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Why, how, when, and for whom does digital disconnection work? A process-based framework of digital disconnection

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Abstract
Digital disconnection has emerged as a concept describing the actions people take to limit their digital connectivity to enhance their well-being. To date, evidence on its effectiveness is mixed, leading to calls for greater consideration of why, how, when, and for whom digital disconnection works. This article responds to these calls, presenting a framework that differentiates four key harms that contribute to experiences of digital ill-being (time displacement, interference, role blurring, and exposure effects). Using these four harms as a starting point, the framework explains: (1) *why* people are motivated to digitally disconnect; (2) *how* specific disconnection strategies (i.e., placing limits on time, access, channels, and contents, interactions and features) may help them; and for *whom* (3) and under which conditions (*when*) these strategies can be effective.

Keywords: digital disconnection, digital well-being, mechanisms, interventions, harms

Digital disconnection, an emerging concept in the social sciences and humanities, refers to placing (temporary) limits on one's digital media use (e.g., Beattie & Daubs, 2020; Jorge, 2019; Nguyen, 2021; Nguyen et al., 2022; Syvertsen, 2020). These digital media mostly concern information and communication technologies such as smartphones and laptops that transmit textual and audiovisual content through the (mobile) Internet, resulting in a networked society connecting individuals anytime, anyplace.

Disconnecting from media is not a new phenomenon (e.g., Syvertsen & Enli, 2020). With the advent of digital media, however, the practice seems to have shifted from a fringe phenomenon to a mainstream concern (Vanden Abeele & Nguyen, 2022). People who struggle with anytime and anyplace connection can turn to digital disconnection in order to "reclaim control" (Syvertsen, 2020) and "tame the technology" (cf. domestication theory, Silverstone & Haddon, 1996) so as to maintain digital well-being. To support individuals in this quest, an industry of digital disconnection products and services emerged, promising to aid regaining control by helping individuals place limits on, or implement barriers to their connectivity (Vanden Abeele, 2020a), e.g., via digital detox programs, advising on optimal platform/device settings, or providing supporting technologies, such as screen time monitoring apps that restrict access and/or time (e.g., Hiniker et al., 2016a).

Evidence for the effectiveness of these disconnection interventions, however, is equivocal (see Nassen et al. [2023] and Radtke et al. [2022] for recent, comprehensive overviews). This has led to a call within the field of media effects research to work towards better understanding the nomothetic principles regarding *why*, *how*, for *whom* and *when* digital disconnection works (Nassen et al., 2023; Radtke et al., 2022; van Wezel et al., 2021; Vanden Abeele et al., 2022).

This article responds to this call by presenting a process-based framework of digital disconnection around four key harms that are commonly understood to jeopardize digital well-being, namely time displacement, interference, boundary blurring and exposure harms. We first describe the broader socio-cultural understanding of these harms to explain *why* they may drive people to digitally disconnect. Next, we explain *how* specific digital disconnection strategies might "work" to revert or mitigate them, and explore for *whom* and *when* these strategies might work (least) best, thereby developing a roadmap from which concrete propositions can be drawn that can be tested in future media psychologically and socio-culturally oriented research.

Digital disconnection: Necessary for digital well-being?

This article defines digital disconnection[1] as "a deliberate form of non-use of devices, platforms, features, interactions

and/or messages that varies in frequency and duration with the aim of restoring or improving one's perceived overuse, social interactions, psychological well-being, productivity, privacy and/or perceived usefulness" (Nassen et al., 2023, p. 1). Digital disconnection is promoted as necessary to balance and maintain (digital) well-being (Van Bruyssel et al., 2023). Indeed, over half of American teens and a third of their parents deem that they spend too much time on screen (Jiang, 2018); almost half of parents and teenagers across Mexico, Japan, the UK, and the US describe themselves as addicted to their mobile devices—with three quarters agreeing that smartphones distract them (Robb, 2019). An annual Belgian report shows that the number of persons struggling with these issues rises every year (De Marez et al., 2022; Sevenhant et al., 2021).

With such percentages reporting digital well-being problems, one wonders why these people do not just stop using digital media. A dominant theme in the literature, however, is *ambivalence* (Karlsen & Ytre-Arne, 2021; Vanman et al., 2018; Ytre-Arne et al., 2020): Users both love and hate digital media. They love the connectivity that digital media use grants them, giving ubiquitous access to entertainment, support, and a wide range of services (Vanden Abeele et al., 2018), but they often feel they are wasting time online (Jorge et al., 2022), struggle with constant appeals made to their attention (Baym et al., 2020), hate feeling "always on" (Nguyen, 2021), and deal with a range of other problems stemming from exposure to contents (e.g., "picture-perfect" Instagram posts), interactions (e.g., cyberbullying), and features (e.g., cognitively fatiguing interfaces).

Caught in this connectivity paradox where digital media has the potential to both support and hamper well-being (Vanden Abeele, 2020a), digital disconnection becomes a necessary yet challenging escape out of this conundrum. Understandably, this process is riddled with challenges, as individuals must carefully navigate these ambivalences, getting rid of the maladaptive features of 24/7 connectivity, while maintaining the benefits (see also Hiniker et al., 2016a).

As mentioned above, a growing industry of digital disconnection products and services tries to support individuals to navigate this ambivalence, offering advice, guidance and intervention for how to quit, take a break, reduce or adapt media behavior (Nassen et al., 2023). Remarkably, to date, the effectiveness of these tools, services and, more generally, strategies remains ill-understood. For instance, findings concerning the efficacy of digital detox intervention research (i.e., fully quitting the use of a device or platform for a longer period) are inconclusive: Brailovskaia et al. (2020) and Tromholt (2016) found that quitting Facebook significantly improved well-being, while Hall and colleagues (2021) found no such effect for detoxes varying from one to four weeks. Interestingly, Vanman et al. (2018) even found that—although levels of stress hormone cortisol declined—subjective well-being actually decreased when disconnecting from Facebook. Radtke et al.'s (2022) recent systematic literature review of digital detox studies concludes out of this evidence that "the inconsistent findings regarding other outcomes across all presented studies prevent making a recommendation as to whether to promote or discard digital detox interventions, as positive and counterproductive consequences need to be examined more clearly" (p. 20).

