Leveraging Self-Regulation Research When Designing for Digital Wellbeing*

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Our research explores how we can support people in using digital devices in line with their long-term goals. Many users find this challenging, because devices such as smartphones and laptops present constant and instant access to distractions, which are often deliberately designed to hijack attention. We have contributed to theoretical understanding of this issue, the empirical evaluation of digital self-control tools, and deployed interventions to effect positive change. In relation to theory, we have argued that psychological research on self-regulation is particularly well-positioned to inform HCI research in this space. In the workshop, we hope to discuss how self-regulation research might provide us with better measurement instruments as well as useful theoretical models for conceptualising the design space for digital self-control tools.

Additional Key Words and Phrases: Digital self-control, digital distraction, digital wellbeing, self-regulation, measurement, dual systems model, process model

1 CONTRIBUTIONS TO DIGITAL WELLBEING RESEARCH

From remote working and grocery shopping to communication with friends and family, an ever-expanding part of our lives is mediated by digital technology. Despite the obvious benefits, this has also brought new challenges: when digital distractions are constantly and effortlessly at hand, it can be difficult to behave the way we wish. For most people, this is readily apparent in everyday life. When we try to focus on work tasks, we easily get interrupted by unrelated notifications, or interrupt ourselves to check social media. If we open Facebook to post in a group, our attention routinely gets hijacked by irrelevant content on the newsfeed. When we go to bed, a last check of our devices often turns into an hour-long journey down the rabbit hole.

Struggling to do what we would ideally like ourselves to do is, of course, nothing new: two millennia ago, St Paul complained that "I do not do the good I want to do, but the evil I do not want to do — this I keep on doing"[1]. However, digital devices like smartphones and laptops increase the potential intensity and scope of self-regulation challenges, by increasing the range of distractions and temptations within reach. Moreover, the competition over capturing our attention during use can be uniquely intense compared to other forms of media, because digital devices can bring together many different modalities of interaction in forms uniquely tailored to individual users [8].

Being able to direct attention in line with our intentions is central to being able to live the life we want [33]. Therefore, the challenge of supporting people's ability to navigate information-rich digital environments in line with their goals, without having their attentional and self-regulatory capacities overwhelmed, is one of the most consequential in HCI. In our work, we have made three types of contributions to help address this challenge.

First, we have contributed to **theoretical understanding** of the issue. We have unpacked how different philosophical assumptions around what it means to want something lead to different metrics of success [23]. To discuss and clarify the issue, we co-organised the *Designing for Digital Wellbeing* workshop at CHI'19 which brought together 32 leading researchers from academia and industry [3, 16]. At this workshop, we argued that theory and concepts drawn from psychological

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research on self-regulation and self-control will be particularly clarifying for HCI research in this space [21]. In our own work, we have shown this in analyses and evaluations of design patterns in 'digital self-control tools' (DSCTs) [19, 24, 26].

Second, we have contributed **empirical data** for characterising digital self-control challenges in the people's daily lives, the range of solutions currently available via DSCTs, and how practically useful those solutions are. Specifically, we have used experience sampling to describe how app usage patterns relate to perceived meaningfulness [20], reviewed design patterns explored in ~400 apps and browser extensions for supporting self-regulation [24, 26], and investigated how features of YouTube support or undermine control [19].

Third, we have pushed for **action research** to effect positive change. We have presented open materials for a 'Reducing Digital Distraction' workshop, an intervention that supports students in managing their digital lives, and also generates data to advance digital wellbeing research [25]. Moreover, we co-organised a recent workshop on what the CHI community can do about dark patterns [17].

Alongside these contributions, we have adopted open and transparent research practices [10], and shared data, analysis scripts, and materials for much of our work (e.g. [18, 19, 22, 24, 26])

2 LEVERAGING SELF-REGULATION RESEARCH IN DESIGNING FOR DIGITAL WELLBEING

In the workshop, we hope to discuss how self-regulation research can be leveraged further in HCI research on digital wellbeing. Specifically, we would like to discuss how self-regulation research may provide useful **measurement tools** and helpful ways to **conceptualise the design space for digital self-control tools**.

2.1 Leveraging self-regulation questionnaires for measurement

Existing work has often used self-report scales related to behavioural addiction to assess baseline difficulties with managing device use and/or evaluate DSCTs [13, 15]. However, when assessment criteria from this line of research are properly applied, the scales apply well to only severe cases of self-regulation breakdown experienced by a small minority of users (e.g., 3.1% of Facebook users in a recent study [4]). Moreover, many researchers have argued that more mundane challenges with digital distraction, experienced by a majority of users, should not be framed as 'addiction', because it easily pathologises everyday patterns of use [1, 2, 12, 31]. In addition, the term is often used very loosely, in a reflection of popular media narratives [14, 27, 30].

