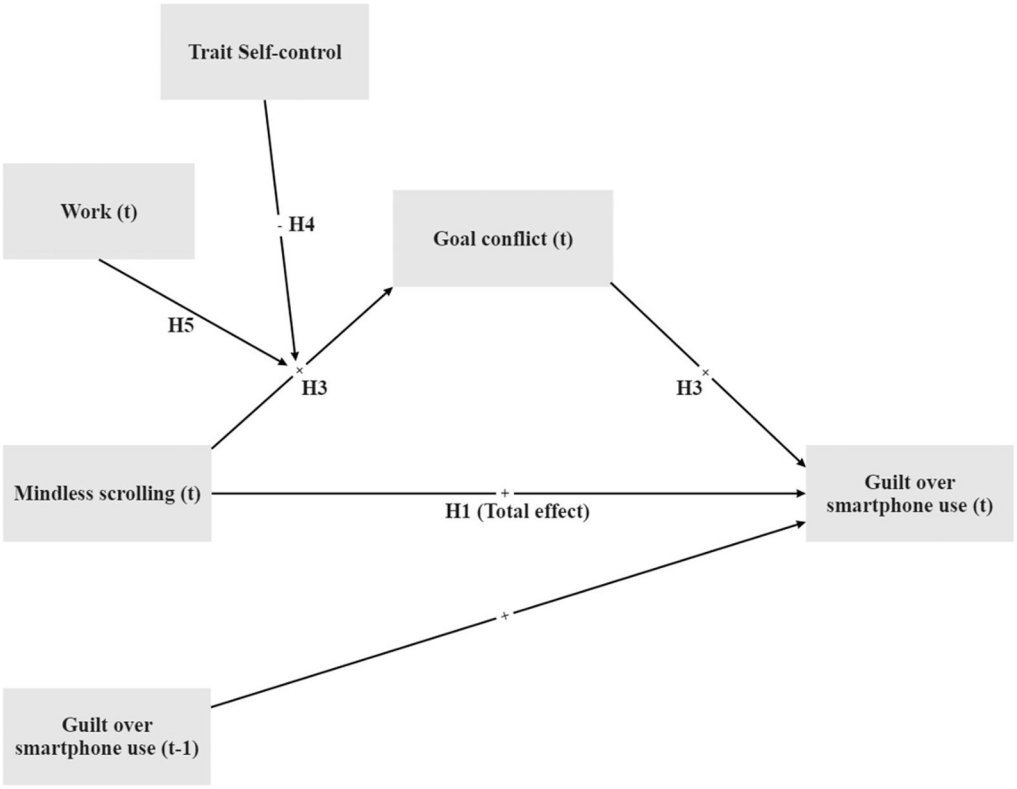

Figure 1. Theoretically expected associations at the momentary level.

Note. Expected associations at the ESM observation level. These theorized associations were tested in separate statistical models for hypotheses 1, 3, 4, and 5. A causal diagram showing the variables included in the study and their expected associations at the momentary level represented by directed arrows, as tested in hypotheses 1, 3, 4, and 5 of the study.

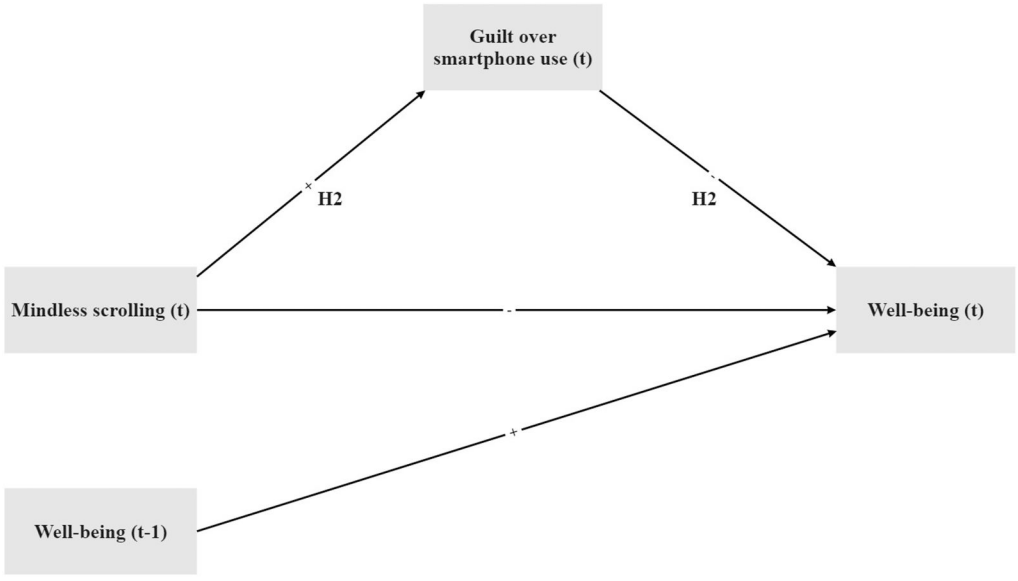

Figure 2. Theoretically expected association at the day level.

Note. Theoretically expected associations at the day level for hypothesis 2. Mindless scrolling and Guilt variables were measured at each ESM questionnaire and then aggregated over a day, whereas Well-being was assessed daily.
A causal diagram showing the variables included in the study and their expected associations at the daily level represented in arrows, as tested in hypothesis 2 of the study.