Knowing that detoxing is only one strategy among many (Nassen et al., 2023; Nguyen, 2021; Nguyen et al., 2022), the inconclusive evidence on this practice alone suggests that the emerging field of digital disconnection research needs scholarship to systematically organize and give clear guidance to empirical inquiry. This is what the current article aims to do, by developing a process-based framework of digital disconnection.

This framework departs from three core assumptions. First, we adopt an "agentic perspective" (see also Karsay & Vandenbosch, 2021), assuming that digital disconnection is a motivated choice that individuals make, based on the perceived harms of digital media. As recent research on "media mindsets" shows, these perceptions can be informed by subjective experiences but also by cultural narratives and social norms (Lee et al., 2021; Lee & Hancock, 2023). We assume that it matters to also lay bare these narratives and norms and show how they impact individual motivations to disconnect.

Second, we assume that digital disconnection improves generalized well-being (often operationalized by constructs such as life satisfaction or happiness) mainly indirectly, by impacting specific antecedents of generalized well-being, such as productivity, physical health, or self-esteem. Hence, we assume that digital disconnection may "work" through various, potentially concurrent processes to affect well-being, and argue that we should focus first on identifying these lower-order theoretical mechanisms, as stepping stones towards understanding digital well-being.

Third, given what we know about the dynamic nature of media use (Vanden Abeele et al., 2022) and the person-specificity of media selection and effects (see also Beyens et al., 2020; Valkenburg & Peter, 2013) we assume that digital disconnection strategies are not one-size-fits-all solutions, but depend on individual and contextual characteristics. Hence, developing our framework, we consider the person- and environment-fit of digital disconnection.

A process-based framework of digital disconnection

We start our process-based framework of digital disconnection with four major harms that people commonly perceive in relation to digital connectivity and that may motivate them to digitally disconnect: (1) time displacement; (2) interference; (3) boundary blurring; and (4) exposure effects. Time displacement and interference effects concern the "amount" or quantity of digital media use, whereas boundary blurring and exposure effects concern the "nature" or quality of the exposure (e.g., the type of content, interactions or features one is exposed to) (Vanden Abeele et al., 2022).

It is essential to match digital disconnection interventions to the nature of each of these harms. Based on Meier and Reinecke's (2020) taxonomy, Nassen et al. (2023) already discuss how interventions may target the device, but also the platform, a feature, interactions, or messages. We build further on this differentiation to develop our framework. For each harm, we first explain *why* it might motivate individuals to disconnect. Next, we elaborate on *how* digital disconnection could revert or mitigate the harm by placing certain limits on connectivity, thereby considering at which "level" (device, platform […]) disconnection might best be sought. Then, we explore *for whom* and *when* this type of digital disconnection might work, by exploring individual and contextual factors that may serve as boundary conditions for the intervention's effectiveness. As illustrated in Table 1, armed with this information, we believe concrete propositions of relevant predictors, outcomes,

Table 1. Overview of the process-based framework of digital disconnection with example propositions.

Harm	Media Behavior	Disconnection strategy	Media Mindset	Socio-cultural assumptions	Momentary subjective experience	Relevant longer-term Outcomes	Individual Susceptibilities	Contextual Determinants
Time Displacement	Quantity of use—Duration	Limits on time on the device or platform	Digital media use as a waste of time	Time is scarce and valuable, and therefore needs to be "spent well"	Guilt and shame over screen time, hurriedness, perceptions of running out of time	Changes in Time expenditure	Self-control failure, limited mindfulness	Variations in the degree of situational goal conflict
Interference	Quantity of use—Frequency and Fragmentation	Limits on access to the device or platform	Digital media use as a threat to our focus	Living a productive and authentic life requires being focused and "present in the moment"	Distraction, Overload, Sequential and Concurrent Multitasking, Task performance	Quality of Performance and/or of the experience	Attentional deficits	Variations in the attentional demands of the situation
Boundary blurring	Quality of use – Degree of (conflicting) role demands	Limits on channels	Digital media use as a threat to our role boundaries	24/7 accountability is a responsibility that needs to be individually managed and maintained	Online vigilance, harriedness, Role Conflict/ Ambiguity, Stress	Burn-out, Interpersonal conflict, Relationship Dissolution	Segmentation preference	Variations in the degree of normative expectations to respond instantly to role demands
Exposure	Quality of use— Degree of exposure to harmful content, interactions, and features	Limits on con-tents, contacts, and features	Digital media use as a threat to our cognitive and affective well-being and physical health	Digital contents, social interactions and interfaces are "un-real" and therefore often inferior, leading to risky and unhealthy experiences	Negative affect, social exclusion, physical health	Internalizing or externalizing problems (e.g., anxiety, de-pression, or aggression); Breakdown of social life/ capital; Health problems (sleep, posture, …)	Psychological, social, or physical vulnerabilities	Variations in degree of modularity of content, interaction and feature exposures

mediators and moderators in intervention research can be more easily developed.

Time displacement: Digital media use as a challenge to our time

A first harm that people may experience from using digital media is time displacement. With only 24 hours in a day, displacement is believed to foster negative outcomes especially when screen time displaces activities that are "better" than the online activity—for example because they are regarded as more conducive to a healthy, productive, and meaningful life (Hall & Liu, 2022; Kushlev & Leitao, 2020). Areas in which time displacement has been investigated are sleep (Vilhelmson et al., 2018), studying (Marciano & Camerini, 2021), and face-to-face interactions with peers (Hall et al., 2019; Twenge et al., 2019). Time displacement is also implicitly recognized as a harm mechanism in phenomena such as "smartphone procrastination" (Aalbers et al., 2022) and "cyber-slacking" (Flanigan & Kiewra, 2018).

Screen time as a waste of time

Time displacement as a problem motivating disconnection can be recognized in individuals' perceptions of screen time—and especially social media screen time—as a "waste of time" (Baym et al., 2020; Vanden Abeele & Mohr, 2021). These perceptions can be situated against socio-cultural, normative assumptions of time being a scarce commodity that we should use "productively" (Jorge et al., 2022), which can be understood literally, as using time for economic productivity through study and work, and figuratively by engaging in "morally superior"[2] or "more authentic" activities for self-actualization (Syvertsen & Enli, 2020).

