

Overcoming Procrastination with *ReMind*

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ABSTRACT

“Never put off till tomorrow what you can do today!” is easier said than done. Actually doing something we intend to do is often hampered by procrastination. This paper presents *ReMind*, a calendar/to-do-list-like object to overcome procrastination. An empirical case study of a functional prototype using *Interpretative Phenomenological Analysis* (IPA) showed that *ReMind* instilled reflection about procrastination and behavioral change in everyday life.

Author Keywords

Transformational Object; persuasion; Aesthetic of Friction; procrastination; self-regulation; pleasure; Experience Design.

General Terms

Human Factors; Design; Measurement.

INTRODUCTION

“Never put off till tomorrow what you can do today!” Although we are all pretty aware of the gist of this saying, we do not behave accordingly. In fact, the very existence of the saying already emphasizes the ubiquity of postponing things we intend to do. We postpone doing the dishes or the laundry. We postpone getting out for a run or a little sportive bike ride. We postpone reading the latest academic papers or idle before conference deadlines. We often postpone until a certain deadline or an uncomfortable situation increases the pressure, a phenomenon called *procrastination*. Procrastination is widespread. For example, studies estimate that 85-95% of all college students procrastinate now and then [19]. Ferrari et. al. [7] reported a 20% prevalence rate for chronic procrastination among adults in the US, UK and Australia.

Procrastination can be defined as deliberately delaying the beginning or the completion of an intended action [8,19]. Procrastination is thus about delaying “intended” tasks (things, we already decided to do) rather than any task (everything we could possibly do, but did not get around to yet). In addition, procrastination is void of any strategic reasoning. A typical procrastinator knows that she would be

better off without procrastination [19].

Reasons for procrastination are manifold. Facilitating *task characteristics* are, for example, the unpleasantness of the task itself or an only abstract benefit, realized far in the future. *Individual differences* such as differences in anxiety (i.e., stress and fear related to the upcoming tasks), self-efficacy and self-esteem (i.e., trust in own capabilities), or need for organization (i.e., structuring and planning one’s life) are further reasons for procrastination (see [19] for an overview). In sum, procrastination is a widespread phenomenon affected by task characteristics as well as individual differences.

In this paper, we present *ReMind*, an object designed to support people with overcoming procrastination. In an empirical study an individual field-tested a functional prototype of *ReMind* over the course of 15 days. We report psychological and behavioral effects of *ReMind*, and discuss general implications of our findings in the light of designing for change through interactivity.

GETTING THINGS DONE WITH REMIND

As long as procrastination is a widespread phenomenon, many helpful recommendations exist. A frequent strategy is to list all goals and to assign them to a certain date. The number of goals should be realistic in terms of interest, time, and personal resources. Most of these recommendations aim at transforming abstract goal intentions into more contextualized implementation intentions [10]. The goal intention “to exercise more” is much easier put into practice, when specifying the when and how of the action. For example, “going for a run each Monday straight after work” is a concrete implementation intention, more likely results in the intended action than the abstract “exercise more”.

While guidebooks (e.g. [4]) help identifying procrastination and offer strategies to confront it, their value is limited, because it is not always easy to make those recommendations into daily routines, i.e., to transform them into actionable implementation intentions. Books are rhetoric – they have only limited possibilities to actually intervene, break and reshape routines. “Interactive technologies” (in the widest sense) are different. Digital calendars, for example, offer some convenient features such as chronological to-do lists. For instance *Any.DO* [1] is a smartphone app featuring such a to-do list with direct links

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to phone numbers for planned calls. *Finish* [9] is a smartphone app that combines a to-do list and a calendar. Tasks are assigned to a certain date, listed by chronological order and categorized into short-, mid-, and long-term tasks.

Although *Finish* or *Any.DO* can be helpful tools, they lack an understanding of procrastination. The number of tasks, for example, should be limited rather than unlimited as it is. *Finish* offers a prioritization of tasks, which can be a problem in itself, as long as prioritization is sometimes already understood as an act of procrastination itself. While clever user can appropriate those apps to overcome procrastination, the apps themselves do not deliberately address procrastination through their design. They take a rather neutral, functional position.

ReMind takes a different approach. It is a “transformational” artifact [14] deliberately designed to make people reflect about and help them to overcome procrastination. It as a tangible, wall mounted calendar/to-do-list-like object, continuously confronting its users with their self-set personal goals [2]. It consists of a wooden ring with a diameter of about ca. 65 centimeters, a rectangular motor on the top and ten magnetic pucks fitted with post-it blocks (see Figure 1).