Time-variant (ESM) variables

For the ESM items, 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. Participants were instructed to interpret the latter stem as referring to the interval that passed since the last questionnaire received (irrespective of whether they had completed or missed it).

Guilt over smartphone use

We measured guilt over smartphone use using one ESM item, asked six times per day "*Since […] I felt bad about my smartphone use*" that had a Likert scale ranging from 1 ("*Not at all*") to 7 ("*Absolutely*"). Participants' responses were, on average, quite low ($M = 1.99$, $SD = 0.91$). The measure showed an intraclass correlation (ICC) of .46, indicating that more than half of the variance (54%) occurred at the within-person level.

Goal conflict

We measured momentary experiences of goal conflict using the following item: "*Since […] my smartphone use hampered me in making progress towards my ongoing goals (e.g., working, studying, exercise, etc.).*" Responses ranged from 1 ("*Not at all*") to 7 ("*All the time*"). Average goal conflict was low ($M = 1.95$, $SD = 0.85$), and the intraclass correlation was .41.

Self-reported mindless scrolling

The first way in which we operationalized mindless scrolling was using self-report measures: In every ESM questionnaire we asked participants "*Since […] did you use social media on your smartphone (Instagram, Twitter, TikTok, etc.)?*" (yes/no). If yes, participants were asked: "*Estimate how much time you spent on social media since the last questionnaire?*" (Slider bar ranging from 0 to 60+ min), and "*What percentage of this social media time were you mindlessly scrolling?*" (Slider bar ranging from 0% to 100%). Because there is no literal translation of the term "mindless scrolling" in Flemish Dutch, we used the term "goal-less scrolling" ("doelloos scrollen"), which is its equivalent signifier. Second, we deliberately set the upper limit of the slider of the SMU time item to 60+ min as previous logging research (e.g., Deng et al., 2019) and our own pilot data showed it to be extremely unlikely that an adult would spend more than 60 min on SM in the times being captured in our measurement, which turned out a correct judgment.[3] Moreover, having longer slider responses made it more difficult to select an accurate amount, and therefore more burdensome for participants. To obtain the final quantity of mindless scrolling time, we multiplied the percentage of mindless scrolling by the SMU time. The average across participants was 2.76 min ($SD = 3.72$) per interval, and the intraclass correlation was .34.

Log-self-report mindless scrolling

For the 691 participants whose smartphones were monitored, we computed a second measure of mindless scrolling combining the ESM and the smartphone log-data. Using the timestamps of the log-data, we computed the time spent on SM apps between ESM beeps. Then, we multiplied this quantity by the percentage participants self-reported in the item "*What percentage of this social media time were you mindlessly scrolling?*" For instance, if a participant indicates they scrolled 50% of their SM time and their trace data shows they spent 20 min in SM apps, the mindless scrolling time was calculated as 10 min. The average of this measure was 1.92 min ($SD = 2.94$) and the intraclass correlations was .24.

Well-being (daily)

In the end-of-day ESM questionnaire, we measured affective well-being with the following Likert item: "*Today I felt…*" answered from 1 ("*really bad*") to 7 ("*really good*").[4] The mean reported across participants was 5.19 ($SD = 0.85$), and its intraclass correlation was 0.39.

Work activity

In every ESM questionnaire, we asked participants to report on the activities they had been doing since the last beep (or since waking up). Specifically, the item said: "*Since […], I have…*" followed by a list of 12 images with corresponding words representing different activities (e.g., work, childcare, household chores, …). To create our "work" variable, we classified the categories "work," "overwork" (meaning working outside of normal working hours), or "telework" as "working," and all the rest as "not working." Of all the registered intervals, participants reported working 40.5% of the time.

Analytical procedures and strategy

Statistical analyses were performed in R (R Core Team, 2022) and the packages *lme4* (Bates et al., 2015), *lmerTest* (Kuznetsova et al., 2017), and *mediation* (Tingley et al., 2014). Because we are interested in effects at the within-person level (level 1) and cross-level interactions, we standardized level 1 predictors at the within-person level (Enders & Tofighi, 2007). Level 2 predictors were grand-mean standardized and outcome variables were included in their original scale. We additionally report centered (unstandardized) coefficients, following the same procedure as with the standardized coefficients. All confirmatory analyses were preregistered in OSF.

For each hypothesis, we fitted two multilevel models, one using only the ESM data (self-report model) and one combining log and ESM data (log-self-report model). We followed recommendations to control for Type 1 errors by including a maximal random structure in all models (Barr et al., 2013). That is, we included a random intercept per participant, and a random slope for every within-person predictor, including interactions. A similar approach was followed for our fifth hypothesis, but as it included exclusively ESM data, only one model was fitted. Confidence intervals were computed using the profile method with the *confint.merMod* function of the *lme4* package (Bates et al., 2015), and *p*-values were obtained via Satterthwaite's degrees of freedom method as implemented in *lmerTest* (Kuznetsova et al., 2017) for an alpha level of .05.

To investigate the mediation hypotheses (H2 and H3), mediation effects were estimated with the *mediation* package (Tingley et al., 2014). We first fitted multilevel models for the mediator and for the dependent variable, then we used the *mediation* function with the fitted objects to estimate direct, indirect, and total effects. As convergence warnings were encountered when estimating some *lme4* models, we changed the default *lme4* estimator. We then compared the results with the initial estimation method to make sure they were consistent.

