

# Designing a Persuasive E-Coaching Application for Informal Caregivers

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**Abstract.** Being an informal caregiver is not easy, and might cause physical and psychosocial burden, especially in the long run. However, the formal health care system has little support for informal caregivers who experience abandonment and lack information. Mobile health can potentially be an efficient and cost-effective way of supporting informal caregivers. However, research has shown that mHealth systems often have problems with usability, and people do not use the systems for more than a short period. Therefore, this paper explores the design of an mHealth app using Persuasive Design, an established design framework. This paper presents the design of the first version of the e-coaching application using the persuasive design framework and unmet needs of informal caregivers from the literature. This prototype version will be updated based on interview data from informal caregivers in Sweden.

**Keywords.** eHealth, Informal caregiving, persuasive design, e-coaching, mHealth

## 1. Introduction

Informal caregivers (hereafter referred to as caregivers) provide in-home care to relatives who are sick or injured [1]. This informal caregiving is an essential social responsibility many people take on voluntarily. However, caregivers can suffer from adverse outcomes like stress and anxiety, and the many risks of being a caregiver have been extensively studied [2]. The formal healthcare structure is stretched in terms of resources such as money and human resources and cannot provide sustainable long-term care needs of patients. There is indeed a trend in health care to provide more care in the home due to an ageing population, and home monitoring systems, smart homes, and connected health are areas that have emerged as a result. In parallel, studies show people have difficulty using mHealth systems, especially among older adults [3,4].

One promising avenue in the quest for successful eHealth design is the area of design methodologies for eHealth, such as the Persuasive System Design Model (PSDM). When using a structured way of designing an eHealth application, it is more likely that it has a functional and efficient design [5]. PSDM has shown promising results related to, for example, physical activity [6]. However, it has rarely been used in the area of informal caregiving. In this paper, we have used PSDM to design the first version of an e-coaching application for caregivers called AnhörigCare by following the persuasive design principles, and considering caregivers' unmet needs from the literature. This paper

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contributes by illustrating a systematic approach to designing a persuasive e-coaching application for caregivers using PSDM. This study uses insights from previous research on informal caregiving contexts and their needs for an e-coaching application (AnhörigCare). Previous research emphasises that participants may have difficulties conceptualizing a mobile app for caregiving, hence, we design a prototype using literature that will further be updated through user data [7].

AnhörigCare is an e-coaching application that aims to support caregivers in Sweden in their caregiving activities, along with assisting them in self-care. It will provide a place where caregivers can have access to practical information and access formal services regarding caregiving, including companion service, booking sessions with a therapist, and more. In the following section, we provide an overview of the persuasive designing process and how it is used to design the first version of AnhörigCare in this study.

PSDM provides a systematic approach to designing engaging and applicable interventions with greater sustainability [8]. It proposes three main design steps: analysing the main aspects of a persuasive system, understanding the persuasion context, and designing system features [5]. PSDM then provides 28 design principles grouped into four dimensions. 1) primary task support that helps users perform their target behaviours, 2) dialogue support that uses design principles that motivate users through feedback and interaction with the app, 3) credibility support uses techniques that make applications look and feel trustworthy to users, and finally, 4) social support, which uses techniques that leverage social influence [5]. In this paper, we illustrate the process of designing the first version of AnhörigCare (see Figure 1).



Figure 1. PSD process for AnhörigCare

## 2. Method

Here we applied the persuasive design process to AnhörigCare as illustrated in figure 1 by beginning to review the literature to understand the persuasion context, including the purpose that the system will serve, the context in which the system will be used along with the technological context, and the persuasion strategy to be used.

### 2.1. Review of Literature

A scoping review is being conducted using the Arksey and O'Malley framework [9]. From an initial screening of the papers (56 in total), we identified broad categories of caregiver needs which are used in this study. The extant literature points to access to information regarding caregiving, access to formal services to assist caregivers, feeling of community [10], words of acknowledgment and encouragement, self-care [11], and informal peer support [12] as major needs of caregivers. The descriptions of their needs were compared with the persuasive design principles from PSDM. Based on this match, a design principle was chosen to meet their needs.

2.2. Analysis of Persuasion Context

This application aims to support caregivers to continue providing care while encouraging them to engage in self-care. AnhörigCare will be designed to autogenously enable caregivers to change their behaviour and attitude without healthcare professionals’ active participation. The application will provide one-stop access to practical information and formal support available to caregivers in the applications. Caregivers could access information from experts in a format (text, video clips, etc.) and in a language of their choice regarding caregiving. They would also be able to access additional formal support services provided by the municipalities for caregivers. Additionally, caregivers would be able to set self-care goals and be motivated by the application to follow through. AnhörigCare will be designed as a mobile application. Both direct and indirect messaging routes will be used. Practical information about caregiving activities and access to formal services is provided using a direct route, while goal-setting and self-monitoring of activities for self-care are provided using an indirect route.

3. Results

Here we present the persuasion features of the first version of AnhörigCare which is designed with the help of identified needs in the literature using an interactive prototyping tool [13]. These persuasion features and their implementation are summarized in Table 1.