An alternative approach is to draw on broader psychological work on self-regulation and self-control, which for decades has investigated how individual differences and environmental factors influence people's ability to regulate behaviour towards desired goals in the face of conflicting impulses and distractions. We believe this literature provides a better foundation for HCI work on design remedies for the self-regulation challenges experienced by the great majority of users. Therefore, we propose that an effort should be made to adapt scales from basic self-regulation research to the context of digital device use. This might provide measurement tools with a closer construct fit to what users commonly want DSCTs to achieve, and also more readily allow for knowledge transfer with basic psychology research.

For example, the Brief Self-Control Scale ([29], example item: *I am able to work effectively toward long-term goals*) has been widely used as a unidimensional measure of self-control ability. This scale might be adapted into a simple state measure of digital self-control ability. Similarly, the UPPS Impulsive Behaviour scale [5, 32] is a widely used multi-dimensional measure that breaks down impulsivity into four impulsive personality traits (Urgency, Lack of Premeditation, Lack of Perseverance, and Sensation Seeking). This scale might be adapted into a more fine-grained

measure of how personality differences lead to distinct user vulnerabilities, and how specific design patterns of DSCTs can be tailored to individual users.

2.2 Using self-regulation models to conceptualise the design space for DSCTs

In previous work, we have explored the usefulness of a 'dual systems' model of self-regulation to categorise and evaluate design patterns in DSCTs, interpret findings around their usefulness, and suggest new research opportunities [24]. The dual systems model is useful in that it explicitly addresses interactions between conscious goals and automatic habits and impulses, a consideration HCI research on behaviour change has argued is key for interventions aimed at long-term change [28].

However, other models from self-regulation research may also prove valuable. One popular alternative in self-regulation research is the 'process model' [6], adapted from Gross' emotion regulation research [9]. This model focuses on how 'impulses' — response tendencies to think, feel, or act — develop over time, and organises self-control strategies according to the stage of impulse generation at which they intervene (see Figure 1).

The process model might provide a simple yet powerful way to think about design patterns in DSCTs in terms of whether they (a) change which situations the user is exposed to (*situation selection*, e.g. blocking access to Facebook); (b) change the circumstances of a situation the user find themselves in (*situation modification*, e.g. removing the newsfeed on Facebook); (c) change what the user pays attention to in a given situation (*attentional deployment*, e.g. the user acquires a habit of ignoring the newsfeed on Facebook); (d) help the user readjust their valuation of the things they do pay attention to (*cognitive change*, e.g. a DSCTs might reward the user for reducing time on Facebook); (e) help the user directly inhibit or enhance their impulses (*response modulation*, e.g. the user tries to ignore an urge to scroll the newsfeed).

Although people often try to manage distractions using response modulation (i.e., willpower), a growing body of evidence suggests that self-regulation is most effective when it employs situational strategies [6, 11]. These findings suggest that digital wellbeing designers should target their interventions at the earlier stages of the process, rather than waiting until an impulse is fully formed and then prompting the user to employ cognitive strategies.
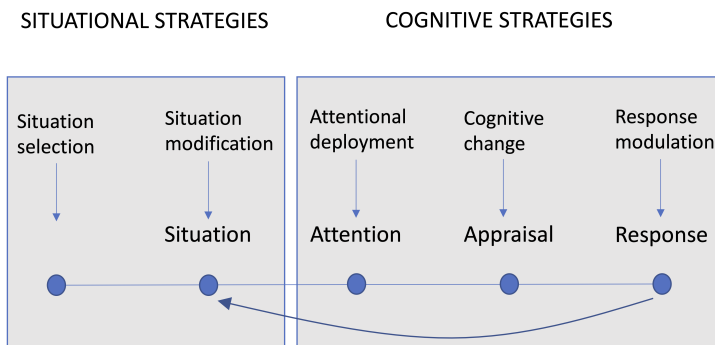

Fig. 1. The process model of self-control, adapted from [7]. This model focuses on how 'impulses' — response tendencies to think, feel, or act — develop over time, and organises self-control strategies according to the stage of impulse generation at which they intervene.

CONCLUSION

As most areas of our lives come to be mediated by digital devices, understanding how to support people's ability to regulate attention and behaviour in digital environments is increasingly important. In our work, we have argued that basic research on self-regulation should play a key role for HCI researchers in understanding the psychological factors involved, and imagining and evaluating potential interventions. In this position paper, we have further suggested that self-regulation research might provide measurement instruments that capture the challenges experienced by average users better than alternatives drawn from the addiction literature. We have also suggested that the 'process model' might provide a simple yet powerful way to conceptualise the design space of digital self-control tools. We look forward to discussing opportunities and challenges in this and other domains of digital wellbeing at the workshop.

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