Transparency and openness

All confirmatory analyses reported in the following sections were performed as specified in our preregistration, with the exception of our second hypothesis, for which the theoretical model was slightly modified upon a reviewer suggestion. No substantial deviations from the preregistered plans took place, but a number of minor changes were made, most notably a last-minute change in the response scale for daily well-being to improve user experience. Our preregistration was submitted to OSF on November 25, 2022, while the data collection was taking place and before starting any analysis or exploration of the data other than compliance monitoring.

Results

Our analyses are based on data collected from 1,315 participants, among whom we gathered 67,762 ESM datapoints, out of which 26,708 (39.4%) ESM datapoints had matching log-data. The median completion time of ESM questionnaires was 93 seconds, and the completion rate was 60.7%. Descriptive statistics of all variables included in the analyses are in Table 1. Bivariate correlations for all key study variables are in Table 2.

The first goal of this study was to identify the average amount of time participants spent mindlessly scrolling since the previous questionnaire they received (RQ1). Based on the self-report, participants spent a total 5.94 min (SD = 6.07) in SM, whereas based on the log-data, the average SMU time was 3.99 min (SD = 4.72). People reported spending 41% (SD = 29.66) of their time on SM mindlessly scrolling between ESM questionnaires. In terms of absolute time spent mindlessly scrolling, the average based on the self-report data was thus 2.75 min (SD = 3.72), while the log-self-report data average was 1.92 min (SD = 2.94). These quantities represent the average estimated mindless scrolling minutes per ESM time window (M = 2 hr 44 min). If scaled to the hour, the average would be about 1 min per hour based on the self-report data and 42 s based on the log-self-report data. The correlation between these quantities was .29 at the within-person level and .52 at the between-person level.

Confirmatory analyses

Our first hypothesis stated that spending more time mindlessly scrolling would predict higher guilt over smartphone use, controlling for experienced guilt at the previous time point. Both the self-report (b = 0.05; β = 0.20, 95% CI: 0.18–0.22) and log-self-report (b = 0.04; β = 0.18, 95% CI: 0.15–0.21) models showed significant positive coefficients, thus supporting our hypothesis. All estimated parameters can be found in Table 3.

Our second hypothesis stated that time spent mindlessly scrolling over a day would negatively predict well-being at the daily level, controlling for well-being reported on the previous day, and that this effect would be mediated by experienced guilt. We tested this prediction by means of two mediation models with day-level variables. In both cases, the estimated parameters were negative and significant, supporting our hypothesis. In the log-self-report model, the proportion of the mediated effect was 0.28 (β = 0.35, 95% CI: 0.24–0.58), while in the self-report model, it was 0.38 (β = 0.45, 95% CI: 0.32–0.70). All estimated parameters for these models are shown in Table 4.

Our third hypothesis stated that the association between mindless scrolling and guilt would be partially mediated by goal conflict, controlling for guilt reported at the previous time point. Both mediation analyses (self-report and log-data) supported our hypothesis. For both models, the estimated total effect was β = 0.18 (b = 0.04), with slightly different confidence intervals (95% $CI_{log\text{-}self\text{-}report}$: 0.15–0.21; 95% $CI_{self\text{-}report}$: 0.16–0.20). The estimated direct effect was also the same in both models (b = 0.02; β = 0.1 for both; 95% $CI_{log\text{-}self\text{-}report}$: 0.08–0.12; 95% $CI_{self\text{-}report}$: 0.08–0.11). The indirect effect was significant and positive in the log-self-report model (b = 0.02; β = 0.08, 95% CIs: 0.07–0.10; b = 0.02) and in the self-report model (b = 0.02; β = 0.09, 95% CIs: 0.08–0.09). The proportion of mediated effects was nearly identical between the self-report (b = 0.51; β = 0.47, 95% CI: 0.43–0.51) and log-self-report (b = 0.45; β = 0.45, 95% CI: 0.38–0.53) models (see Table 5 for all estimated parameters).

Our fourth hypothesis stated that self-control would moderate the association between mindless scrolling and goal conflict. Our model supported our hypothesis, participants who reported lower trait self-control exhibited a stronger association between mindless scrolling and goal conflict (see Figures 3 and 4 for visualizations, and Table 6 for parameters). The estimated coefficients were significant and negative for the self-report (b = −0.02; β = −0.11, 95% CI: −0.14, −0.08]) and the log-self-report models (b = 0.00; β = −0.06, 95% CI: −0.1, −0.01), albeit in smaller size.

Finally,[5] our fifth hypothesis stated that being at work would moderate the association between mindless scrolling and goal conflict. Both the log-self-report model (b = 0.02; β = 0.06, 95% CI: 0.01–0.11) and the self-report model (b = 0.00; β = 0.02. 95% CI: 0.00–0.5) showed a significant interaction in the expected direction, but effect sizes were small. All estimated parameters can be found in Table 7.

Discussion

This two-week mixed-methods study, involving mobile experience sampling and behavioral observations of smartphone

Table 1. Descriptive statistics of study variables.