Table 1. Design of System Qualities

Category	Feature	Implementation
Primary task Support	Tailoring	The application is designed to provide tailored data based on their location, the condition they provide care for, and their relationship to the care recipient (refer Fig. 2, needs for information and formal services).
	Self-monitoring	Provides a provision to connect other health apps and health devices and monitor their progress (refer to Fig. 4, need for self-care).
	Goal-setting	Allows caregivers to set their weekly or daily goals and follow through (refer to Fig. 3, need for self-care).
Dialogue Support	Liking	Use of words and phrases that caregivers can identify with. For e.g., ‘AnhörigCare’ means caring for ‘anhöriga’, the Swedish word for relatives.
	Praise	Use motivational quotes and encouraging textual feedback after the completion of a day of caregiving
	Reminder	Caregivers can set reminders for time-sensitive care activities like giving medicines to their care recipient, cleaning etc. Also allows them to set reminders about their self-care (refer Fig. 5).
Credibility Support	Expertise	Provides contact information of caregiver support organizations like Anhörigas Riksförbund counsellors and links to reach their homepage (refer Fig. 6).
	Trustworthiness	Provides information about and contact information for the team involved in developing the application.
Social Support	Social learning	Provide a discussion forum where caregivers can discuss their experiences or challenges (refer Fig. 7, informal peer support, feeling of community).

Cooperation Via a discussion forum, caregivers can feel that they are part of a community with a common interest (refer Fig. 7, informal peer support, feeling of community).

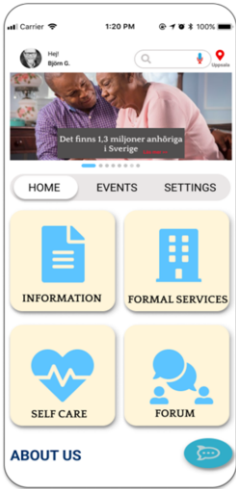


Figure 2. Home Page

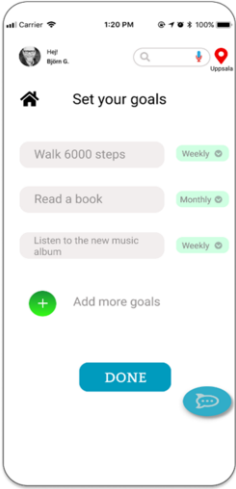


Figure 3. Goal-setting

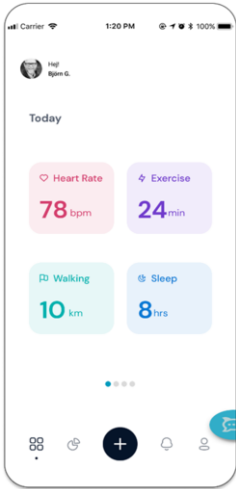


Figure 4. Self-monitoring

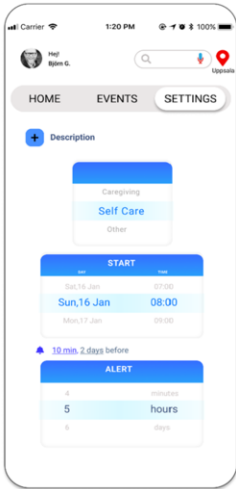


Figure 5. Reminders

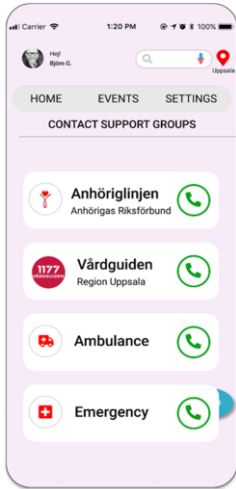


Figure 6. Contact information



Figure 7. Online Forums

4. Discussion and Conclusion

This study uses insights from previous research on informal caregiving contexts and their needs for an e-coaching application (AnhörigCare). Previous research gave us an understanding of caregivers' needs of caregiving to patients such as tailored and trustable information, access to formal services, caregivers' self-care and well-being,

acknowledgment, social interaction, and engagement [10–12]. These needs are addressed using PSDM making AnhörigCare more usable and engaging. Interestingly, we found the most suitable persuasive design principles to address the caregivers' needs. PSDM helps in designing effective and usable persuasive e-health applications for caregivers [5] through Primary Task Support (e.g., tailored practical information, monitoring health, and setting goals), Dialogue Support (acknowledgments and praise, and setting reminders), Credibility Support (quick access to caregiver support organizations and information on design team), and Social Support (social learning, and cooperation through online forums).

Based on PSDM and the unmet needs of caregivers from previous literature, we designed an initial prototype of AnhörigCare. This prototype might be useful for Information Systems researchers and designers as a first step in creating meaningful applications with a focus on elements that nudge users towards effective use of applications. A limitation of this paper is the lack of empirical evidence from caregivers in Sweden. As the involvement of actual users in design and development is of utmost importance for better usability and usefulness [1], our next step is to obtain empirical evidence by interviewing caregivers in Sweden. The next version of the prototype will be evaluated with caregivers which is a limitation in the current study. It will be interesting to understand how our findings from this study compare to the empirical evidence from the Swedish context.

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