

Brief Report

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Practical Challenges for the Design of Personal Informatics Systems

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The proliferation of fitness trackers is a reality. We not only observe increasing sales of devices for fitness tracking, but also more and more fitness tracking features are embedded in other interactive artefacts. The most popular smartphones and smart watches now feature fitness tracking functions. In an ideal world, this appears to be an amazing opportunity for a utopian future with users empowered to understand more about their bodies to lead healthier lifestyles. The ever-increasing number of wearable trackers shows that users expect certain benefits from wearing a tracker. Yet, empirical studies indicate that we are yet to observe meaningful long-term impact of fitness trackers [7]. Moreover, we do not know if the way trackers are currently designed allows for fostering health improvement in the general population. In this paper, we provide an overview of current research ideas on how to improve trackers so that they benefit users. We also address practical challenges in designing future, better trackers.

The HCI community strives to gain a deeper understanding of personal informatics and aims to enrich the personal informatics experience. To build an understanding of people's tracking practices Li, Dey and Forlizzi introduced the stage-based model of personal informatics systems [11]. It consists of five stages: preparing, collecting, integrating, reflecting and acting on personal data.

Based on the stage-based model of personal informatics [11] Epstein et al. published the lived informatics model of personal informatics [4]. They introduced lapses as one step of the personal informatics process. Epstein et al. emphasised that users can resume tracking after having a lapse.

Another strain of research addressed the design of personal informatics systems in a more atomic way. Previous



work introduced a number of systems exploring various techniques to support users on their way to wellbeing. Reflection is considered to be one of the main components of a successful personal informatics process [6] and has been integrated in the design of various systems. For instance, Khot et al. created artefacts that presented physical activity data of the users to prompt reflection [8].

Munson and Consolvo designed a mobile application to explore how goal setting, rewards, self-monitoring and sharing can motivate physical activity. They found that goal setting strategies were appealing to most users, whereas commonly used strategies (e. g., rewards) mostly failed to motivate participants to get more active [13]. The social computer game Fish'n'Steps from Lin et al. [12] connects a player's physical activity to the growth of an animated fish in a tank. Thus, the game is utilising rewards as one of the strategies to encourage physical activity. However, since some of the players' fish tanks included other players' fish, the authors additionally included social aspects into their design [12].

While research build a considerable understanding of current practices around fitness tracking [3], it remains a challenge to design new tracker experiences that keep users engaged and lead to tangible long-term benefits in wellbeing. As a consequence, designers and the HCI research community need to look for new ways to understand the fitness tracking experience and augment it in ways that can make tracking more meaningful.

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In our work, we took another approach. Based on the assumption that humans react to technologies in a social way [5, 14] we suggest focusing on the dialog and emerging communication between product and user, considering the personal informatics tool as an interactive coach and advisor. Our research showed that users are able to perceive and differentiate the way a personal informatics tool speaks to them (i. e. recognise its *communication style*) [15]. The communication style determines the tone in which a message is provided (e. g., friendly communication style – “Time to work out” versus dominant communication style – “You have to work out now!”; whereas feedback type determines the content of the message (e. g., positive feedback – “You did it once. If you continue practicing you can do it twice.” Negative feedback – “You are continuously failing. You have to practice more, otherwise you don’t stand a chance.”). Thus, there can be friendly messages that give negative feedback and the other way around. Different communication styles of the technology come with particular emotional consequences, thus contributing to a positive personal tracking experience. But the question remains how these findings can enrich the design of fitness trackers.