Variable	*N*	*n*	Mean	*SD*	Range	ICC
Guilt	1,315	67,760	1.99	0.91	1–7	0.46
Goal conflict	1,315	67,758	1.95	0.85	1–7	0.41
Scrolling (self-report)	1,315	67,760	2.76	3.72	0–60	0.34
Scrolling (Log-self-report)	691	26,708	1.92	2.94	0–93.5	0.24
Well-being	1,283	10,768	5.19	0.85	1–7	0.39
Self-control	1,315	1,315	2.99	0.54	1–5	–

Note. *N* represents the number of participants that contributed data; *n* is the number of observations. Scrolling variables are expressed in minutes per ESM interval. Intraclass Correlation (ICC) indicates the amount of variance explained by random factors in each variable (without predictors).

Table 2. Within- and between-person correlations.

	Guilt	Goal conflict	Scrolling (self-report)	Scrolling (Log-self-report)	Well-being	Self-control
Guilt	1.00	0.88	0.31	0.27	−0.42	−0.32
Goal conflict	0.48	1.00	0.34	0.26	−0.38	−0.33
Scrolling (self-report)	0.17	0.18	1.00	0.52	−0.13	−0.18
Scrolling (Log-self-report)	0.17	0.16	0.29	1.00	−0.20	−0.23
Well-being	−0.14	−0.15	−0.06	−0.06	1.00	0.24
Self-control	–	–	–	–	–	1.00

Note. Within-person correlations are shown in the lower side of the diagonal, and between-person correlations are shown in the upper side. All correlations were statistically significant at level .001.

Table 3. Fixed effects parameters of models for hypothesis 1 predicting guilt

Predictor	b	SEs	95% CIs	β	SEs	95% CIs	R^2F	R^2R
Log-ESM data model (N participants = 474; N datapoints = 23,643)								
Intercept	1.94	0.03	1.88–2.01	2.05	0.04	1.97–2.13	0.04	0.45
Scrolling	0.04	0.00	0.03–0.04	0.18	0.01	0.15–0.21		
Guilt (*t*−1)	0.20	0.01	0.18–0.22	0.21	0.01	0.18–0.23		
ESM data model (N participants = 1,055; N datapoints = 34,901)								
Intercept	2.02	0.03	1.97–2.07	2.14	0.03	2.08–2.19	0.04	0.48
Scrolling	0.05	0.00	0.04–0.05	0.20	0.01	0.18–0.22		
Guilt (*t*−1)	0.20	0.01	0.18–0.21	0.20	0.01	0.19–0.22		

Note. All estimated parameters were significant at level .001. Estimates are either within-person centered (b) or within-person standardized (*β*). R^2F denotes the variance explained by fixed factors. R2R denotes the variance explained by random factors. Both R^2 statistics are from the standardized models.

Table 4. Mediation model of hypothesis 2 predicting well-being.

Effect	b	95% CIs	β	95% CIs
Log-self-report model (N participants = 446; N datapoints = 2,304)				
Total Effect: *Mindless scrolling + Guilt → Well-being*	−0.10	−0.15, −0.06	−0.03	−0.05, −0.02
Indirect Effect: *Mindless scrolling → Guilt → Well-being*	−0.03	−0.04, −0.02	−0.01	−0.01, −0.01
Direct Effect: *Mindless scrolling → Well-being*	−0.08	−0.12, −0.03	−0.02	−0.03, −0.01
Proportion of mediated effect	0.28	0.17, 0.50	0.35	0.24, 0.58
Self-report model (N participants = 913; N datapoints = 5,889)				
Total Effect: *Mindless scrolling + Guilt → Well-being*	−0.09	−0.12, −0.06	−0.02	−0.03, −0.02
Indirect Effect: *Mindless scrolling → Guilt → Well-being*	−0.03	−0.04, −0.03	−0.01	−0.01, −0.01
Direct Effect: *Mindless scrolling → Well-being*	−0.05[a]	−0.08, −0.02	−0.01	−0.02, −0.00
Proportion of mediated effect	0.38	0.27, 0.59	0.45	0.32, 0.70

Note. All parameters were significant at .001 level, except the direct effect in the self-report data model (superscripted [a]), which was significant at .01 level. Estimates are either within-person centered (b) or within-person standardized (*β*).

Table 5. Mediation models of hypothesis 3 predicting guilt

Effect	b	95% CIs	β	95% CIs
Log-self-report model (N participants = 484; N datapoints = 12,648)				
Total Effect: *Mindless scrolling + Goal conflict → Guilt*	0.04	0.03–0.04	0.18	0.15, 0.21
Indirect Effect: *Mindless scrolling → Goal conflict → Guilt*	0.02	0.01–0.02	0.08	0.07–0.10
Direct Effect: *Mindless scrolling → Guilt*	0.02	0.02–0.03	0.10	0.08–0.12
Proportion of Indirect Effect	0.45	0.37–0.53	0.45	0.38–0.53
Self-report model (N participants = 1,026; N datapoints = 33,826)				
Total Effect: *Mindless scrolling + Goal conflict → Guilt*	0.04	0.04–0.05	0.18	0.16–0.20
Indirect Effect: *Mindless scrolling → Goal conflict → Guilt*	0.02	0.02–0.02	0.09	0.08–0.09
Direct Effect: *Mindless scrolling → Guilt*	0.02	0.02–0.02	0.10	0.08–0.11
Proportion of Indirect Effect	0.51	0.46–0.56	0.47	0.43–0.51

Note. All estimated effects were statistically significant at .001 level. Estimated coefficients are either within-person centered (b) or within-person standardized (*β*).

activity, examined the prevalence of mindless scrolling and its link with feelings of guilt over smartphone use and daily well-being. We used two measurement approaches for the operationalization of mindless scrolling: one using only ESM self-reports (self-report model) and one combining self-reports with log-data (log-self-report model).

