

Designing Cognitive Supports for Dementia

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Abstract

This paper gives an overview of a PhD programme focusing on the design of cognitive prostheses to support people with mild-moderate dementia in the home. The approach taken involves two main phases. The first phase explores the problems that need to be addressed, from the perspective of professional carers, patients, and informal caregivers. The second phase focuses on designing a cognitive support that can assist patients through a specific activity. This paper reports the findings from the first phase (exploring problems of dementia in the home), and describes plans for the subsequent designing phase.

Introduction

During the early to middle stages of dementia, cognitive deficits are most profound in episodic memory (memories of experienced events) and executive function processes (required for planning, sequencing, and attentional control) [3]. Executive function processes are essential for goal-directed behaviour, and so impairment in this domain severely disrupts patients' ability to perform everyday tasks [1]. Existing concepts aimed at supporting dementia patients through daily activities involve systems that monitor task progress and provide prompts when necessary. Mihaildis et al. [4] devised the Cognitive Orthosis for Assisting Activities in the Home (COACH), which is designed to support hospitalised dementia patients when washing their hands. The system tracks progress during the activity and provides audio cues when the patient fails to initiate an action or performs an action out of sequence. Similarly, Dishman [2] devised a prototype that uses radio frequency identification (RFID) tags to monitor progress when making a cup of tea, and provides video clips of to-be-performed actions on a monitor located on the worktop.

Developments in motion tracking and artificial intelligence demonstrate a real potential in implementing technological supports across a broad range of tasks. However, little work has been done to explore the requirements of such systems so that they meet the needs of the users. The project aims to address this issue by designing a cognitive prosthesis that is grounded in an understanding of the problems patients experience during daily activities. The first phase includes two interview studies exploring the problems of dementia in the home [7,8]. The second phase focuses on the designing and evaluation of a Wizard of Oz prototype. This section will summarise the findings from the interview studies, before going on to describe plans for the designing phase.

Problems of dementia in the home: Professional carer and patient-caregiver perspectives

Two interview studies were conducted to identify aspects of daily living that are important to support. In the first study, nine interviews and one focus group were conducted with 20 care assistants and Occupational Therapists (OTs). In the second study five mild-moderate dementia patients and seven informal caregivers were interviewed in their own home. All transcripts were analysed using Grounded Theory Analysis [6].

Study 1: Professional carer perspective

The analysis revealed three themes that summarise the problems of dementia in the home, from the perspective of the professional carers. These were ‘Problems in the Home’, ‘Underlying Deficits’, and ‘Consequences for Patients and Caregiver’. The themes consisted of ten main categories, and 29 sub-categories. Figure 1 depicts the three themes and their constituent categories.

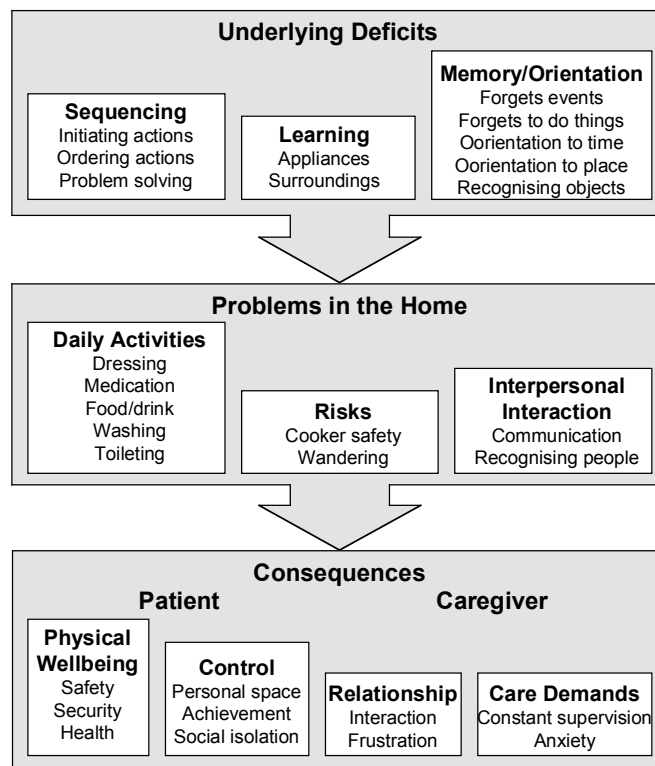


Figure 1. A summary of the problems in the home, as perceived by professional carers

Study 2: Patient-caregiver perspective

Interviews with patients and informal caregivers revealed four themes. Three themes covered similar issues raised in Study 1 (Problems in the Home, Underlying Deficits, and Consequences for Patients and Caregivers). The fourth theme covers ‘Situational Factors’ that influence the impact of the underlying deficits on patients’ functional status. The

themes composed of 13 main categories and 38 sub-categories. Figure 2 depicts the four themes and their categories.

