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Your Screen-Time App Is Keeping Track:

Consumers are Happy to Monitor but Unlikely to Reduce Smartphone Usage

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Non-Technical Summary

Many consumers nowadays are concerned about the amount of time they spend on their smartphone and use screen time tracking apps, with the promise of being empowered to change their mobile habits. But do these screen time apps actually help to reduce mobile usage? This paper suggests that screen time apps improve digital self-awareness, but that they are less likely to lead to a reduction of mobile usage. Interestingly, consumers seem to prefer less effective self-monitoring apps over more effective alternatives, especially if they are very dependent on their smartphone. These findings suggest that many people want to monitor their smartphone usage but not necessarily to control it.

Your Screen-Time App Is Keeping Track:

Consumers are Happy to Monitor but Unlikely to Reduce Smartphone Usage

Can screen-time applications help to control smartphone usage? Maladaptive consumption in the form of smartphone overuse is a concern for many consumers. As a solution, screen-time applications were launched by the largest technology companies. This research predicts that, while improving screen time knowledge, tracking apps are less likely to empower users to reduce actual usage. Study 1, a longitudinal field study (*N*=242), shows that screen time tracking improves digital self-awareness but that it is less likely to lead to a reduction of mobile usage. The results also reveal a small negative association between smartphone usage and performance at university. Study 2, an online experiment (*N*=139), uncovers that consumers prefer informational tracking over more restrictive alternatives (blocking, digital nudges), despite evaluating it as less effective for reducing screen time—especially those highest in smartphone dependence. These findings suggest that many people want to monitor their smartphone usage but not necessarily control it.

THE DARK SIDE OF SMARTPHONE OVERUSE

Smartphones have become an irreplaceable part of our daily work routine and a constant companion in our private lives. The vast majority of under 35-year-olds check their phone immediately after waking up and just before bed (Ofcom 2020). In between waking and sleeping, Gen Z spends an average of four hours per day on their smartphone[1], approximately a quarter of all time awake (GobalWebIndex 2020). Despite the advantages of mobile technology, there is also a darker side to the relationships we have with our phones. Recent research is uncovering negative consequences of mobile overuse on performance (Lanaj, Johnson, and Barnes 2014; Felisoni and Godoi 2018), stress and compulsive behavior (Lee et al. 2014), sleep patterns (Thomée, Härenstam, and Hagberg 2011) and cognitive capacity (Ward et al. 2017). No standardized definition exists for what is considered *too much* screen time, so 'over-use' is a subjective term. However, a significant proportion of people (61% Gen Z, 39% 16-75-year old) describe themselves as a smartphone 'over-users' wanting to reduce their screen time, yet are unable to achieve this (Deloitte 2019). Research also shows the prevalence of procrastination via social media apps (Meier, Reinecke, and Meltzer 2016), the "fear of missing out" when offline (Przybylski et al. 2013) and the pressure of constant connectivity (Mazmanian 2013) as detrimental outcomes of mobile consumption.

The Rise of Screen Time Tracking Apps

As a solution, both Apple and Google released time management features ("Screen Time", "Digital Wellbeing") to their respective operating systems in 2018 with the goal of helping consumers understand their mobile usage and, if desired, enable them to change their usage habits.

[1] 16-64-year old's global average: 3hrs 23min

Both tech giants argue that these tools empower consumers by providing detailed information about mobile screen time. However, thus far evidence about the efficacy of these apps is lacking.

This research investigates whether screen time apps effectively educate consumers about their mobile behavior, and whether this is likely to lead to a usage reduction. Since smartphones can be a source of distraction for students (Ames 2013), a further aim was to explore whether reducing screen time is a worthwhile goal to pursue for performance (i.e., is screen time associated with grade point average).

Related Work on Self-Quantification

Consumers' use of mobile technology provides rich data to companies for marketing management (Cooke and Zubcsek 2017). But can this data also facilitate digital wellbeing? The related Quantified Self (QS) literature can help to provide insights. Digital QS tools for self-tracking are hugely popular in the health domain with the goal of improving self-awareness and supporting behavior change.