Measuring mindless scrolling

To the best of our knowledge, this study is among the first to operationalize mindless scrolling using a combination of self-report and log-data. This "hybrid" operationalization was motivated by the conceptualization of mindless scrolling as a subjective experience (self-report) that is nonetheless

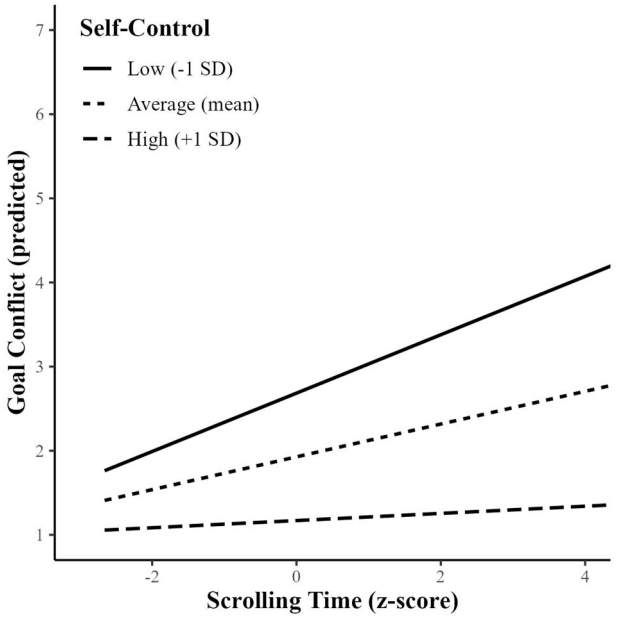

Figure 3. Goal conflict by the interaction between mindless scrolling (self-report) and self-control

Note. Model-based representation of the association between time spent mindlessly scrolling, self-control trait scores, and goal conflict. Scrolling time is assessed by the self-report ESM items and then standardized within-person. Goal conflict is represented in its original item scale. Self-control is represented in three levels: the sample average and one standard deviation above and below the average.
A line graph depicting the relationship between scrolling time (self-report) and predicted goal conflict. Three lines indicate low, average, and high self-control, showing an increasing trend, with lower self-control associated with greater conflict.

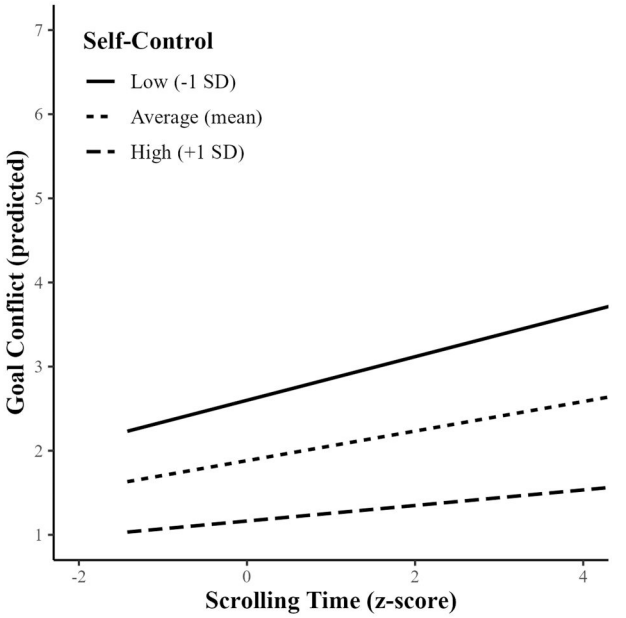

Figure 4. Goal conflict by the interaction between mindless scrolling (log-self-report) and self-control.

Note. Model-based representation of the association between time spent mindlessly scrolling, self-control trait scores, and goal conflict. Scrolling time is assessed by a combination of log-data and an ESM item, and then standardized within-person. Goal conflict is represented in its original item scale. Self-control is represented in three levels: the sample average and one standard deviation above and below the average.
A line graph depicting the relationship between scrolling time (log-self-report) and predicted goal conflict. Three lines indicate low, average, and high self-control, each showing a small upward trend.

grounded in observable behavior (logged SMU use). Digital well-being researchers have recently called to be more considerate of these subjective experiences (Hall, 2017; Vanden Abeele, 2021). Our research findings overall align with those of other recent studies on "media mindsets" (Ernala et al., 2022; Hall, 2017; Lee et al., 2021; Lee & Hancock, inpress), showing that *how* individuals experienced their SMU use, that is as more or less mindless, is crucial to understand effects of SMU on well-being. This suggests that this renewed approach may allow the field to move beyond the active/passive dichotomy, as it appears that not just the behavior, but also the meaning given to it, matters.

With respect to the prevalence of mindless scrolling, our study found that, in between ESM beeps (2 hr 44 min on average), participants mindlessly scrolled for close to 2 min when looking at the log-self-report measure (1.92 min or 42 s per hour) and for almost 3 min (2.76 min or 1 min per hour) when looking only at the self-report measure. If extrapolated to a day, this quantity would sum up to roughly 12 or 18 min, which constitutes 41% of participants' total SM time in the current sample. These numbers may seem small, and one might question whether this is due to our adult sample not being fully representative of the adult population in Flanders. However, the average daily SMU of our participants of close to 30 min (as logged) is in line with averages found in other studies involving adult samples (e.g., Deng et al., 2019).