Interestingly, meta-studies do not offer strong support for time displacement effects at the between-person level (e.g., Marker et al., 2018). For example, although there is concern over "social media time" displacing face-to-face socializing, research suggests it has mostly displaced time on other—often more traditional—media activities, such as television viewing (e.g., Hall & Liu, 2022), or on affectively unpleasant activities such as cleaning (Hall, Johnson, et al., 2019). Regardless of whether time displacement effects are real or illusory, however, studies do show that people can experience guilt and shame over their time on media (de Segovia Vicente et al., 2024; Du et al., 2018; Halfmann et al., 2021), indicating that individuals' subjective experiences and perceptions (i.e., their "media mindset"; see also Ernala et al., 2022) on digital media time matters.

Mitigating time displacement: Limiting usage time

Considering the above, it is clear that a primary digital disconnection strategy for (real or perceived) time displacement is to limit the *duration* of screen time. After all, such limits ought to free up time to spend on alternative activities. Such time limits may be short-term, but may also concern a longer-term period, for instance when implementing a longer period of complete abstinence (i.e., taking a "digital detox"). Time limits may be applied at the level of the device, limiting *absolute* screen time, but can also be applied at the level of the platform, working in a *particular window* of time (e.g., restricting social media time during work hours).

Intervention studies suggest that, overall, time restrictions are successful in reducing time spent on digital media. van Wezel et al. (2021), for instance, found that a restriction on social media time led to a 10–15% decrease in the total time participants spent on their smartphone. Importantly, participants self-reported that they did not use other devices as a substitute gateway to spend time on social media. Similarly, Hiniker et al. (2016a) noted a 21% decrease in time spent on apps that participants self-selected when using the MyTime. In their systematic review of "smartphone and social media digital detox" studies, Radtke et al. (2022) also observed that there was a significant decrease in smartphone use time in all reviewed studies involving passive sensing of smartphone use.

Do these time restrictions also help individuals in allocating more time to what they believe matters, though? Research evidence that directly addresses the latter question through an investigation of time expenditure is surprisingly scant. Some evidence suggests that smartphone removal has a small effect on sleep duration (Dunican et al., 2017). Otherwise, most research is circumstantial, focusing on outcomes such as "social connectedness" or "life satisfaction," without systematically monitoring changes in individuals' time usage before and after the disconnection intervention.

Importantly, the subjective experience of "wasting time" is predominantly referred to in relation to binge behaviors such as "binge-watching" and "mindless scrolling" (Baym et al., 2020). These online behaviors do not only stretch out over time, but are also characterized by an experience of a loss of control over the behavior. Therefore, key to tackling the problem of time displacement, is whether time restrictions support people in preventing these binge behaviors. Research examining procrastination lends preliminary evidence here, as time-restricted internet use was found to facilitate the "onset" of engaging in alternative activities (Hinsch & Sheldon, 2013). Also relevant are interventions that rely on a mindful and self-reflective engagement with screen time. Ko et al. (2015), for instance, found that when a time-based disconnection intervention was organized as a group-based activity that supported self-judgment and self-reaction on top of self-monitoring, self-perceptions over agency to regulate the time spent on the smartphone in accordance with personal goals increased.

Individual and situational boundary conditions for the effectiveness of time limits

Time management is generally considered a self-regulatory competence (Claessens et al., 2007). Therefore, the capacity to regulate one's own behavior is likely an essential individual factor that could influence the effectiveness of time-based interventions, with these types of interventions being particularly relevant to individuals suffering from limited self-control over their digital media use. Recent research by Oeldorf-Hirsch and Chen (2022) supports this notion, showing that mindfulness, a trait closely related to self-control (Masicampo & Baumeister, 2007), negatively predicts the perceived usefulness of screen time tracking. As such, when testing the effectiveness of time limit interventions, it may be essential to consider between-person differences in self-regulation and mindfulness towards screen time. To date, however, research including measures such as self-perceived "self-control failure" in dealing with digital media (e.g., Du et al., 2018; Halfmann, 2021) is lacking.

With respect to relevant situational boundary conditions, research suggests that especially the absence or presence of "goal conflict" (e.g., Halfmann et al., 2021, 2023) between the media behavior and alternate activities may determine

whether time restrictions have the desired effect. After all, if individuals do not experience their screen time as conflicting with other activities, an intervention might have no—or even a reversed—effect. Yet, to date, intervention research has not looked at such a boundary condition.

Conclusion: Setting limits on time to make time

Concluding, there is substantial evidence of individuals perceiving their time spent on digital media as "wasted time" that elicits guilt. This seems to be especially the case when screen time is perceived to conflict with achieving other goals. Consequently, tackling time displacement by limiting screen time seems a straightforward and promising intervention, but it appears relevant to complement this with supporting the initiation of alternative activities, and to work on general mindfulness to enhance self-control. Moreover, these experiences are likely especially prevalent among individuals who perceive a lack of self-control to mitigate this issue, hence interventions might especially target these users. Finally, it is essential to consider socio-cultural assumptions surrounding time and time displacement, as interventions might (re-)produce normative beliefs that further commodify time and that emphasize the moral superiority of certain activities over others.

Interference: Digital media use as a challenge to our focus

Interference refers to the potential of digital media to interrupt or interfere with our activities (Kushlev & Leitao, 2020). Interference differs from time displacement: While time displacement considers the duration (i.e., length) of screen activities, interference concerns the frequency of short digital media interruptions in everyday life. These multiple daily interruptions can interfere with attentional processes, making it more difficult to focus on primary tasks and activities, to respond to others (Vanden Abeele, 2020b), and to make adequate decisions (McDaniel, 2015). Furthermore, with diverse—and potentially irrelevant—communication streams reaching us through various channels, interruptions can also fuel perceptions of overload (Elciyar, 2021). Given that humans are inherently limited in their capacity to process information, such overload can exacerbate bounded rationality and ultimately undermine performance (Karr-Wisniewski & Lu, 2010).

Problems in relation to interference and distraction are at the center of research exploring new concepts such as "digital distractions" (e.g., Hanin, 2021), but also "phubbing" (i.e., phone use during f-t-f social interactions; Vanden Abeele, 2020b), and "technoference" (e.g., McDaniel, 2015). These problems carry substantial societal weight when considering the potential detrimental consequences of smartphone-induced distractions during, for example, driving (Bayer & Campbell, 2012).