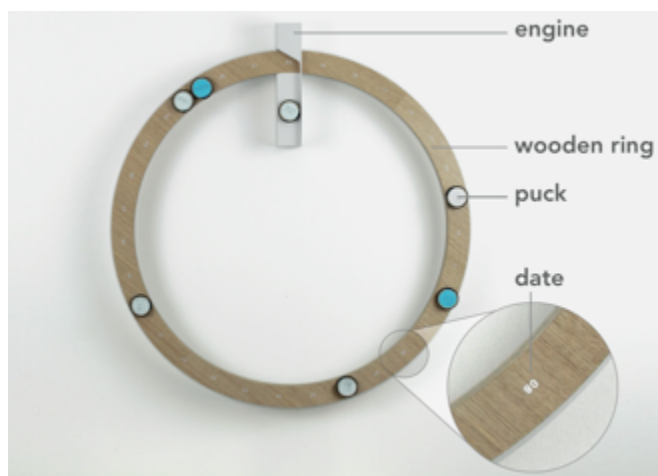


Figure 1. ReMind in its several parts.

Each puck represents a personal goal. As long as a central advice is to set a realistic number of personal goals, the number of pucks was deliberately limited to ten. This also facilitates a more thorough reflection on and choice of the goals to be achieved next (for an extended video figure see <https://vimeo.com/38991886>).

The wooden ring has 31 sections (i.e., days), each labeled with a number. Each section offers space for a single task to achieve at this day. Again, *ReMind* supports realistic goal setting by limiting the number of tasks assigned to a single day. Instead it draws attention to the period of a whole month to sequence and space personal goals.

As time goes by, the ring turns clockwise one section each day (months with less than 31 days are adjusted by passing through these days). The top represents the current day. It consists of a barrier, where unattended goals heap – not unlike real life (see Figure 2). If there are too many goals idling at the barrier, they fall down, one after the other. *ReMind* quite literally throws unattended goals at its user. Picking up a puck from the floor becomes picking up the goal. It creates a moment of choice: The user can complete the task now, put it back on hold by picking a new date, or abandon it altogether – by sweeping it under the carpet. *ReMind* creates friction by presenting a rather tangible choice. This is supposed to nudge users into reflection and action [14].

Friction is necessary to instill change, but must be designed with care. We believe that features making the object more likeable and similar to its user should complement the necessary friction [11]. To achieve this, we adopt three different strategies: Naivety, understanding and irony/ambiguity. *ReMind* is not especially smart. It seemingly does not offer elaborate algorithms to provide solutions to the problem of procrastination. It is a to-do-list and the only power it possesses over its user is the almost pathetic ability to litter the floor with unfinished tasks. In addition, *ReMind* does not create a choice, which requires superhuman powers to behave ideally. It understands procrastination and playfully hints at this. Furthermore, *ReMind* deliberately allows for cheating. It is so easy to just move a goal over the barrier and to delay it for another 31 days; or to sweep the puck on the floor under the carpet, out of sight, out of mind. In a way, *ReMind* itself embodies procrastination by offering a time scope of 31 days. Placing a goal there, far in the future, is typical for procrastinators. By allowing for the very same transgressions, it wants to help overcome, it shows some understanding for the complexity of the problem. *ReMind* becomes a “partner in crime”, a mirror of the Self. We believe that these features do not even undermine the effectiveness of *ReMind* in instilling change. Goals placed far in the future will sooner or later approach “now”, signifying the futility of postponing. Picking up a puck and pushing it back in time is always allowed. But each deliberate act of doing so will inevitably create a moment of reflection. It is easy to cheat *ReMind*, but difficult to cheat yourself.

As an object, *ReMind* primarily incorporates knowledge about procrastination, behavior change, and a certain aesthetic to design for change. Its form and materiality was derived from the underlying rationale. The magnetic pucks, for example, invite the constant rearrangement of goals. The barrier creates a literal “slide” of goals. The wooden ring is endless and emphasizes the futility of postponing. Above this, the aesthetic of *ReMind* aims at pleasantly fitting the context of a home.

In the following, we describe an empirical exploration of the emerging feelings, thoughts and change in behavior when “living” with *ReMind*.



Figure 2. Placing a goal on a puck (*upper*); assigning goals on a certain date, agglomerating goals at the barrier (*lower*).

METHOD

The following study of *ReMind* is based on *Interpretative Phenomenological Analysis* (IPA). IPA focuses on the detailed examination of human experiences [18]. It focuses on single cases and is more concerned with existence than incidence [20]. Its point is to demonstrate that a phenomenon exists and to describe in detail, how it unfolds in a person’s lifeworld. In the first phase (phenomenological), its focus is on understanding individual experience. This implies to engage and to empathize with the participant to get a detailed understanding of her or his feelings, thoughts, and actions. In the second phase (interpretative), the researcher interprets the participants’ experiences. Here the researchers’ own perceptions and beliefs become especially relevant.