These overall low daily averages stand in stark contrast to those found for adolescent and student samples, which typically report logged daily averages of more than 2 hr of SMU (e.g., Johannes et al., 2021; Verbeij et al., 2021). As younger populations spend more time on SM than adults, a pertinent question is whether this discrepancy is caused by noticeably higher adoption rates of TikTok, an app centered around the consumption of reels that shows markedly lengthier usage durations than other platforms (Sevenhant et al., 2021). With more SM platforms recently integrating the reels format, future research could investigate whether this system drift has contributed to a net increase in SMU and whether this pattern exists equally across different age cohorts. This information could shed further light on the tech industry's responsibility and whether concerns over especially youth's SMU are warranted.

There are two additional things to keep in mind which may explain the seemingly low SMU of our adult sample. First, we explicitly asked about SMU on smartphones, but most of our participants were knowledge workers who likely spend large portions of their day behind a PC/laptop. We may thus miss some (and perhaps even most) of their SM use. Second, we explicitly excluded mobile messaging, while several other studies reporting larger daily averages included this into the category of SMU (e.g., Johannes et al., 2021; Verbeij et al., 2021). Including mobile messaging in our study would add another 20+ min to the daily average.

Consistent with previous work that quantified the size of the discrepancy between self-reported and logged measures of digital media use (Parry et al., 2021), we found that mindless scrolling time was overestimated when measuring only with self-reported data, compared to the combined log-self-report approach, and that the within-person correlation between self-report data and log-self-report was also only

Table 6. Fixed effects of hypothesis 4 models predicting goal conflict.

Predictor	b	SEs	95% CIs	β	SEs	95% CIs	R^2F	R^2R
Log-self-report model (N participants = 530; N datapoints = 20,554)							0.06	0.35
Intercept	1.88***	0.03	1.82, 1.93	1.92***	0.03	1.86, 1.99		
Scrolling	0.04***	0.00	0.03, 0.05	0.18***	0.01	0.16, 0.2		
Self-control	−0.49***	0.05	−0.6, −0.39	−0.51***	0.06	−0.63, −0.39		
Scrolling*Self-control	0.00	0.01	−0.01, 0.01	−0.06**	0.02	−0.1, −0.01		
Self-report model (N participants = 1,173; N datapoints = 60,444)							0.08	0.37
Intercept	1.94***	0.02	1.9, 1.99	1.97***	0.02	1.93, 2.02		
Scrolling	0.05***	0.00	0.05, 0.05	0.20***	0.01	0.19, 0.22		
Self-control	−0.53***	0.04	−0.61, −0.45	−0.54***	0.04	−0.62, −0.45		
Scrolling*Self-control	−0.02***	0.00	−0.02, −0.01	−0.11***	0.01	−0.14, −0.08 –		

Note. Significant codes:
*** indicates $p < .001$,
** indicates $p < .01$. Estimated coefficients are either within-person centered (b) or within-person standardized (β). Level 1 predictors are standardized/centered at the within-person level, and level 2 predictors (Self-control) are standardized/centered at the between-person level. R^2F denotes the variance explained by fixed factors, while R^2R denotes the variance explained by random factors. Both R^2 statistics come from the standardized models.

Table 7. Fixed effects of hypothesis 5 models predicting goal conflict.

Predictor	b	SEs	95% CIs	β	SEs_{β}	$95\%\ CIs_{\beta}$	R^2F	R^2R
Log-self-report data model (N participants = 530; N datapoints = 20,418)							0.03	0.42
Intercept	1.78***	0.03	1.72–1.83	1.83***	0.03	1.77–1.9		
Scrolling	0.04***	0.00	0.03–0.04	0.17***	0.01	0.15–0.2		
Work	0.26***	0.02	0.22–0.31	0.28***	0.03	0.22–0.33		
Scrolling*Work	0.02**	0.01	0.01–0.03	0.06*	0.02	0.01–0.11		
Self-report data model (N participants = 1173; N datapoints = 60,003)							0.03	0.45
Intercept	1.83***	0.02	1.79–1.87	1.86***	0.02	1.82–1.91		
Scrolling	0.05***	0.00	0.04–0.05	0.19***	0.01	0.18–0.21		
Work	0.27***	0.02	0.24–0.3	0.28***	0.02	0.24–0.31		
Scrolling*Work	0.00	0.00	0–0.01	0.02*	0.01	0.00–0.05		

Note. Significant codes:
*** indicates p .001,
** indicates $p <$ .01,
* indicates $p < .05$. Estimated coefficients are either within-person centered (b) or within-person standardized (β). R^2F denotes the variance explained by fixed factors, while R^2R denotes the variance explained by random factors. Both R^2 statistics are based on the standardized model.

moderate ($r = .29$). The overestimation is in line with previous work. While likely a regression to the mean effect (Scharkow, 2016), the often mindless nature of SMU might also hinder participants from providing more accurate estimates of past behavior.