Technological interruptions as a distraction

People perceive distraction as a major problem, and especially villainize smartphones. In the US, for example, 39% of parents and 31% of their teens state losing focus at work or in class because of their phone. People perceive digital distractions as making them less "present in the moment" (Palalas, 2018), and report that they evoke undesirable multitasking behavior (Aagaard, 2019).

Nonetheless, Wiradhany et al. (2021) point out that media multitasking is not necessarily maladaptive, but can be part of the normal waxing and waning of task engagement. Similarly, Baughan et al. (2022) identify "normative dissociation" as a common result of automatized digital media behavior, that is a benign everyday experience that successfully restores depleted resources. When focusing on the harm of technological interference, it is important to thus acknowledge that people may have colored perceptions of technology-induced distractions, perceiving them more negatively than they truly are. A central assumption that can be recognized as underlying these perceptions is that attention is key to keeping up the "deep work" needed to uphold professional productivity (Fast, 2021), and central to achieving fundamental values such as creativity, play, nature, and contemplation (Syvertsen, 2023). In view of these—real or illusory—beliefs, it may not surprise that people take action to minimize distraction from digital technologies.

Mitigating technological interruptions: Placing limits on access

Technological distraction is believed to occur in large part because of habituation (Bayer et al., 2016, 2022; Bayer & LaRose, 2018): People have "embodied technohabits," that make them unwillingly engage in behavior that they actually condemn "with a degree of automaticity and stubbornness that challenges the conventional conceptions of agency" (Aagaard, 2020, pp. 241–242).

Because stimulus-response behavior is at the heart of habitual phone use, problems of distraction can likely be successfully mitigated through design friction that weakens the stimulus-behavior link by creating access barriers. These barriers can work as micro-boundaries or "stumbling blocks" that prevent users from non-consciously accessing the technology (Aagaard, 2021). Physical barriers concern the restructuring of the physical environment—for instance moving technology out of sight or locking the smartphone into a container or cabinet, and thus operate on the device level. Technological barriers operate by limiting access to programs/apps and their notification systems and thus operate on the platform and feature level.

Whereas the tech industry initially gradually removed access barriers—for instance, allowing screens to be automatically unlocked using facial recognition (Anderson & Wood, 2021)—they are recently being reintroduced. Users can, for instance, limit access by implementing a time limit (see time displacement), but can also put their smartphone in "gray mode," adjust the settings of programs and apps to disable notification systems, or use dedicated apps that restrict access to selected programs/apps, and/or require greater—and more deliberate—effort to access them. Some design friction interventions combine a physical with a technological barrier, for instance, having to insert a special micro-USB into the smartphone to "open up access" to a priori selected applications (e.g., the "unpluq" key).

How effective are digital disconnection interventions to improve attention and focus? Perhaps unsurprising, evidence of "digital detox" research shows limiting the duration of use has limited impact. Radtke et al.'s (2022) systematic literature review reports one study on cognitive performance and one on grade point average, but neither show an effect of digital detoxing. van Wezel et al. (2021) also found no effect of a time-based restriction on attentional capacity—although

participants in the experiment overall reported improved attention, suggesting a potential Hawthorne effect.

Interventions focusing more directly on limiting access show greater promise. For instance, requiring users to (partially and/or temporarily) disable notifications systems does appear to improve attention and (through that) productivity (Kushlev et al., 2016); However, to date this research relies mostly on self-reports, and when reviewing behavioral log data, disabling notifications led to *more* rather than less checking behavior (Liao & Sundar, 2022). Moreover, completely disabling notifications increases anxiety and worries over missing out (Fitz et al., 2019; Pielot & Rello, 2015). Studies exploring the effect of grayscaling interventions show reductions in screen time and in self-reported problematic use (e.g., Holte et al., 2023; Holte & Ferraro, 2023; Wickord & Quaiser-Pohl, 2023) – but as far as we are aware none of these studies focused on outcomes such as attention, distraction, or productivity. Interventions requiring individuals to reflect on their behavior when activating the phone/an app did reduce "absentminded" phone use (Terzimehić et al., 2022), but to our knowledge downstream implications for attention and productivity remain unevidenced.

In addition to the above intervention studies, there is also research looking into the longer-term strategy of modifying one's own reactions in response to the stimulus, for instance through cognitive behavioral training (CBT), mindfulness, or educational training. To date, however, evidence is mixed and does not really focus on attention/distraction: A systematic review and meta-analysis of randomized controlled trials (RCTs) targeting internet addiction found that CBT successfully reduced Internet Addiction, albeit not in all its dimensions (Liu et al., 2017). On the other hand, a 2019 meta-analysis (Malinauskas & Malinauskiene, 2019) presenting results of three earlier RCTs did not show very strong support for an effect of group CBT on addiction, whereas educational programs did appear successful.

Individual and situational boundary conditions for the effectiveness of access limits

Overall, we judge the above evidence as too limited to warrant definitive conclusions about the effectiveness of interventions limiting access to technology to improve attentional focus and productivity. Nonetheless, we already briefly discuss attentional deficits and attention-demanding contexts as examples of potential individual and situational moderators.

Attentional deficits are known to make especially children more prone to digitally multitask (Baumgartner & Sumter, 2017), which in turn predicts greater problems with attention (Baumgartner, 2022). Given these findings, deficits in attention, for instance common in ADHD, may represent a relevant individual susceptibility that predisposes to experience greater benefit from an intervention that limits access to technology.

With respect to situational boundaries, the effectiveness of the interventions may depend on situational demands for sustained attention. During tasks requiring high degrees of vigilance (e.g., driving in heavy traffic), digital distractions come with a high cost and therefore interventions might be most effective under those circumstances. Evidence for this assumption can be found in a recent study examining the "do-not-disturb-while-driving" feature on Apple phones, which sets a "soft block" on notifications. Findings show that participants reduced phone use when driving at higher speeds, but,

surprisingly not at lower speeds, which the authors tentatively attribute to drivers placing "high value on their autonomy to exercise (…) self-regulation" (Shelef et al., 2021). In other words, in situations demanding greater vigilance users may be more accepting of interventions that restrict their autonomy in self-regulating their technology use than others.