IPA places values on detailed accounts of individual experiences rather than generalization across individuals. This justifies detailed single case studies. Especially for design, with its necessary attention to detail, IPA is a suitable approach.

Participant

Linda (name is changed for anonymisation), a 41 years old woman, participated in the study. She works as a clerk in a German university. In a short screening conversation, Linda explicitly expressed a wish to reduce procrastination and signaled a general interest in participating in a study. In fact, procrastination can get quite personal, especially, when it is discussed as a “weakness of character”. In-depth exploration of procrastination requires empathy, openness and trust between participant and researcher. This was given for Linda and the first author, who carried out the fieldwork.



Figure 3. *ReMind* installed in Linda’s kitchen.

Procedure

The study consisted of six parts: the installation of *ReMind*, four interviews, and the removal of *ReMind*. They were all carried out in the flat of the participant over the course of 15 days. For the interviews, the participant chose a place in her flat, she felt most comfortable at. The *initial interview* took place on a Thursday. Its main purpose was to gain a deep insight into the participant’s general lifeworld and her specific issues with procrastination (e.g. “Tell me how you manage daily tasks”, “Tell me what place procrastination has in you life at the moment?”, “Describe a typical task you procrastinate?”, “How do other people think about you in general and in terms of procrastination?”).

A day later, on Friday, *ReMind* was installed. It was mounted to a wall. The place was selected by Linda (see Figure 3). She got an introduction to the object and the instruction to take a picture of *ReMind* each evening. A week later, the first author carried out a first *concept interview*, focusing on the experience of *ReMind*, procrastination, and potential changes in behavior (e.g. “How was the week with *ReMind*?”, “Describe typical, meaningful situations, where *ReMind* played a role”, “How important is *ReMind* so far?”, “Did your perception of your own procrastination change?”). This interview was repeated after a week, to capture potential changes in experience, attitude and behavior. After the second *concept interview*, *ReMind* was removed. The study closed with a *review interview* another five days after the removal of *ReMind*.

(e.g. “Describe your overall impression of the study in retrospect?”, “Did *ReMind* influence the way you think and act now?”). Each interview took about 90 minutes.

Results and Discussion

In the following, we present and discuss our findings organized according to the four interviews (initial interview, concept interview I, concept interview II, review interview) and the inductively derived topics.

Initial-Interview

During the initial interview Linda reflected about several topics (verbatim statements are in italics).

Existing procrastination. Linda mentioned a number of domains in which she tends to procrastinate. One domain was social relationships, especially calling friends: “*Then I know I neglected a friend. And I think it is about time to call her. But on the other hand, I think; ‘Hold on. She [the friend] did not call me either.’ Then again it crosses my mind. I should call her, but then I think, ‘Ok, no. I do not have to call her right now, I am just not in the right mood’*” (I, 8). Another domain was household chores, such as cleaning the windows, “*Ok, things like cleaning the windows or so. Such things [...] I skimp on doing them a little bit*” (I, 4), or improving her Internet connection. In the past she used an Internet USB-stick for surfing. This connection was slow and unreliable. She wanted to change this: “*[...] also something that I kicked down the road for ever and ever was this thing with this dump internet stick that I had for years. It was so slow that I couldn’t connect to the Internet at all*” (I, 65). A final domain she mentioned was personal activities. For instance to pursue her pastime to photograph: “*[...] and what I definitely want to do is to photograph. [...] I recently neglected doing that*” (I, 163). Most of the mentioned domains are typical for people, who procrastinate.

Strategies: In order to overcome procrastination, Linda mentioned a number of strategies. One strategy was to keep track of accomplished tasks. For instance: “*When I clean the windows, I note the date either in the window frame or from the inside [she laughs loud]. Ok, these [windows] here, they are not cleaned, yet [laughs loud again] [...] Or I store it on my cell phone*” (I, 28). However, she refused to use a calendar: “*I started using a calendar to write down the things, I want to do, but then the calendar is in my bag*” (I, 226). While she attempted to work on her procrastination, none of the strategies seemed to really work for her.