As Kersten-van-Dijk et al. (2017) summarize in their critical review, QS devices can be effective tools for raising self-awareness of the tracked behavior by providing data-driven insights. In the smartphone context, people typically have limited knowledge of their own mobile usage (Andrews et al. 2015), and usage estimate are malleable and contingent on context cues (Raghubir, Menon, and Ling 2021). This suggests that there is potential for improvement of digital self-awareness.

Evidence regarding the effectiveness of QS tools for actual behavior change, however, is mixed (e.g., Stiglbauer, Weber, and Batinic 2019; Banerjee et al. 2020), arguably because there is a substantial gap between recording information and changing behavior (Patel, Asch, and Volpp 2015). Quantifying a behavior can even backfire and have unintended harmful effects, as found in

the physical activity domain. Here, self-tracking can reduce intrinsic motivation and experienced enjoyment of an activity (Etkin 2016).

To maximize effectiveness, QS tools should provide clear, actionable insights (e.g., if-this-then-that insights; Kersten van Dijk et al. 2017) while also appealing to hedonic motives (e.g., fun user experience; Shin and Biocca 2017). Comparative information (e.g., one's own behavior vs. a reference group average) tends to be more effective than non-comparative information (Shin and Biocca 2017). None of the most popular screen time apps currently incorporate such design elements. Furthermore, in App-Store reviews, consumers often describe screen time apps as "insufficiently restrictive" to actually change mobile habits (Roffarello and De Russis 2019). In line with this, Orji et al. (2018) suggest that mobile self-tracking calls for complementary strategies such as rewards, social comparison or competition.

Accordingly, in study 1, I hypothesize that—while screen time apps are likely to improve (poorly calibrated) knowledge about mobile usage—they are less likely to lead to a usage reduction in absence of other strategies. Notwithstanding, consumers may be content with self-tracking as a form of symbolic goal progress (Wicklund and Gollwitzer 2013) and actually prefer it over alternatives. Study 2 tests this proposition.

STUDY 1: LONGITUDINAL FIELD STUDY

Data was collected as part of a University workshop (see appendix for detailed methodology and result). Participants (N=280, 58.93% female, M_{age}=26, 78% iPhone) completed two surveys before and after the workshop, at T1 and T2, in which they estimated their screen time (example item: *"On a typical weekday, how much time per day do you spend looking at your smartphone screen?"*).

In the intervening time, students completed a smartphone project (duration: 6-25 days, *M*=18, *SD*=4.8) which comprised tracking their mobile usage with an app[2] and submitting screenshots thereof (i.e., daily screen time in hours and minutes) to provide objective usage data. To standardize data collection while keeping the workload reasonably low, participants submitted screenshots three times per week. The screen time data from these screenshots constituted the dependent variable.

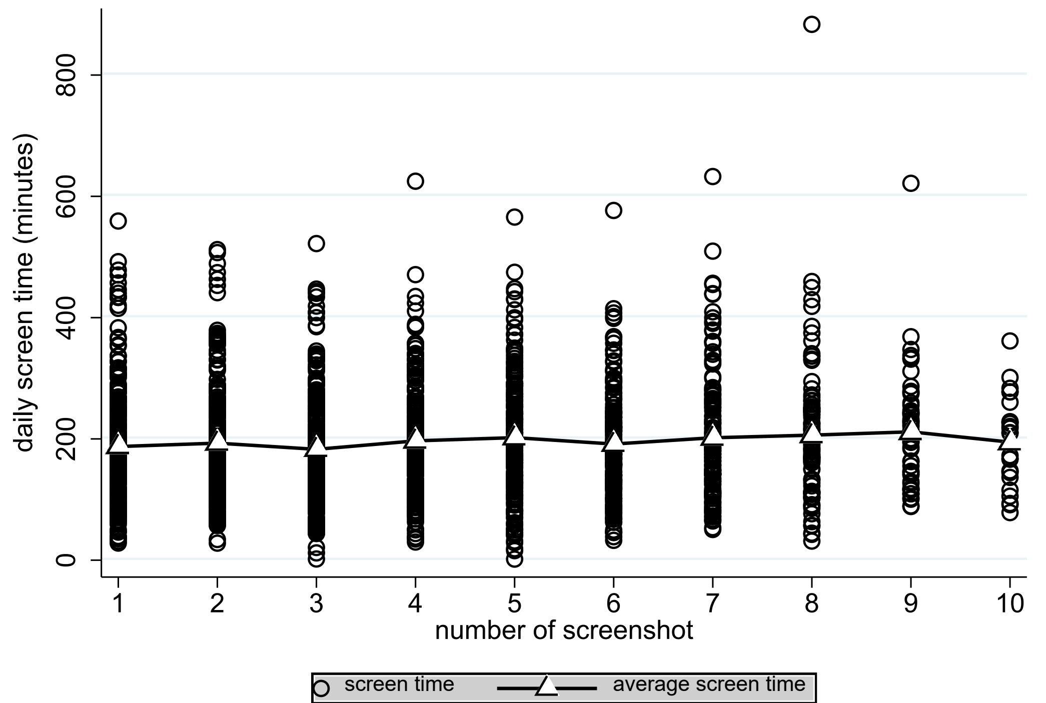
At T2, participants also evaluated the tracking experience. For example, whether tracking had changed their mobile behavior and if so, in what way (text response). Six months later, GPA was obtained from the university (N=205).