Mindless scrolling, guilt, and well-being

With respect to our hypotheses, the large amount of data collected make it likely to find significant patterns for (virtually) all estimated parameters (Standing et al., 1991). Therefore, we discuss our results based on the minimal effect sizes of theoretical interest.

Our results support that mindless scrolling is associated with feeling guilty about one's smartphone use at the momentary within-person level (H1). This aligns with previous theoretical and empirical work on SMU and guilt (Halfmann et al., 2021; Hall, 2017), and further extends it to the specific experience of mindless scrolling. The effect sizes found ($\beta = 0.20$ for self-report data, $\beta = 0.18$ with log-self-report data) are small but meaningful when compared to literature using comparable designs to study SM effects (e.g., Beyens et al., 2021; Gilbert et al., 2022), and provide evidence that after an individual spends time mindlessly scrolling, they are more likely to experience guilt over their smartphone use. Our study remains observational and does not identify a specific causal direction of effects. However, as guilt is an emotion that often leads to reparations about one's own behavior (Sznycer, 2019), it seems unlikely that higher levels of guilt over smartphone use would promote mindless scrolling.

An important contribution of this work was to investigate whether mindless scrolling, via its effect on guilt, may hamper affective well-being (assessed at the day-level). Findings supported this second hypothesis. Although observed total effect sizes were very small and thus should be interpreted with caution, unstandardized coefficients ($b = -0.10$ for log-self-report and $b = -0.09$ for self-report data) indicate that scrolling about 10 min above one's person-specific average on a day, goes hand in hand with a one point (on a 7-point scale) decrease in well-being at the end of the day.

Experienced guilt explained a significant portion of the total effect of mindless scrolling on daily affective well-being, in both models (28% in the log-self-report model and 38% in the self-report model), but still left a substantial amount of variance unexplained, indicating that there are likely other psychological pathways also driving this effect. Our observational design employed here does not demonstrate a particular directionality, but it would be interesting to further examine whether markers of well-being might also elicit mindless scrolling behavior—for example, might people who feel down try and escape those feelings by mindlessly scrolling, but then potentially feel even worse afterward? Just as people might use traditional forms of entertainment media (e.g., watching TV or playing videogames) to recover from stress (Reinecke et al., 2014), mindless scrolling can also

occur as a form of coping with negative affective states. Nonetheless, consistent with our results and prior work (Reinecke & Meier, 2021), when this media usage subsequently evokes a goal conflict, it may actually contribute to adverse emotions like guilt, ultimately having the opposite effect than originally intended. Such a cycle perhaps also explains why we see a negative association of mindless scrolling with both guilt and affective well-being. Future research should explore whether such a vicious cycle exists and/or further examine whether mindless scrolling might serve as a digital phenotype of ill-being on which just-in-time-interventions could be built.

Supporting our third hypothesis, around half of the association between mindless scrolling and guilt was mediated by goal conflict. This finding aligns with prior work on media and guilt (Reinecke & Meier, 2020) and empirical work on messaging behavior (Halfmann et al., 2021, 2023). Interestingly, however, nearly half of the effect was *not* mediated by goal conflict, so even in the absence of having to work for other relevant goals, individuals feel guilty after spending time mindlessly scrolling. Perhaps most individuals carry a negative mindset toward mindless scrolling, resulting at least partly from having internalized public discourse that often paints SMU and mindless scrolling as inherently inferior, unproductive, and inauthentic experiences while speaking nostalgically about a screen-free past (e.g., Syvertsen & Enli, 2020; Vanden Abeele & Mohr, 2021). Given that recent "media mindsets" research (Lee & Hancock, inpress) indicates that the perceptions individuals hold in relation to their media behavior—and in this case, mindless scrolling—could play a crucial role in explaining its downstream of psychological effects, future research might explore this aspect further.

Returning to goal conflict, earlier work conceptualizes it not only as a mechanism (or mediator), but also as an important situational boundary condition (i.e., moderator) of the relationship between the media use and guilt. Building on this, we examined one situational boundary condition, namely being at work (versus not), in which we assumed mindless scrolling to be more likely to produce goal conflict. Albeit significant, the moderating effect of being at work was very small, which precludes strong theoretical conclusions.

Finally, we explored the role of self-control as a person-specific factor potentially moderating the effects of mindless scrolling (H5) and observed that individuals lower in self-control were more vulnerable to experiencing goal conflict after mindlessly scrolling. This finding aligns with prior work (e.g., Schneider et al., 2021) explaining how low self-control may make individuals prone to mindlessly scrolling even when there is a (perceived) goal conflict. Of note is that, although in both estimate models the effects were small ($\beta = -0.11$ for self-report model, $\beta = -0.06$ for the log-self-report model), the estimated (standardized) parameters were nearly twice as large for the self-report model. This difference might be explained as a methodological artifact: Individuals with higher trait self-control might also be less inclined to report goal conflict overall, as that is likely not in line with their self-perception of having good self-control.

Limitations and recommendations

Our study is not without limitations. First, our self-report measurements were mostly single-item measurements, which we opted for to diminish participant burden. However, our single-item measures may not adequately capture the often complex constructs they stand for. Particularly, the affective well-being item might not capture the complex and multifaceted nature of this construct (e.g., Diener, 1984), which typically also comprises elements such as eudaimonic well-being and life satisfaction. We hope future research will validate single-item measures to better tackle the issue of measuring complex phenomena in dynamic measurement approaches.