Below, we discuss three practical challenges for the design of future personal informatics systems. These challenges draw from our own research and from previous work in the field of personal informatics:

1 Sensing so that the Style Can Adapt to the User

Our research showed that there is no default option when it comes to picking the right communication style of interactive technologies for positive change. Different communication styles are connected to different facets of the self-improvement process [2]. This is similar to social experiences in everyday life where it is likely that the way our boss, our trainer, our friend or our coach speaks to us can feel appropriate on one day and inappropriate or even unpleasant on another. The users’ current mental state, recent experiences as well as contextual factors influence how users would like the personal informatics system to speak to them (e. g., friendly or critical). One way to tackle this challenge could be through sensing technologies. Research explored ways how emotion detection can enrich automated coaching systems [1]. Concurrently, physical activity tracker including all-day stress-tracking are intro-

duced to consumers.¹ We propose to go a step further for future tracking experiences and utilise sensing technologies to help the tracker finding the right tone to speak to its user.

2 Adapting to Life Events

Depending on one’s experiences on a given day, the preferences for a specific communication style may change. Past research found that trackers often provided notifications which were often perceived as demotivating, mistimed or even as additional burden [15]. In our work, we observed a large variety of when and in which context users interacted with their trackers and tracker applications during the day [16]. Past research suggests that reflection is necessary to enable users to understand the meaning behind their tracking data and foster long-term improvements in wellbeing. Yet, current trackers do little to help users find the right time for reflection, encourage social support in understanding data or integrate reflection in everyday routines. Thus, given the importance of seamlessly integrating physical activity into the everyday life of users [10], identifying opportune moments for interacting with tracker data for individuals and groups is essential for a positive personal informatics experience.



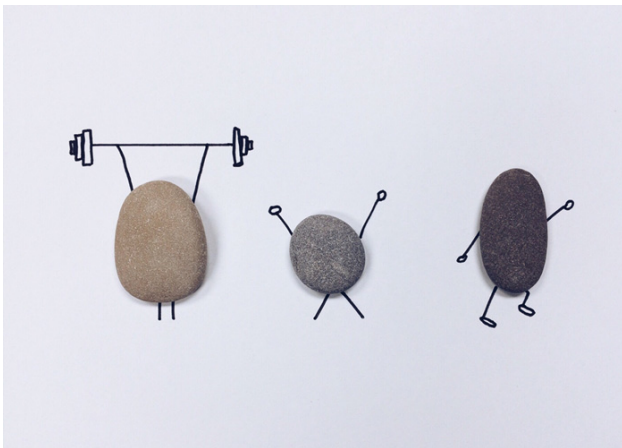
3 What Style for whom?

Previous studies showed that preferences for a specific communication style varied from user to user [15]. In addition, previous work in the area of eHealth emphasised

¹ <https://buy.garmin.com/en-US/US/p/605739>

that there is not one universal, generic solution for every user [17]. Consequently, it still remains an open question if user preferences for a specific communication style of the personal informatics system are stable over time. Since users traverse different stages when they interact with their self-tracking device [9], their preference for a specific communication style may change accordingly. Exploring these preferences and customising and adapting the system's communication style to the user's specific needs has the potential to make the fitness tracking experience more meaningful.

Finding the right way to communicate feedback to users is one way to foster engagement in users. But, as Watzlavick, Beavin and Jackson already stated in their five axioms of human communication: "one cannot not communicate" [18]. Based on the work from Nass et al. [14], we hypothesise that this axiom is also applicable to human-computer interaction. The communication style of the device can manifest itself in text-based communication, sound, vibration and visual cues. A consistent design of the multiple communication cues should reflect the appropriate communication style of the device potentially leading to a harmonious experience.



4 Conclusion

In this brief report, we discussed three practical challenges for personal informatics systems. We emphasise that finding the right way and the appropriate time to communicate feedback to users is a promising way to foster engagement in users. We hope to provide starting points for researchers and practitioners to enrich the design of future personal informatics systems.

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Jasmin Niess is a PhD candidate at LMU Munich, Germany. She explores how interactive systems can potentially enhance the users' wellbeing. To that end, she applies a variety of methods to gain a deeper understanding of users of personal informatics systems. Furthermore, she investigates the implementation of psychological knowledge within personal informatics systems.