Results

Behavior Change. Participants spent on average 191.57 minutes (SD=69.65) per day on their phone. As hypothesized, tracking was unlikely to have led to a screen time reduction (Figure 1). Random effects regression, controlling for age, gender, and phone type, suggested a slight but insignificant increase in screen time over the project (β=0.054, CI [-.001, .110], z=1.91, p=.056).[3] Nevertheless, participants evaluated the tracking experience positively (53% wanted to continue; 83% said it was useful for productivity). But participants were ambivalent whether tracking had indeed changed their mobile behavior (48% said tracking had *not* changed their behavior).

[2] Options: Apple Screen Time, Moment–Screen Time Control (https://inthemoment.io/), QualityTime–My Digital Diet' (http://www.qualitytimeapp.com)
[3] As a sign of robustness, fixed effects regression yielded equivalent results.

Figure 1. Scatterplot and average of mobile screen time in minutes over the study period.



Self-awareness. To investigate whether participants' usage knowledge improved through tracking, screen time estimates at T1 and T2 were correlated with the actual screen time observations. The results showed that T1 estimates were uncorrelated with the objective screen time during the project, irrespective of whether data came from an early or late screenshot. However, T2 estimates were highly correlated with actual screen time early and late in the tracking process (web appendix Table 3), indicating that tracking improved self-awareness.

GPA. There was a small, negative association between screen time and GPA (β=-.0109, SE=.005, p=.042), controlling for age and gender. Students with higher screen time tended to have lower GPA at the end of the academic year.

Qualitative Analysis. Participants who indicated that tracking had changed their mobile behavior were asked for an explanation. A thematic analysis of 141 responses revealed that most explanations (72%) were related to the theme *'tracking increased self-awareness'* encompassing

comments about recognizing problematic mobile usage. Only a small proportion (19%) mentioned *'proactive behavior-change strategies'* for screen time reduction (e.g., setting time limits, reducing notifications; further results in the appendix).

Discussion

These results raise the question why tracking apps were less likely to lead to a screen time reduction, despite being evaluated positively and improving self-awareness. Few participants engaged in proactive behavior change strategies, as the qualitative analysis revealed. In behavior change theories, such strategies match the volitional action stage of goal pursuit where people actively modify their behavior or environment to overcome problematic behavior (Prochaska and Velicer 1997; Gollwitzer 2012). Most participants, however, reported an increased self-awareness of problematic behavior—an indicator of pre-decisional contemplation. Like a smoker who knows how many cigarettes she is smoking but still fails to quit, self-awareness alone is insufficient to change highly automatic or compulsive behavior (Patel, Asch, and Volpp 2015; Vogel and Pechmann 2021; Turel and Bechara 2021).