Justifications. Linda tried to explain her tendency to procrastinate. She quoted both, personal and task characteristics. For instance a lack of encouragement and motivation: “*It is certainly one’s weaker self or finally the missing encouragement*” (I, 57) and “*Sometimes, I do not have enough motivation and then I am not in the mood to search for information and to compare prices*” (I, 65). A

further personal reason is simply forgetting about intended goals: “*[...] anyway, sometimes I just forget about intentions, the things I actually planned to keep an eye on for today*” (I, 98). Furthermore she identified distractions: “*I am on my couch for a while, my notebook in front of me, I already surfed for a while and forgot about the time. Then I think ‘Oh no. It is already late. Now you do not have time enough to get something done or so’*” (I, 211). As a task characteristic, she mentioned the pent-up hurdle of tasks: “*Now, sometimes, even if I wanted to call a friend, I do not feel like it, because I know [...] the call will take a while, because we did not talk for such a long time*” (I, 93). Most of the justifications match “classical” reasons for procrastination.

Spontaneity. A frequently used self-characterization was to be spontaneous. She does things without reflecting much: “*Such knee-jerk actions. For example, when we talked to each other on the phone and you asked me if I procrastinate and I answered ‘not necessarily’. I got hysteric and cleared out my whole flat. Then I do not think twice. Then it is like this. Without great reflection, things, such as glasses or cups, everlasting things, are thrown away*” (I, 20). In fact, spontaneity and impulsivity is a frequently mentioned excuse of procrastinating people [16]. It is mostly framed as character trait, allegedly impossible to change.

Pressure. With reference to her spontaneity, she did not want to be put under pressure to do things. In her last relationship, she had felt pressured to do the household chores. Now it is important to her to choose action: “*[...] I do not have the inclination for this anymore. Both how it was in my past relationship and it certainly was at work. At some point, you tell yourself ‘Now, you don’t want to do this anymore’*” (I, 107). Because of this, Linda is sensitive towards all types of external goal-setting and pressures.

Achieving goals as a source of pleasure. Linda considered achieving personal goals as a source of pleasure: “*Finally I am glad and think ‘My God. Why haven’t you done it already?’*” (I, 20) or “*I think afterwards, if it [a cooked meal] tasted good ‘Hey, super. Good that I came around to do it’*” (I, 203). But even though she considers achieving goals as a pleasure, she procrastinates. This ambivalence does not go unnoticed: “*I could cook myself something tasty. And then I am in the situation and think ‘No, now this effort. No, you do not have to eat something today’.* That is a bit ambivalent. Then I think ‘You finally neglect yourself’” (I, 191). She is able to see the potential positive effects of achieved goals, but is not able to always overcome procrastination.

Intended Goals. Linda mentioned the following eight personal goals during the initial interview: to read more books, to stay in touch with friends more frequently, to go for a walk more often, to work less to have more private time, to go out and participate in live, to photograph, and to

cook more often. The mentioned goals matched the domains, in which she procrastinates.

In sum, Linda procrastinated in many situations. Although she was aware of some strategies to overcome this, she was not able to actually employ them. One self-perceived reason was her spontaneity and impulsivity. Additionally, she is wary of external pressure and externally-set goals, and wants to achieve her own personal goals. She procrastinates although she experiences the achievement of goals as a source of pleasure. She noticed her ambivalence. All in all, Linda is a typical example of a mild procrastinator. Especially her rejection of external pressure and externally-set goals as well as her self-concept of being especially spontaneous and impulsive is typical. Nevertheless, she has a list of goals, she considers worthwhile to pursue.

Concept interview 1 and 2

In the following we summarize emerging topics and insights of concept interview 1 and 2. During both concept interviews, similar topics emerged. Particular differences are highlighted.

Skepticism. Initially, Linda was quite skeptical about ReMind's ability to support change. She said: "*I thought, 'Come on, it is just a thing on a wall. Does [the first author] seriously believe, this could have any effect on me?' [But it had] I never would have guessed*" (CI 1, 231). Another passage directly refers to skepticism. "*I think about the object. Now and then, I talk about it with my colleagues. I tell them about having been skeptical about whether this thing could have any effect on me*" (CI 1, 163). However, the initial skepticism rapidly disappeared: "*I had to revise my initial opinion about the object. I was skeptical, and I thought that it has no power to change my behavior. But it has*" (CI 1, 8).

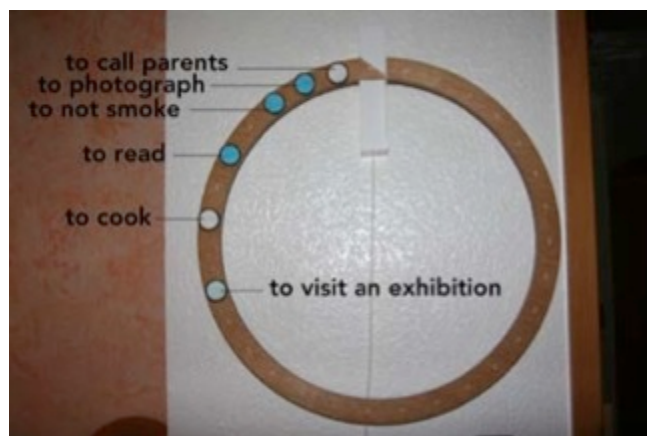


Figure 4. ReMind at the evening after the installation.