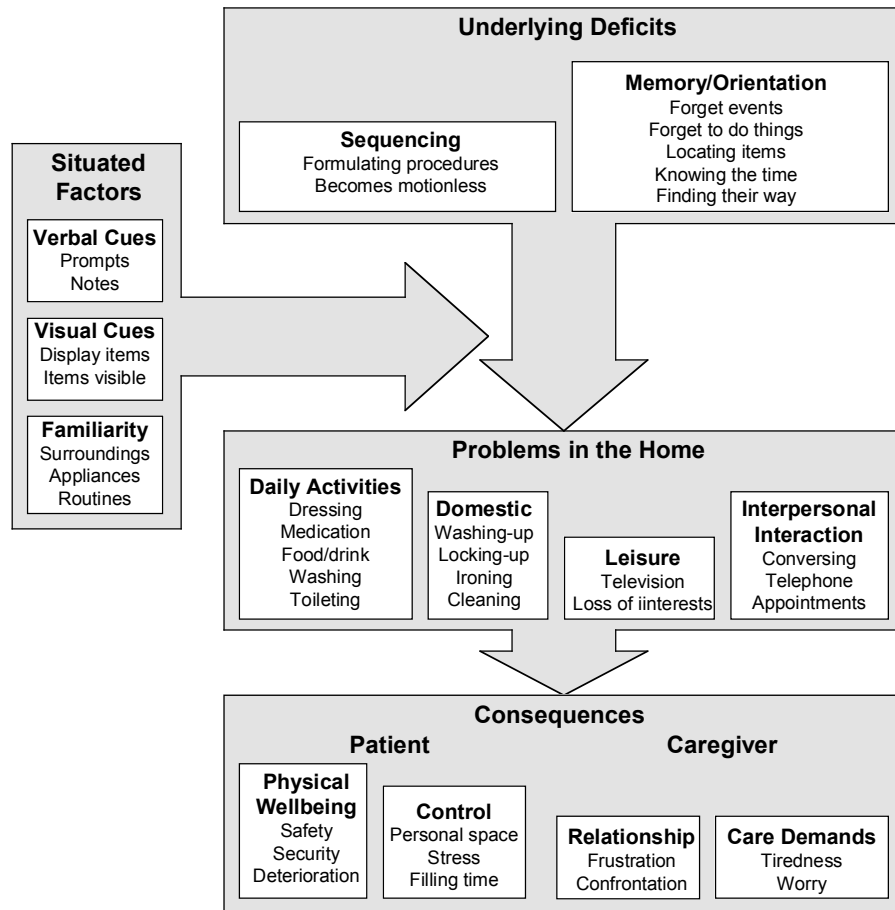


Figure 2. A summary of the problems in the home, as perceived by patients and informal caregivers.

Video analysis of kitchen tasks

The next phase of the project will explore how technology can be designed to support patients through a daily task. Problems in cooking were reported frequently in the interview studies, and so this activity will be the focus for the design. In order to further understand the types of problems that occur during kitchen tasks patients are being video recorded performing activities in their own kitchens. Actions will be transcribed using the Action Coding System, devised by Schwartz [5], and action errors will be classified based on behavioral characteristics. In conjunction with cognitive theory the error classifications provide a basis to address specific problems and design strategies that are compatible with patients’ cognitive capabilities. Preliminary analysis has shown that problems occur with regards to sequencing (intrusion, omission, and repetition), orientation (locating items and identifying items), operation of appliances, and incoherence (toying and inactivity).

Conclusion

The interview studies provide an account of dementia in the context of the home. This helps direct research efforts towards aspects of daily living that are important to support. Slight discrepancies between the two perspectives illustrate the benefits in using different elicitation methods and sources of information to gain an insight into the various problems. The naturalistic observations highlight aspects of the task that a technological support should address. Understanding how these errors relate to executive function deficits is an essential part in designing appropriate methods of support. The next phase will test different strategies of support using a single case experimental design.

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