Conclusion: Setting limits on access to avoid distraction

There is substantial evidence of individuals being concerned about digital technologies distracting them. This problem may especially occur when performing tasks or activities in which sustained attention is desired, such as when engaging in "deep work" or during interactions with loved ones. To tackle the problem of digital distraction, reducing technological interference by limiting access to devices, platforms and features shows some effect, although findings remain scarce and are sometimes mixed. Early evidence suggests that, for interventions to be effective here, it is essential to consider situational demands and individual acceptance of access-limits: Interventions need to strike the right balance between protecting users from distraction on the one hand, while safeguarding their autonomy on the other. This thus likely requires a combination of "intelligently restructuring one's surroundings to avoid succumbing to temptation" (Aagaard, 2021, p. 355) while also working on greater mindfulness, although a risk of the latter focus is that it may shift responsibility to individual shoulders, potentially neglecting the corporate responsibility of the tech industry to address this problem.

Finally, giving in to digital distractions may often be a relatively benign form of the waxing-and-waning that occurs during task performance for most individuals. When developing and implementing interventions targeting technological interference, it is essential to be considerate of this, so that occasionally succumbing to digital distractions is normalized rather than pathologized. Nonetheless, identifying those individuals for whom it is a problem, for example, those suffering from attentional deficits, may then be essential to consider.

Boundary blurring: Digital media use as a challenge to managing role demands

People create and maintain boundaries related to their social roles to simplify and classify the world around them (Allen et al., 2014). Digital media use, however, blurs the boundaries between these roles by disentangling role performance from time and place constraints (Vanden Abeele et al., 2018): As long as there is connectivity, one can act in the capacity of parent, child, worker, friend, partner, etcetera.

Increased permeability of the boundaries between social roles can benefit people, for example by allowing them to align activities more flexibly to momentary demands (Bertel, 2013; Vanden Abeele et al., 2018). But the permeability of boundaries between roles can also become problematic: People feel that they need to be "always on" (e.g., Nguyen, 2021), and this fuels perceptions of role ambiguity (i.e., under which role am I currently operating; Bauer & Simmons, 2000). They can also be overly exposed to—sometimes conflicting—role demands (i.e., role conflict; Cho et al., 2020). Especially in the context of work–life balance, these negative experiences may ultimately hamper health and well-being (Baumeister et al., 2021; Salanova et al., 2013).

24/7 Connectivity forces us to be "Always-On"

People perceive the problem of boundary blurring most strongly in the context of their work–life balance, where especially work life creeping into one's private life is reported to form a problem. For instance, a multitude of studies on work-related uses of digital communication after hours documents how this behavior molds work–nonwork conflict, interpersonal conflicts both at work and in the private sphere, telepressure, stress, exhaustion, and in the long run role stress and even burnout (Diaz et al., 2012; Gadeyne et al., 2018; Kao et al., 2020; Liu et al., 2015; Schlachter et al., 2018). A complicating matter is that people often witness the convergence of work and non-work related roles onto one digital platform. Mols and Pridmore (2019), for instance, note how especially mobile messengers such as WhatsApp support contexts to converge in one digital space, making it very hard to disconnect from one context (e.g., work) but not another (e. g., family).

Blurred boundaries may stem from real availability demands that role domains put on people, for example as related to certain jobs (e.g., working internationally or being self-employed comes with high demands; Hilbrecht & Lero, 2014). Real demands may also be exerted by the company or supervisor (Kao et al., 2020). But they can also grow from internalized or implicit norms within the person that "responding swiftly is important" (Barber & Santuzzi, 2015; Grawitch et al., 2018). Either way, people experience normative pressures favoring 24/7 connectedness. These pressures can be situated against a broader socio-cultural shift towards greater individual responsibility, that tasks individuals with the "ongoing negotiation of audiences, contents and boundaries in a collapsed and networked environment," requiring a constant process of decision making and boundary delineation[3] (Vanden Abeele et al., 2018).

Mitigating boundary blurring: Placing limits on channels

Given that 24/7 connectivity enables a blurring of roles that contributes to role pressures, conflicts, and role overload, following work/family border theory (Clark, 2000) successful digital interventions may be those that make the boundaries between domain borders less permeable. Disconnection interventions that target the interaction channels through which social roles are performed and negotiated may therefore be most successful in responding to problems of blurred boundaries. Channels could be rearranged, for example, and/or limits could be set to features pertaining to role-specific channels so that they more clearly segregate interactions into their respective role domains.

Examples of channel rearrangement are actions such as using a separate smartphone or using separate apps or accounts for email, communication and social media to handle work communication. Examples of smaller "micro-boundary" efforts are limit-setting actions such as installing an out-of-office reply, disabling notifications from role-specific apps (e.g., work email) (Cecchinato et al., 2015), or muting read receipts for chats with interaction partners specific to certain role performances (see also Mannell, 2019). Although qualitative research suggests these types of actions and strategies are to a certain extent effective, to date, systematic experimental research that specifically tackles the question of their effectiveness appears limited. Experimental research where micro-boundary setting was part of the intervention seemed effective, however (Rich et al., 2020). New tools are also being developed for personal boundary management through channel segregation, such as mobile apps that filter notification streams according to their source domain (e.g., Gross & Mueller, 2021). These developments may be promising to digitally disconnect from specific domains, but altogether evidence remains limited.

It is important to notice here that limits to channels can be imposed by individuals but also by social groups or institutions, for example when work organizations restrict access to work servers after hours, or batch emails. Such email batching, for instance, shows beneficial impact on employee exhaustion—although this effect seems to wear off over time and thus is not the "panacea for enhancing well-being" (Wijngaards et al., 2022).

Individual and situational boundary conditions for the effectiveness of channel limits

Prior research on boundary blurring shows the problem is sensitive to particular individual susceptibilities, most notably, a person's preference for integrating versus segmenting work and private social roles may play a central role into how bothersome the problem of work–home interference is experienced (Derks et al., 2016). So-called "segmenters" have a natural preference for strong and impermeable boundaries, thus digital disconnection from work channels after work hours also appears more easy to enforce for them, benefiting their well-being (Park et al., 2011). But for "integrators" such strong boundaries may be undesirable, and even be counter-productive as they may prevent them from keeping up with their family role while simultaneously flexibly managing the work role (Derks et al., 2016). In sum, segmentation preference may be of major impact in determining the beneficial versus deleterious effect of digital disconnection interventions that set limits to channels.