So, what apps or app features could be more effective to curb mobile usage, and importantly, would consumers be willing to use them? Digital nudge apps can disrupt habitual behavior and stimulate more mindful phone interactions (e.g., by incorporating design frictions; Cox et al. 2016). A digital nudge hailed as effective which has not been investigated thus far is 'grayscale mode' (i.e., black and white colored screen). Similarly, coercive blocking apps which enforce strict time limits can reduce self-interruptions and mobile usage (Kim, Cho, and Lee 2017).

If consumers were truly motivated to take action, they should prefer apps which they perceive to be most effective for screen time reduction. However, if consumers are not willing to take action, they should prefer apps which improve self-awareness for contemplation but do not enforce or nudge behavior change. Through replacing real change with a symbolic act (Wicklund

and Gollwitzer 2013), learning about usage via tracking apps can become a substitute for goal attainment. Study 2 tests this proposition: Despite knowing that an informational tracking app is not most effective for usage reduction, consumers evaluate it more positively than a coercive (blocking) app or a digital nudge (grayscale) app—as long as they think it raises self-awareness.

STUDY 2: PERCEPTIONS OF APP FEATURES

Participants (N=139, 44.6% female, 71.9% Android, M_{age}=28 years, SD=8.75), recruited via Prolific (https://prolific.co), completed an experiment in form of a survey about app designs for screen time reduction. Participants evaluated three apps in a within-subjects design (informational tracking app vs. grayscale digital nudge app vs. coercive blocking app; counterbalanced).

Evaluations were given on three dimensions on a scale from 0-100: 1) overall preference (*"How interested would you be in using this app?"*), 2) knowledge efficacy (*"How effective is this app for helping people understand their smartphone habits?"*) and 3) reduction efficacy (*"How effective is this app for helping people reduce screen time?*"). Additionally, self-control (Tangney, Baumeister, and Boone 2004) and smartphone dependence (Ward et al. 2017) were measured.