Achieved goals. During the concept interviews, Linda reported on several goals, she already achieved during the study. Initially after the installation of ReMind on Friday, Linda placed six personal goals 'to call parents', 'to

photograph', 'to not smoke', 'to read', 'to cook' and 'to visit an exhibition' (see Figure 4).

On the first day with ReMind, Linda already called her parents. One day later, she achieved all goals, except of 'to visit an exhibition' (see Figure 5). Interestingly, Linda arranged the pucks of achieved tasks in a symmetric pattern on the right side (see Figure 5).

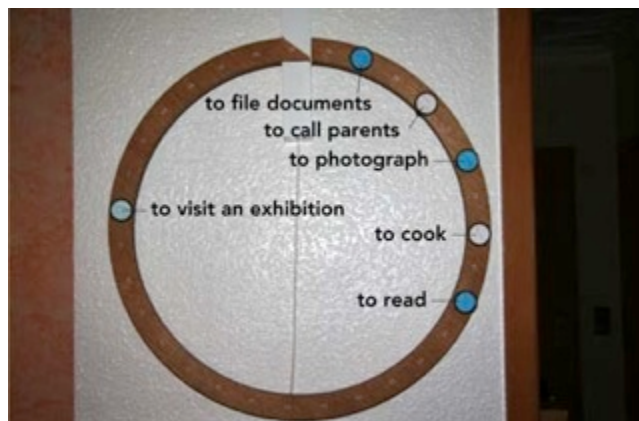


Figure 5. ReMind two days after the installation.

Asked about this, she underlined the importance of moving the pucks from the left to the right to reflect about how to reassign those goals: "*I stand in front of it [the object] and [...] look at the dots [the pucks] on the right side. I consider: 'There are things that I could actually repeat.' I sort of contemplate*" (I, 123). During the study, Linda added two pucks labeled as 'to do sit-ups in the morning' and 'to file documents' (by replacing 'do not smoke'). Linda repeated 'to read' and 'to cook' several times (see Figure 6).

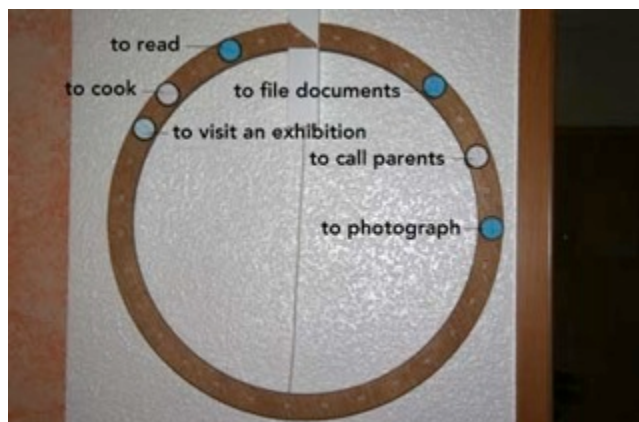


Figure 6. Reassigned, repeated goals 'to read' and 'to cook' on the left.

For instance, she 'filed documents' only once: "*That were things, you cannot repeat. Ok, one point [puck] was for example 'to file documents'. I cannot do that over and over, because I do not get so much mail, that I constantly have to file it. Things such as 'to cook' or 'to read' are*

things, I can reassign from time to time" (I, 20). Obviously, since the installation of *ReMind*, Linda achieved all self-set goals she typically postpones and even repeated some of those.

Achieving goals as a source of pleasure. Linda considered achieving personal goals with *ReMind* still as a source of pleasure: "What I've set with the dots [the pucks], I actually accomplished. Somehow you really feel good and you think 'Hey, super! You actually managed a lot'" (CI 1, 28). Moreover it was even better than before, based on the review of already achieved tasks: "It was a satisfaction that I had the feeling of 'Hey super. Look! I moved, let's say, five of the pins [pucks], from the left to the right in a relatively short time'" (CI 2, 183).