With respect to contextual characteristics, it is essential to note that there may also be real and perceived differences in workplaces and social settings in relation to 24/7 connectivity and its associated norms. Email batching, for example, was found to be effective only when organizational norms did not dictate fast response time (Wijngaards et al., 2022), indicating that reciprocity norms will moderate the effectiveness of interventions. Moreover, recent research indicates that perceived pressure to be digitally available can shape self-control processes in relation to media behaviors (Halfmann, 2021). Thus, whether situations or settings (are perceived to) demand 24/7 availability and immediate reciprocity may play a crucial role in determining the effectiveness of digital disconnection interventions.

Conclusion: Setting limits on channels to avoid boundary blurring

In conclusion, digital media facilitate the blurring of boundaries between role domains, bringing both benefits (e.g., flexibility) and harms (e.g., role conflict) to individuals who increasingly feel that they have to be "always on" in their various social roles. This is in part because digital channels allow contexts to converge which can exacerbate role pressures, conflicts and overload. Consequently, digital disconnection interventions may be effective at targeting undesirable blurring of boundaries by rearranging these digital channels so that they decrease permeability between domain borders.

To date, findings from mostly qualitative studies suggest that setting limits to channels by segregating devices, platforms, and interactive features according to role domains is somewhat effective in tackling the problem of boundary blurring. The effectiveness of channel rearrangement, however, likely depends on individual and contextual characteristics: Channel limits may mostly be beneficial to people who prefer strict segmentation between role domains while potentially detrimental to those who thrive on the ability to simultaneously manage social roles. The degree of a context's availability and reciprocity demands likely also moderates the effectiveness of channel rearrangement. Further systematic experimental research is needed, however, that disentangles these and other characteristics to better understand when, why and for whom setting limits to one's digital channels is effective in diminishing the problem of blurred boundaries.

Exposure: Digital media use as a challenge to cognitive and affective well-being and health

Finally, undesirable or negative arousal experiences and physical strain resulting from exposure to screen contents, digitally-mediated interactions, and material devices/interfaces might motivate people to disconnect. The paucity of research on these negative experiences makes an exhaustive discussion fall beyond the scope of this article, but we name a few examples:

With respect to screen *content exposure*, a well-known example is negative arousal resulting from social comparison, which may lead to negative affect in the short term, and contribute to longer-term detrimental outcomes such as problems with one's mental health (Faelens et al., 2019, 2021). Regarding *computer-mediated-interaction exposure*, cyberbullying is one example of online social interaction that elicits substantial negative arousal, even when one is not directly victimized but bystander to the bullying (Bastiaensens et al., 2014). Victimization may equally lead to negative longer-term consequences in various life domains (Pabian & Vandebosch, 2021). *Feature/device exposure* problems are issues that users may experience from physically interacting with technological objects, interfaces and environments. An example is the "technostress" resulting from a technology's low usability, manifesting in emotional and physical strain experiences (Nisafani et al., 2020). Other examples are "zoom fatigue" (Bailenson, 2021) and "text neck syndrome" (Neupane et al., 2017).

Screen exposures are unhealthy for Us

People often attribute negative exposure experiences to the technological affordances of digital media, as they are considered to leverage "unreal," "unnatural," and "inferior" experiences compared to "real world experiences" (Darr & Doss, 2022). Technological affordances are indeed oftentimes implicated in negative experiences. For example, technological affordances such as editability and algorithmic popularity (e. g., boosting mechanics such as "likes") enable and socially reward "picture perfect" online self-presentation that may be unrealistic to attain in real life, contributing to negative upward social comparison exposure effects (Meeus, et al., 2019). Similarly, technological affordances such as 24/7 persistence and association play an undoubtedly important role in the specific harms associated with cyberbullying, and the easy portability of smartphones is likely implicated in device/feature exposure problems such as reduced sleep quality or text neck syndrome.

Although there is ample research on a large variety of exposure effects, it should be noted here that exposure harms are often surrounded by "techno-panic" discourse. For example, social media are seen as the culprit for thin ideal internalization effects, while research points towards various other agents of socialization from which these ideals are socially learnt (Roberts et al., 2022). As such, a sole focus on social media might mask more fundamental questions surrounding societies' gendered beauty ideals. Also, although evidence bases are sometimes weak or more nuanced, claims sometimes persist. For example, while research notes positive outcomes of social comparison on social media (e.g., Meier & Schäfer, 2018), negative narratives prevail. Similarly, Shahar and Sayers' (2018) study suggesting growth of "horns" on young people's skulls resulting from posture changes due to smartphone use was later debunked and labeled as "fake news," but the narrative is difficult to correct in the public domain (Gilligan & Gologorsky, 2019).

Mitigating exposure effects: Setting limits on contents, interactions and objects/features

Research on interventions directly targeting exposure effects is rare—although issues such as negative social comparison are sometimes implicitly referred to as explaining the effects of social media detoxes on well-being. However, digital disconnection can also mitigate the undesired effects of content, interaction, and device/feature exposure more directly. For content exposure effects, users can limit what contents they are exposed to by using filters for contents, for instance by blacklisting certain hashtags (e.g., to avoid "picture-perfect" images in one's timeline), or unfollowing accounts on which undesired contents are shared. Recent qualitative research, for example, shows that girls are aware about how Instagram exposes them to idealized self-presentations, and interact with the platform's features to reduce content exposure, for instance, by (un-)following particular accounts (van der Wal et al., 2022). There is also experimental evidence that "disconnecting" by hiding "likes" reduces negative affect (Wallace & Buil, 2021). Given the wealth of actions that users can take, however, research remains limited.

For interaction exposure, at least in the context of cyberbullying, qualitative research suggests that "disconnecting" from undesired online interactions by unfriending, unfollowing and/or blocking the bully, self-silencing and quitting social media seem effective, but comes with the caveat of requiring victims to isolate themselves from their communities to avoid harm (Byrne, 2021).

To mitigate device/feature exposure effects, research indicates that digitally disconnecting by taking breaks from devices or rearranging/disabling device features might be effective. Results from a within-person "zoom fatigue" experiment, for instance, show that disabling the camera during video conferencing weakens effects on fatigue (Shockley et al., 2021). Overall, however, systematic inquiry into digital disconnection interventions targeting exposure effects is limited.

