Adapting at Run-time: Exploring the Design Space of Personalized Fitness Coaches

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IUI'17 Companion, March 13–16, 2017, Limassol, Cyprus.
ACM ISBN 978-1-4503-4893-5/17/03.
http://dx.doi.org/10.1145/3030024.3038280

Abstract
Personal health and fitness technologies, such as activity trackers, bear the potential to impact health behaviors globally. However, most users abandon these technology quickly. Possible reasons are that provided feedback (often consisting of raw data) is not actionable, not relevant, or the provided advice is not easy to integrate into people's lives. One approach to tackle this problem, is to develop personalized or adaptive digital coaches that take users' individual differences and situation into account. Even though the first prototypes of personalized coaches have been presented and evaluated, this research is still in its infancy. In my thesis, I want to extend this research by (a) investigating the influences of individual differences on behaviors and motivations to use a digital fitness coach, (2) mapping and conceptually exploring the design space of personalized digital fitness coaches, (3) and iteratively prototyping and testing adaptations of personalized fitness coaches in a user-centered design process.

Author Keywords
Fitness coach; Personalization; Design Space.

ACM Classification Keywords
H.5.m. [Information Interfaces and Presentation (e.g. HCI)]: Miscellaneous

Introduction

We increasingly let technology coach us for our lifestyle in general and especially for our personal health, fitness, and well-being [11]: Electronic medical records keep track of our health problems, activity trackers remind us to walk more steps, and mobile fitness coaches help us to push through our training plans. Many researchers hope that such technologies will eventually be able to impact health behaviours globally [11, **?**]. However, currently, we are far from this vision, since most users quickly abandon health and fitness tracking technologies [3]. One reason for the abandonment might be, that the provided feedback is not actionable or does not fit our current needs [5, 2]. While we might accept advice from a good friend who knows us well or a human fitness coach who is sensitive to our personal needs, accepting advice from an algorithm is much harder, as we neither understand it nor does it understand us. There is a fine line between helpful guidance and intrusive notifications, between well-intended nudges and patronising instructions and this line might be different for each of us.

Hence, one approach to improve the user experience of health and fitness technologies is to use personalization, to provide a real *coaching experience*. Only few personalized mobile coaches have been built and evaluated. Examples are MyBehaviour [5] SociableSense [4], Inspirun [9]. Their goal is to provide actionable advice that is easy to integrate into users' lives, by accommodating users' situation and individual differences among users. These systems provide first promising results and first insights into the design space of personalized systems.In my thesis, I want to add to the understanding of the design space of personalized fitness coaches and their potential benefits. More concretely, I aim to provide three contributions: (A) an improved understanding of the influence of individual differences on users' motivation and user experience with a mobile app-based fitness coach, (B) a conceptual exploration of the design space of possible adaptive mechanisms of an app-based mobile fitness coach, (C) a case study of the perceived benefits and drawbacks of an adaptive mechanism in an app-based fitness coach.

Progress so far

(A) Understanding the Influence of Individual Differences
So far, in the first part of my thesis, I investigated (A) and developed a research plan for (B) and (C).

To gain a better understanding of the influence of individual differences on users' motivation (A), we conducted a study based on the theory of planned behavior [1]. More precisely, we investigated the potential of increasing users motivations by tailoring motivational strategies to their personal values, in particular their motivation to use the high-intensity app-based fitness coach Freeletics (details of this study have been reported at CHI 2016 [6]). The study was planned and conducted according to the recommendations provided by Ajzen [1]: First, we conducted qualitative pilot interviews (N=12) to elicit people's salient beliefs that influence their intention to work out with the fitness coach Freeletics. In the second step we conducted a survey (N=643) that quantitatively assesses, which beliefs influence a participant's behavior the most. Additionally, we used the *Portrait Value Questionnaire* (PVQ) to assess Schwartz's set of personal values per participant [7].

Our analysis identified three significantly distinct clusters. We named and described clusters on the basis of the importance of salient beliefs as achievers, hedonists, and

followers. Each of these groups is motivated the most by a different set of beliefs: For example, *followers* are motivated by friends who exercise and clear instructions, *hedonists* appreciate the experiential qualities of exercising are more vulnerable to motivation drops, and *achievers* are motivated by the idea of becoming stronger. Based on these findings, we proposed motivational prompts and strategies tailored for each group. For further details of the analysis and the cluster, please refer to Schneider et al. [6]).

This theoretical analysis identified which salient beliefs to target in order to have the biggest impact on an individual user's motivation, e.g. *perceived capacity*. It can, therefore, provide a framework and guidance for design choices of a personalized fitness coach. However, due to the high level of the theory, further multidisciplinary design work is needed to translate abstract concepts into an adaptive prototype, more precisely to assess how groups are identified in runtime and how appropriate adaptations are implemented (B + C).

Research Plan

In the next step (B), a conceptual design space exploration is intended to to understand and lay out possible adaptive mechanisms of an app-based mobile fitness coach. Finally, as part of an ongoing collaboration with Freeletics, we aim to test perceived benefits and drawbacks of a selected adaptive mechanism in a final project (C).

(B) Mapping the Design Space of Personalized Fitness Coaches
To better understand the design space of personalized health and well-being technology, I'm conducting a systematic analysis of design decisions of existing systems, namely *what*, *when*, *how*, and *why* adaptations were used. Such an analysis allows me to build on the results of previous systems and to identify innovative and novel adaptation mechanisms. A useful model to describe existing systems was suggested by Stephanidis et al. [8]: Stephanidis et al. decompose adaptive user interfaces into *determinants* (when to adapt: adpects of the user model on which the adaptation decisions are conditioned), *constituents* (what to adapt: the aspects of the interface that are adapted), *goals* (why to adapt), and *rules* (how to adapt).

(C) Exploring the Design Space of Personalized Fitness Coaches
To design the personalization of Freeletics, we follow a two-step approach that is similar to the one proposed by Stephanidis et al. [8]. However, it should be noted that these steps serve as structured design exercise and are not used for the final implementation of adaptations. Both steps are conducted in an interdisciplinary team consisting of sport scientists, psychologists, designers, and engineers.

First, we derive a list of determinants and constituents, from the results of (A) and the literature research in (B). Then, possible attributes of determinants and constituents are defined. In the second step, Stephanidis et al. [8] suggest to define partial adaptation rules, which assess the match between determinants and constituents. To implement this step in an interdisciplinary team, I borrow a technique from General Morphological Analysis [10]. This technique allows all team members to assess the fit between attributes of determinants and constituents individually in regard to a specified goal.

Questions to Student Consortium

At the Student Consortium, I would like to discuss the following concrete questions about my research: (1) Is Stephanidis et al.'s decision making model for intelligent

user interfaces suitable for an exploration of the design space of personalized fitness coaches [8]? (2) Are the proposed interdisciplinary design process borrowing techniques from morphological analysis and a user-centered design approach appropriate?

Acknowledgements

I thank my supervisor Andreas Butz for his highly appreciated advice throughout the course of the reported projects and for feedback on earlier versions of this document.

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