Presence. An important factor for her positive behavior was the presence of *ReMind*. She explained: "I can just keep on repeating it. Based on the presence of the object. Normally, I have several things on my mind, I want to do. I want to do the one or other. But, here I have it right before my eyes. [She moves her hand from the left to the right] That is the way it is" (CI 1, 159) or "I really have it before my eyes. I can really see it and it is not buried somewhere in my mind [...] No. I definitely got it before my very eyes every morning and it will be remembered" (CI 2, 135). A further quality Linda mentioned in terms of presence is the option to plan goals in advance: "[...] because every morning I look at it and see 'Yes, true. You want to do that this week.' [...] 'Ok, you planned this and that for the week' then I have it on my mind and I tell myself know 'remember to shop for grocery', for example, to cook in the evening" (CI 2, 5). Through its presence, *ReMind* becomes a memory aid, thereby removing one of Linda's alleged reasons for procrastination. Additionally, if a task appeared at the top, it became very present and Linda felt concerned about it: "This [a task almost fell down] actually just happened last Sunday. [...] But I knew that I will go off with my camera in an hour [...] and therefore I was not afraid to pick it up" (CI 2, 235).

Overview of achieved goals. A further positive quality of *ReMind* was the overview of already reached goals. Linda noticed: "Yes, because it becomes obvious, what I have already done, what I intended to do [...] 'Look, I tell myself, you are not as uncaring as you expected'" (CI 2, 271). Furthermore *ReMind* was an improvement in comparison to the normal situation: "Many achievements are forgotten. You think 'My God, you do not steam ahead.' But it is not true at all. Obviously, you get done a lot and you are not just hanging out" (CI 2, 271). In fact, she describes how *ReMind* strengthens her self-efficacy beliefs through the simple continuous display of already achieved goals. Self-efficacy is an important prerequisite to procrastinate less.

Embodiment. The tangible nature of *ReMind* was important. While talking about her achievements, Linda continuously performed the gesture of physically moving pucks from the left to the right (see Figure 7): "It is strangely satisfying. It feels as if I am checking off something" (CI 1, 155). Moreover, she described the act of physically labeling a puck as a relief: "First, I have this thought out of my mind: 'I really want to do that'. I write it onto the pin [puck] and in this moment, it is checked off [it is decided], and I know that I have noted it and pinned it. Now the object will remind me every day" (CI 2, 17).



Figure 7. Linda performs the gesture of moving pucks from the left to the right.

Display of goals. The continuous, visible display of goals allowed for a better match of constraints (e.g., moods) and getting things done. With regard to calling her parents, she mentioned: "And then in the morning it came together, when glancing at the object. I thought 'Ok, now you are in the mood and you feel well, now you call them'" (CI 1, 115). The display of goals even led to doing things earlier than planned for. Concerning filing documents, she mentioned: "On Sunday I wrote it down. I assigned it to the middle of the next week, but I already did it on Sunday. Relatively spontaneous" (CI 1, 179).

Cooperation rather than patronization. Linda perceived *ReMind* as a partner in a dialogue or cooperation rather than as patronizing. She mentioned: "It was at least a cooperation between me and the object. I'd say that the object somehow showed me a weakness [...] Here the object supported me" (CI 2, 41) or "No, I would say, we did it together. I do not have a problem to be somehow, in inverted commas, 'externally controlled'. Somehow it is like that. Controlled is [she struggles with the term] yes, very true, but it is not meant negatively. It [the object] supports me with reaching my goals" (CI 2, 49). During the interview, she spoke very positive about the cooperation between her and *ReMind*: "Pressure, pressure is somehow always with negative connotations, I think. And that is a feeling, I definitely did not have" (CI 2, 267). While

ReMind caused friction and change, it did not restrict autonomy or pressurized. It became a “partner in crime”.

Cheating. A further topic that emerged in both concept interviews was the idea of cheating. Linda initially thought about cheating: “I read [a part of book] first and only after I was done with it for today, I moved it [the puck] to the right side. [Why this way?] To ensure that I really read [and not only move the puck]. I did not want to cheat myself” (CI 1, 80). Because of being aware of the potential to cheat, Linda became more sincere: “Otherwise I would have moved [the puck] and only then started to read. ‘Come on! Two or three pages [she smiles] are enough.’ And then I thought ‘No, ok...no.’ I do not want it this way” (CI 1, 86). She further thought about cheating during the study: “At the beginning I thought ‘Come on! You could easily cheat on the object and the researcher [first author]. But then I thought that I do not do myself a favor’” (CI, 151). By reflecting about cheating and the consequences for herself, Linda recognized that cheating the system or the researcher is always possible, but cheating oneself is impossible. The exact opposite is the fact: The possibility to cheat, the somewhat careless nature of *ReMind*, motivated rather more than less: “I could have done it like this [cheating]. You [the first author] would not have recognized it. But what would be in for me? Nothing. Then I got the ambition and I thought ‘No, now you do it’. And I do not do myself a favor by just pinning it to the right without having actually done it. The dot [the puck] has moved, but it [the task] is not done anyway” (CI 1, 239).