Individual and situational boundary conditions for the effectiveness of limits to contents, interactions and devices/features

Although few studies have systematically explored digital disconnection interventions targeting exposure effects, we can hypothesize how such susceptibilities might matter. For
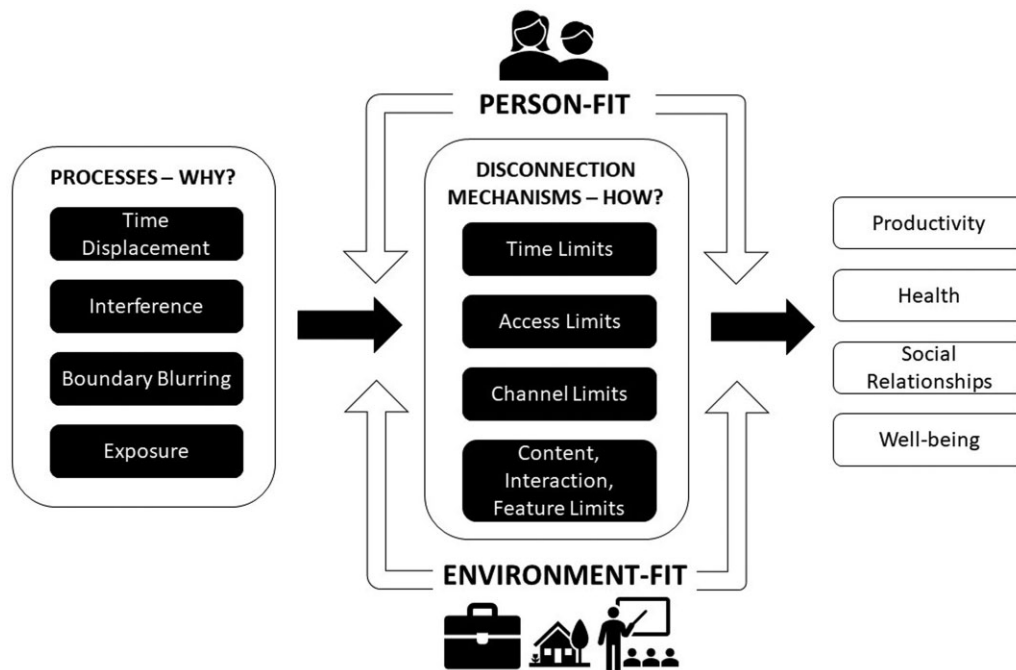
Figure 1. A process-based framework of digital disconnection.

instance, people low in self-esteem and social status are found to attach greater relevance to feedback in the form of Instagram likes (Diefenbach & Anders, 2022), which might modulate the effectiveness of "hiding likes" on their well-being. Similarly, research shows securely attached individuals are more likely to "unfriend" than anxiously attached ones (Floyd et al., 2019) making such interventions potentially less anxiety-inducing to them. For feature exposure, social interaction anxiety was found to aggravate the harm of camera use during video conferencing on zoom fatigue (Ngien & Hogan, 2023). These examples are but some of the undoubtedly many relevant individual susceptibilities that future research may consider.

Given the breadth of exposure effects, an exhaustive overview of potentially relevant contextual moderators goes beyond the scope of this article, but it is clear these are even less researched. But one could hypothetically think here about platform features or friends' online sharing practices as examples of factors that may make limit-setting more or less effective in mitigating undesired exposures and interactions. Also, real-world experiences, such as involvement in offline bullying or situational exposure to physical strain-inducing activities might make setting limits more or less effective.

Conclusion: Setting limits on exposure to avoid negative cognitions, negative affect and physical strain

In conclusion, ample evidence illustrates that exposure to online contents, interactions, and features/devices can elicit detrimental cognitive and affective responses that, when regularly experienced, might affect an individual's psychological as well as physical well-being. Digital disconnection interventions that limit exposure to them may be promising to mitigate harmful effects, but to date, systematic research that clearly maps specific interventions onto relevant outcomes, and that accounts for contingency on individual susceptibilities and contextual factors remains too limited.

It is important to note here, that discussions surrounding harmful exposure effects risk getting tied up with pervasive techno-panics, which forecloses critical questions about the interaction between broader societal issues and digital media's affordances. It is essential to acknowledge that limiting exposure to digital media alone is not a silver-bullet solution to mitigate harmful effects on an individual's well-being.

Further considerations

Above, we differentiated four key problems that may motivate individuals to disconnect from digital media. By doing so, we identified the core processes through which digital disconnection ought to be effective, most notably by setting limits to time, access, channels, and contents, contacts and interactions. The digital disconnection framework is visualized in Figure 1.

Three further considerations are required to bring greater complexity and nuance to this framework. First, the human relationship with digital connectivity is fraught with ambivalences (Ytre-Arne et al., 2020). For instance, people may experience their screen time as both rewarding and as a waste of time (Baughan et al., 2022). This ambivalence is important to consider as the implementation of any disconnection intervention risks sacrificing benefits of connectivity (Hiniker et al., 2016a). In this respect, a digital detox may temporarily reduce stress, but simultaneously activate fear of missing out, potentially leading to a zero sum effect on well-being.

Second, digital disconnection strategies may work on several problems concurrently. An example is the digital detox, which limits the harms resulting from time displacement, but likely also leads to less technological interference, boundary blurring, and undesired exposures. Yet, for certain outcomes, people and circumstances, disconnection strategies may also work against each other. For instance, limiting access to work email after hours may help to make time for family, but might make the border of the work domain less permeable

than desired for integrators. These issues imply that intervention research needs to carefully identify both the beneficial and deleterious outcomes of interventions, how much they fluctuate over time, and the individual susceptibilities and contextual factors upon which they might depend. This implies that—similar to the study of the effects of *con*nection (e.g., Beyens et al., 2020)—investigating *dis*connection may benefit from embracing dynamic and idiosyncratic methodologies to unravel the time scales at which effects operate and how generalizable they are to particular (sub-)populations.