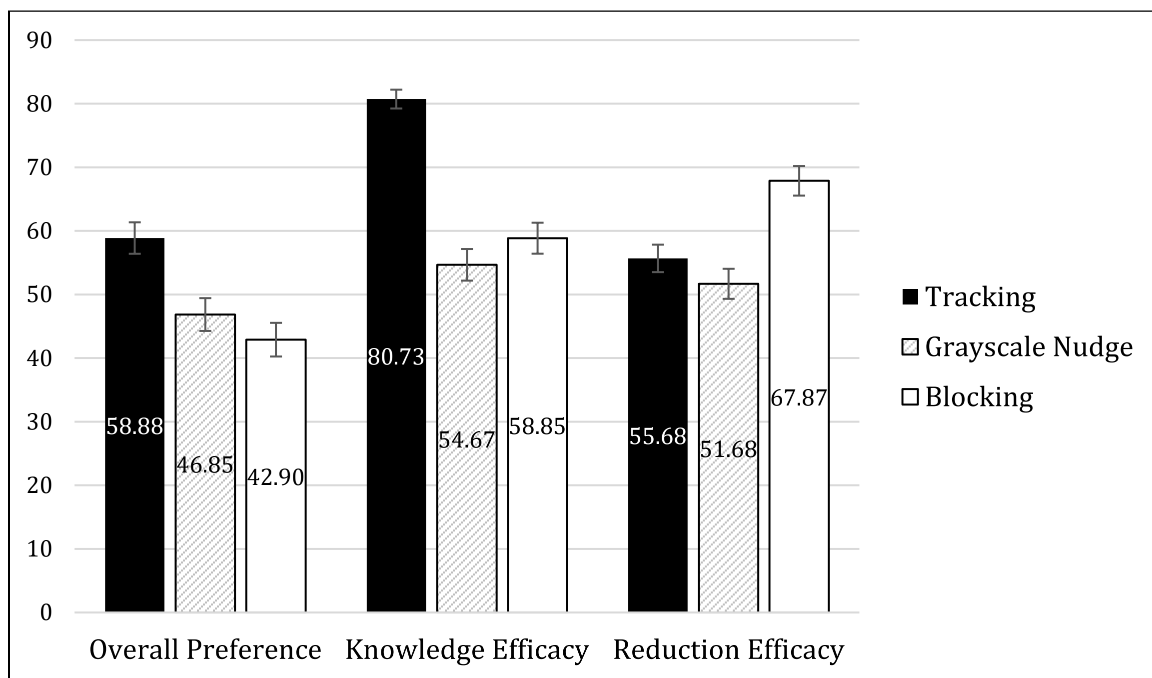
Results

Participants showed a strong preference for the tracking app ($F(2, 276)=15.73$, $p<.001$) over the digital nudge ($p<.001$) and blocking app ($p<.001$). Participants also evaluated the tracking app as superior in knowledge efficacy ($F(2, 276)=50.98$, $p<.001$) than the digital nudge ($p<.001$) and blocking app ($p<.001$). However, for reduction efficacy, the blocking app was evaluated as superior ($F(2, 276)=18.55$, $p<.001$) than the tracking app ($p<.001$) and digital nudge ($p<.001$; means in

Figure 2). Thus, participants were aware of the gap between knowledge efficacy and reduction efficacy, but nevertheless preferred the tracking app.

Highly smartphone dependent users (those least likely to take action) tended to evaluate the tracking app more positively (β=.67, *SE*=.24, *t*=2.78, *p*=.006). Individuals with high self-control (those most likely to be proactive; Turel and Bechara 2021) tended to evaluate the digital nudge more positively (β=.86, *SE*=.34, *t*=2.52, *p*=.013). There were no associations for the blocking app.

Figure 2. Average evaluation of three app designs (tracking app vs. grayscale app vs. blocking app) for overall preference, knowledge efficacy and reduction efficacy.



DISCUSSION

Millions of people now use screen time apps, with the promise that they are being empowered to reduce their phone usage. This research contributes to the growing literature on maladaptive consumption of technology (Clithero, Karmarkar, and Hsu 2021) by showing that this

promise is unlikely to be true. This research finds that, despite its popularity and improving digital self-awareness, screen time tracking is less likely to lead to an actual reduction of smartphone usage. One reason for this is that only a minority of users take advantage of proactive behavior change tactics. This indicates that many consumers are not willing to take concrete action to reduce screen time but are satisfied with receiving information for pre-decisional contemplation (Prochaska and Velicer 1997; Gollwitzer 2012), especially if they are highly smartphone dependent.

Symbolic self-completion provides a theoretical explanation for the favorable evaluation despite limited effectiveness. Goal achievement efforts do not have to alleviate the actual problem but can rather involve a substitute symbolizing goal attainment (Wicklund and Gollwitzer 2013). Perhaps, self-tracking even distracts from goal achievement? –an avenue for future research.

Screen time was linked to GPA (objectively measured). Thus, reducing mobile usage might be important in educational contexts. However, without randomized studies the exact causal relationship remains unclear.

In our technology-driven society, spending time on the phone, particularly social media, helps us regain a sense of belonging, ironically sometimes at the detriment of actual human interaction (David and Roberts 2017). The deep-rooted benefits of mobile usage are hard to replace, especially without suitable alternatives (Dai and Fishbach 2014). This explains why consumers may find it difficult to avoid their smartphone, despite awareness of problematic behavior. Melumad and Pham (2020) describe smartphones as “adult pacifiers” relieving stress and enhancing psychological comfort through their reassuring presence. Such displaced coping to alter negative emotions with certain behaviors, (e.g., frequent mobile checking) is an indicator of maladaptive consumption (Chang, Jain, and Reimann 2021).

Moving forward on addiction and maladaptive consumption, there is tremendous potential for future research on solutions for technology over-use. Consumers are frequently portrayed as helpless addicts when it comes to their mobile behavior. However, with sufficient willpower, motivation and importantly, effective tools to support behavior change, automatic impulses can be controlled (Turel and Bechara 2021). Instead of relying on self-monitoring, consumers should disrupt triggers and consumption cues of automatic mobile behavior, add design frictions to make the unwanted behavior less rewarding and support the formation of alternative habits (Wood and Neal 2016; Turel and Bechara 2021). Future research could systematically test such habit-breaking interventions in the smartphone context. Finally, it is important to stress that curbing excessive product use can also be in a company's interest (Nevskaya and Albuquerque 2019), leading to positive outcomes for revenue as well as consumer wellbeing.

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