Relapses. In both interviews, especially in concept interview 2, Linda reflected about relapses. Already after the first week, she said: “I don’t think, I’ll miss it [the object] when it’s gone. But I never know? [Why?]. Because I could fall back into my old behavior. This danger exists” (CI 1, 131-135). After 15 days with the concept, she stated: “I am somehow hopeful that I will remember the object tonight, even when it is gone, and that I not only internalized doing my sit-ups everyday, but also actually have it on my mind ‘You wanted to read once in a while so that you will finish the book at one time or another’” (CI 2, 70).

During the study Linda set seven goals. All goals were achieved “in cooperation” with *ReMind*. Moreover, Linda repeated activities, such as ‘to cook’ and ‘to read’ frequently. While in the beginning Linda was rather skeptical about the object and its effects, she later on used *ReMind* and considered achieving her goals as a source of pleasure. She pointed out a number of to her important qualities. One was the presence of the object in itself, keeping the goals on display and, thus, active in her mind. Additionally, Linda perceived the overview of achieved goals as positive, hinting at self-efficacy. A further important aspect of *ReMind* was its physical embodiment of abstract intentions. In addition, *ReMind* offered a positive

way to incorporate spontaneity. Overall the interaction with *ReMind* was perceived as cooperative rather than as patronizing. Linda initially mentioned the possibility to cheat the object, but explained how she got aware of the impossibility to cheat herself. Finally Linda bettered her procrastination behavior with *ReMind* and attributed success to a good part to herself. This became apparent in her frequent thoughts about relapses and missing the object after removal. While she was aware of *ReMind*’s supporting role, she was pretty much convinced to be able to prolong her “good” behavior, because she believed to have internalized it.

Review interview

In the following, we summarize emerging topics and insights of the review interview.

Astonishment. In hindsight, when comparing her initial skepticism towards *ReMind* with her later positive experience, Linda felt astonished: “I recognized after a while: ‘Yes, the object is effective.’ And my initial wariness was gone after a few days” (R, 13). With reference to her previous procrastination, she said: “Then, somehow I thought ‘Oh my God, you could actually do this more often, why did you procrastinate so often in the past?’” (R, 15).

Engaged in reflection. After the study Linda felt more conscious about herself and procrastination: “Ok, it was like acknowledging a weakness to me. [...] I thought: ‘frustrating?’ But I think you cannot have everything on your mind. And why not doing it this way?” (R, 4). Additionally, Linda attributed her newly found consciousness to *ReMind*: “Actually it affected me a lot and helped me to overcome my weakness” (R, 20). *ReMind* nudged Linda into reflecting about her weakness, but in a positive way.

Goals as a source of pleasure. Linda found *ReMind* very positive. She stated: “It was a relieving feeling. Or actually a good feeling that I thought ‘from the left to the right so that I really checked it off and I have really done another point [puck] for me.’ [...] That was a good feeling. Definitely!” (R, 6). But the positive feelings were not only attributed to the object, she primarily felt proud of herself: “And then I assigned the points [pucks] on the next day and I already finished two points. I was proud of myself within the next days or the first two days. I said ‘Look at what you’ve already achieved’” (R, 2).

Future prospects and relapses. Initially, Linda felt very positive about the future without *ReMind*: “Somehow it actually internalized something. Even without the object, I already sat down and read last weekend. That’s the way it is. It actually changed something” (R, 12). But Linda still felt uncertain about the possibility of relapses: “Actually, I would like to wait and see. Now it works without the object [...]. Maybe after some time I would rather have it back”

(R, 48). In sum, her feeling towards the future is cautiously optimistic.

All in all, Linda felt astonished about the positive effects of *ReMind*. It engaged her in reflection about her weakness to procrastinate, but in a positive way. She felt cautiously optimistic about future prospects and relapses. On one hand, she attributed a lasting effect to *ReMind*, but wasn't certain, that it will prevail.

A REFLECTION: REMIND IN THE LIGHT OF AN AESTHETIC OF FRICTION

While Linda felt confronted with her tendency to procrastinate – a consequence of the friction *ReMind* created – this was not accompanied by strong negative feelings. Rather, Linda and *ReMind* joined into cooperation. They actually became partners in fighting Linda's procrastination, with *ReMind* providing practical support (e.g., physical, continuous representations of goals) and a lot of food for thought. *ReMind* is what we call a "pleasurable troublemaker", a *transformational object* [14], drawing upon principles of an *Aesthetic of Friction* [11,12].