Second, the operationalizations of goal conflict and guilt over smartphone use are conceptually close, potentially capturing the same underlying psychological construct. Nevertheless, the within-person correlation between the two items ($r = .48$) indicated that sufficient variability exists for them to be considered separate. A similar concern can be expressed for the guilt and affective well-being item. In this case, the within-person correlation was low ($r = -.14$), which evidences that there is minimal overlap.

Third, an important challenge of this work was the conceptualization of mindless scrolling as well as its measurement. Our rationale here was to approach mindless scrolling as an experience grounded in behavior and to thus operationalize it using both a behavioral observation (logged SMU) and a subjective experience (self-report item). This "hybrid" approach does not come without problems: General SMU is just a proxy for the behavior (scrolling or watching reels) we are trying to capture, and the estimation of mindless scrolling time might be subject to memory biases. Additionally, we used a single self-reported item that, in its literal translation, focused only on the goal-less nature of mindless scrolling and not on the reduced awareness that equally characterizes mindless scrolling. Future research could include items that also cover this aspect and explore different operationalizations and measurement approaches to capture mindless scrolling. For instance, it would be interesting to see whether behavioral markers of mindless scrolling (i.e., physical scrolling) show better or worse validity. Furthermore, lab research could investigate psychophysiological correlates of mindless scrolling to unravel the underlying cognitive, affective, and psychological processes involved in this experience.

Fourth, our analyses did not control for differences in time intervals that were captured in each ESM measurement. We expect that the (pseudo)randomized distribution of these intervals would counterbalance the effect that these differences in interval length might have. However, it is still possible that the effect of our predictors (i.e., mindless scrolling) might be dependent on the amount of time each measurement captured. Future research could utilize different scheduling designs or control for interval length in their analyses to avoid any potential biases.

Fifth, our study leaves unknown whether there are alternative psychological pathways associated with mindless scrolling that might lead to positive outcomes, such as recovery effects. Investigating potential recovery effects and whether these are hampered by guilt (Reinecke et al., 2014) is essential, as it may help to generate greater nuance in terms of what we ought to be concerned about and what we need to target. Given the overall low prevalence of mindless scrolling, perhaps we should be less concerned about adults' mindless scrolling behavior than about their potentially unwarranted sense of guilt over it, which may stem from internalized societal values dictating that time needs to be spent productively.

Sixth, we explored self-control as a moderator, but given that one of the central components of this work is the *mindless* aspect of the mindless scrolling experience, and given recent work demonstrating the buffering role of mindfulness

(Hefner & Freytag, 2023), it is likely that individual differences in mindfulness (i.e., trait mindfulness) might better explain important differences.

Seventh, our operationalization of "being at work" lacked precision because we asked participants about all activities engaged with in the time before beeps, making it difficult to specifically locate "'work time" in intervals where also other activities were mentioned. Therefore, it is likely that even when we classify such intervals as "work time," in reality participants might have only been at work for a portion of the time. Related, we assumed being at work to be a critical situational boundary condition for mindless scrolling to elicit a goal conflict, but perhaps non-work activities such as spending quality time with one's children might produce an equally strong goal conflict.

Finally, it remains theoretically plausible that effects exist in the opposite direction or that third variables explain the observed associations. We thus advise future research to employ cross-lagged designs, as well as intervention designs to *reduce* mindless scrolling as these can inform with greater confidence of the causal effect-directions theorized in this study.

Conclusion

This work moves beyond the active/passive SMU dichotomy by targeting the specific experience of mindless scrolling, which encompasses both a behavioral and subjective component. Overall, our results evidence the relevance of including subjective construals to advance understanding of when and why SMU can be harmful. More specifically, they indicate that the experience of mindless scrolling comes with feelings of guilt over smartphone use and that goal conflict explains this mechanism, especially for individuals low in self-control and at work. While mindless scrolling may seem a relatively harmless experience, we find that through its effects on guilt, it may have downstream negative implications for individual well-being that should be further investigated.

Supplementary material

Supplementary material is available at *Journal of Computer-Mediated Communication* online.

Open science framework badges

Open Materials
The components of the research methodology needed to reproduce the reported procedure and analysis are publicly available for this article.

Open Data
Digitally shareable data necessary to reproduce the reported results are publicly available for this article.

Preregistered
Research design was preregistered.

Notes

1. Note that the object of guilt here is the past consumption behavior—which is different from, for instance, feeling guilty over not being responsive enough to other people's messages (Halfmann et al., 2023).
2. We opt for a self-evaluation of how one generally *feels* here (Diener, 1984), as affective well-being is known to show daily fluctuations (Galinha & Pais-Ribeiro, 2008).
3. Only 55 out of 26,708 observations (.002%) were above 60 min (the upper limit of the "equivalent" ESM item). We separately ran the analyses truncating these observations to a maximum of 60 min for comparability with the self-report data, but no meaningful changes were found compared to our reported results.
4. The item was translated literally (*Vandaag voelde ik mij … heel slecht/heel goed)*, as this translation has equivalent signifier value.
5. Following the suggestion of a reviewer, we additionally estimated three-way moderation models that combined the moderation effects of both self-control trait and work context in the effect of mindless scrolling on goal conflict, but the results were not significant (see Supplementary Materials).

Data availability

We make all data and code necessary to reproduce our results available at our OSF repository.

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