Finally, at least five additional dimensions may influence the effectiveness of digital disconnection interventions (some also identified by Nassen et al., 2023). First, the degree of voluntariness of the intervention, visible in rewards and punishments resulting from (non-)compliance, may matter: "Forced disconnection" could be less effective for restoring well-being by frustrating autonomy needs. Second, the formality of the implementation matters, as explicitly defined rules and strategies may carry greater weight than implicitly formulated policies. Third, it is essential to consider whether the disconnection strategy requires technological mediation or involvement of a third party. Fourth, the above issues intersect with whether the intervention is implemented at the micro-level of the individual, the meso-level of the social group, or the macro level of the institution. For instance, with the "the right to disconnect" being legislated into European labor laws (Müller, 2020), formal policies such as no access to work servers after hours may be enforced. Alternatively, rule-setting might occur at the meso-level of the social group as an informal part of one's organizational culture. Finally, the temporal-spatial dimensions of digital disconnection interventions warrant greater attention as research shows digital disconnection is often organized informally around such markers. For example, families often agree to never use the smartphone at the dinner table (spatial) during evening dinners (temporal) (Hiniker et al., 2016b).

Discussion

With digital disconnection interventions growing ever more popular, empirical research investigating their effectiveness is on the rise. To date, however, intervention studies show rather mixed findings, leading to calls from researchers to further explore when, why, for whom and under which conditions digital disconnection might be more or less effective (Nassen et al., 2023; Radtke et al., 2022). This article responded to these calls by presenting a theoretically informed framework of four digital disconnection processes that provides a roadmap from which concrete propositions can be derived to be developed and tested.

The framework posits that digital disconnection is a motivated choice that people make in response to the real and perceived harms that they experience from digital media use and connectivity. Two of these harms, time displacement and interference, are associated with the quantity of digital media use. Hence, tackling these harms requires disconnection strategies that are organized at the level of the device and the platform, through time and access restrictions. Two other harms, boundary blurring and exposure effects, are rather concerned with the quality of digital media exposure, and stem from exposure to online contents, interactions and the material features of digital devices and platforms, hence requiring

intervention at the level of the content, interaction or features of technology.

The framework, together with the proposed further considerations, sheds further light on why systematic reviews such as those of Radtke et al. (2022) and Nassen et al. (2023) provide mixed evidence. As the authors note themselves, the current body of research consists of an eclectic set of manipulations, organized at different levels and time scales, in different populations, who often participate with different degrees of voluntariness, and focus on a wide variety of outcomes. It is noticeable that these outcomes do not always seem perfectly fit to the manipulation used. For instance, when studies implement an intervention of limiting social media time, it may not surprise that they do not show effects on relationship outcomes (e.g., interpersonal support in Hunt et al., 2018) or internalization problems (e.g., anxiety in Wilcockson et al., 2019, self-esteem in Hunt et al., 2018), as these latter outcomes might be foremost impacted by content and interaction exposures and thus would benefit more strongly from limiting those.

A core assumption of our framework is that digital disconnection is an agentic practice that may be motivated by perceived and experienced harms. The importance of this agentic perspective may also explain the mixed evidence. As Hall et al. (2021) note, the lack of any significant effect of social media abstinence on loneliness and affective well-being in their experiment might be explained by the use of student participants, participating in exchange of credit, and who may simply not have perceived nor experienced burdens of social media to begin with, or for whom these burdens might have been outweighed by the many positives. As they note, this is different from Tromholt's (2016) Facebook experiment, which involved a self-selected sample of volunteer participants receiving no incentive for participation, who were likely highly motivated by the perceived burdens or harms of social media use to their lives, and whose well-being might have improved because of a sense of accomplishment over banning social media.

In sum, what we take from our analysis is that experimental research needs to carefully develop testable propositions, and develop adequate research designs with a clear identification strategy, and sufficient power, for causally testing them. Given that intervention experiments will often rely on making changes to individuals' media ecologies in the real world, it is difficult—if not impossible—to have participants be blind to the enforced manipulations (see van Wezel et al. (2021) for a discussion of this issue). Consequently, the "mindsets" of participants, both when entering, and during/after the intervention's implementation, are crucial to incorporate.

Future research should also consider socio-cultural, normative assumptions surrounding "screen time" and how these assumptions manifest in people's mindsets, potentially affecting the effectiveness of digital disconnection interventions. To that end, intervention researchers should keep tabs on critical-interpretive scholarship, to better understand how disconnection is perceived and practiced, and question when and why interventions may sometimes be problematic. For instance, researchers might scrutinize whether interventions transfer the responsibility for maintaining digital well-being solely onto individuals, thereby perpetuating or exacerbating existing societal inequalities. They should also assess whether these interventions prioritize productivity at the expense of

care (Fast, 2021), or explore if there is a tendency to romanticize authenticity through nostalgic representations of "primitive" pasts and communities (Enli & Syvertsen, 2021; Syvertsen & Enli, 2020). Finally, it is vital to consider the potential commodification of disconnection transforming it into a privilege (Fast et al., 2021).

The goal of theoretical frameworks is to make sense of human reality by mapping out its observable patterns. Given the complexity of our social world, however, such efforts always come with limitations. For the current framework, one limitation is that it focuses only on burdens experienced in relation to 24/7 digital connectivity, and does not encompass an exploration of the various benefits that users experience, while these benefits may need to be considered as counterbalances that may motivate against digital disconnection. Also, there are undoubtedly harms that people may experience from digital media use that we overlook.

Nonetheless, we hope that our framework provides a starting point for future research to unravel how, why, for whom and when digital disconnection may be successful in improving the health and well-being of individuals.

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Data availability

No new data were generated or analysed in support of this research.

Notes

1   It should be noted here that the term digital disconnection also carries other meanings and definitions. It can also refer, for example, to ideological resistance against the attention economy (Rosenberg & Vogelman-Natan, 2022), involuntary digital disconnection stemming from the digital divide (Treré et al., 2020), or being subjected to a chilling effect (Strycharz et al., 2023).

2   An example is spending time with children, which parents themselves perceive as a form of time expenditure that a 'good parent' should prioritize over screen time (Wolfers et al., 2023).

3   As Moe and Madsen (2021) note, responsibility is the thread that runs through all discussions on connection versus disconnection, where the individual is tasked to self-regulate that which society needs to see governed in order to keep processes running smoothly.

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