Transformational objects are 'materialized' implementation intentions [10]. They embody strategies, which are beneficial to achieve personal goals in daily life. In contrast to abstract goals (i.e. goal intentions), transformational objects specify the 'when', 'where' and 'how' (e.g. to list all goals intended to achieve and assigning them to a certain date). Other than appeals (i.e., the rhetoric), objects have the power to shape how we interact with the world [5,6]. Through presence and embodiment, objects can break routines by interrupting unbeneficial behavior and offering beneficial behavior. However, such an "intervention" must be accompanied by friction to take an effect. As Linda mentioned about her calendar on the smartphone: While it creates certainly no negative feelings, it is also not very effective in changing procrastination. It lacks confrontation. It lacks friction. Obviously, friction must be designed in a way that let users keep interacting with the object. We need an *Aesthetic of Friction*. In the following, we discuss a set of according principles based on psychological knowledge and further inductively refined through design cases [13,14].

Situatedness. Transformational objects flourish on the intimate understanding and knowledge of a situation and practices at hand. They are part of a story. Placed in the flat, *ReMind* continuously confronted Linda with her self-set personal goals. For instance, Linda underlined the outstanding presence of *ReMind* both mentally and physically. However, as an object intended to address several different types of goals, it cannot be as close to the moment of choice as other, more focused concepts.

Alternatives. Transformational objects offer an alternative behavior in line with an idealized self. *ReMind* is clearly about stopping procrastination. It takes a position, and

offers several alternative strategies (i.e. implementation intentions) to overcome procrastination. Linda incorporated several behavioral alternatives offered by *ReMind*. For example, she labeled and assigned only a limited number of tasks and structured them for a specific time (i.e. she became organized).

Moment of choice. Transformational objects create or re-script moments of choice. *ReMind*, for example, literally throws unfinished and overdue goals at its user. To pick it up creates a (dreaded) moment of choice. Linda was actually quite aware of this feature. A goal that almost fell down became very present and was immediately carried out.

Meaning-Making. Transformational objects are about nudging people into reflection and "meaning making". For instance, Linda felt confronted with her weakness to procrastinate. *ReMind* did this in several ways, for example, by continuously displaying Linda's self-set goals. It never stopped "reminding" her.

While the continuous situated offer of alternative behaviors in the form of choice and reflection is effective to instill change, it might not be especially pleasurable. Friction can easily be experienced as inconvenience or "nagging". The consequence is *reactance* [3]. Instead of focusing on the helpful content of the interaction, people may focus on the threat to their autonomy. As a consequence, they not only ignore recommendations, but even engage in the opposite to reassure themselves of their autonomy. Studies, however, show that this effect is reduced, given the "sender" is viewed as similar and likable [17]. The challenge is, thus, to create friction and at the same time to let a transformational object appear similar to its user and likable. We use three strategies to achieve this: we make the objects *naïve*, *understanding* and *ironic/ambiguous*. Linda was well-aware of *ReMind*'s ostensible naivety. She recognized the possibility to cheat and to transgress, without *ReMind* being judgmental about it (i.e., understanding), and she reflected about the apparent futility of procrastination. Even if one places a goal far in the future (i.e., procrastinates), it will inevitable come closer (i.e., irony). We believe these features to be responsible for the perception of *ReMind* as a partner rather than as a "know-all".

CONCLUSION

All in all, the present case supports the notion of *ReMind* as an object to overcome procrastination. We believe this to be the consequence of a certain approach to the design of "friction" – what we call an *Aesthetic of Friction*. According objects become "pleasurable troublemakers" through the deliberate balancing of situated, object-induced interventions and attempts to let objects appear similar to the user and likeable. Obviously, further studies are needed to fully explore the limits of *ReMind*. For example, procrastination comes in different shades of severity. For

some people, the friction induced may still be too weak. On the other hand, designing for naivety, understanding and irony is relatively uncharted territory in *Interaction Design*. We definitely need a better understanding of how to design for those aspects.

We believe that detailed case studies, such as the present, are valuable contributions to professional knowledge. While certainly not appropriate to answer questions of incidence, that is, how many people out of a hundred would benefit from *ReMind*, they proof existence and offer many insights and implications. The detailed understanding of the experiences inscribed into an artifact is crucial. This seems especially important, when technology aims at changing people. It is not only a matter of effectiveness. It is a matter of the “how”, the responsible, sensible and concerned dealing with people’s failures and aspirations [15].

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