

# Improving Therapeutic Exercise Devices for People with Rheumatoid Arthritis: A Research Method Combining Cultural Probes and Persuasive Design Theory

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**Abstract:** Persuasive Design engages a number of theories and strategies for influencing people towards desired target behaviors. To ensure the effectiveness of these strategies, detailed contextual information about the user group is required to guide and appropriate persuasive design theory to specific applications. This paper presents an innovative application of the photographic ‘cultural probe’ and ‘photo-elicitation’ research methods - used as part of a research study which aims to improve therapeutic exercise devices for people with Rheumatoid Arthritis (RA).

**Keywords:** Persuasive Design, Technology, Design for health, Rheumatoid Arthritis, Qualitative Research, Photo-elicitation, Successful Aging.

## 1 Introduction

Exercise therapies help to maintain functional ability in patients with RA. Pinch grip, overall grip strength and hand dexterity are the three hand functions most widely recognized as having the greatest impact on functional ability and quality of life. Therapeutic exercise devices are available to help maintain these functions, however, many patients struggle to engage with such equipment long-term. This is reportedly due to fatigue, fear of injury, pain, or patients’ own beliefs. This study explores the potential of ‘Persuasive Design’ to improve patient engagement with therapeutic exercise devices. To achieve this we ask the following key question:

What designable factors, specific to RA, should be considered alongside existing persuasive design theories, to inform the development of therapeutic exercise interventions which also support patients’ daily-life needs?

To achieve this, detailed information about the objects, environments and behaviors already present within the lives of people living with RA, is required to guide and appropriate persuasive design theory to specific applications. A multi-phase, photographic ‘cultural Probe’ and ‘photo-elicitation’, study was developed.

## 1.1 Why Rheumatoid Arthritis?

Rheumatoid arthritis is a chronic autoimmune disorder affecting approximately 1% of the working age population. The costs of RA to those who live with the condition, their families and to the economy, are very high. In 2000 there were 1.9 million GP consultations for inflammatory arthritis and around 46,000 hospital admissions in the UK alone. From 1999 to 2000 the loss of working time and subsequent cost to society and to the economy was 9.4m working days, representing £833m in lost production. [1] The cost to the NHS of managing RA, and complications such as osteoporosis, is an estimated £240 million a year. The National Audit Office (NAO) estimates the total annual cost of treating RA and its additional complications, including sick leave and work-related disability, to be £1.8 billion. [2]

## 1.2 Persuasive Design

Developed from Behavior Change theory ‘Persuasive Design’ engages a number of socio-psychological and design theories to influence people towards desired target behaviors.

Within this study Persuasive Design is defined as: an area of design research which seeks to change a person’s attitude or behavior, through physical objects or environments, to facilitate and support concordance with healthcare recommendations.

The diagram below is a prototype behavior model, developed as part of this study, to locate the role of design in facilitating behavior change. The model identifies ‘designed objects and environments’ as the principle agent facilitating therapeutic exercise behavior; the ‘bilinear’ pathways identify both ‘intentional’ (considered & planned) and ‘non intentional’ (unconsidered & unplanned) actions, ‘trigger factors’ (timely reminder/facilitator) and the ‘biopsychosocial’ - biological (ability), psychological (attitude) and social, factors affecting our ability and willingness to engage with target behaviors. This is a cyclical and multidirectional model.

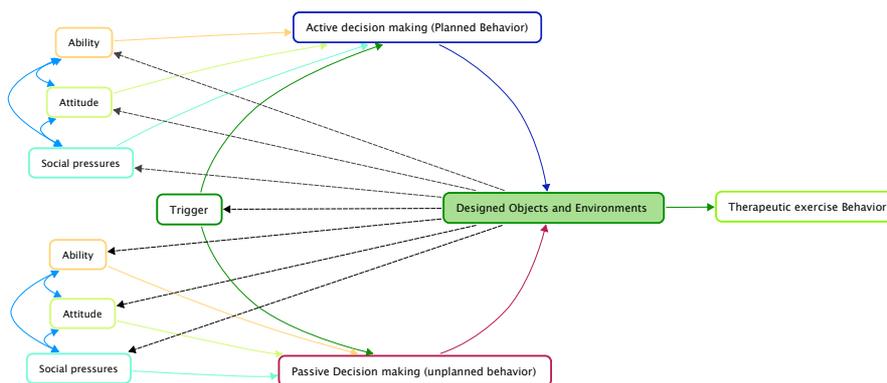


Fig 1. Prototype behavior change model for therapeutic exercise devices

## 2 Contextual Evidence Research Study

### 2.1 Study Design & Procedure

Photographic ‘Cultural Probe’ and ‘Photo-elicitation’ methods were adopted as part of a multi-phase focus group study. The Cultural Probe method invites participants to engage with ‘novel interaction techniques’ [3] designed to provoke inspirational responses and provide qualitative data that illustrates the lives and memories of participants. Participants were asked to take 27 photographs of objects they use everyday and the places they visit most regularly. Images provide detailed contextual information about daily life activities and the limitations of currently available treatments. Participant generated images were then used as conversational triggers within the ‘photo-elicitation’ exercise. Photo Elicitation is used to facilitate deeper discussion; photographs, drawings and artifacts can be used to trigger, unlock and identify personal narratives, social contexts and emotional elements within a respondent group [4]. Each focus group session was recorded, transcribed and analyzed for emergent and reoccurring themes. This information is then analyzed to identify opportunities for persuasive design interventions.

### 2.2 Results

Analysis for this study is ongoing. Preliminary findings have been identified using an ‘Interpretive’ model of analysis:

- **Existing devices have been developed to solve problems too narrowly conceived.** For example, many patients use their wrist splints to swim, play tennis, cycle and generally pursue the interests they had before onset of RA. Existing devices have not been developed to support these activities, instead, the design of most existing devices have been limited to functional effectiveness. Furthermore, many existing devices are considered by many to convey a design language of ‘illness’. This adds further psychological and social strain to individuals already having to deal with the affects of ill health.
- **The Patient Journey.** Evidence suggests that the length of time an individual has lived with RA has an affect on the nature of their concerns these can be broadly mapped between short, medium and long-term issues. Interventions should take these factors into account - tailoring recommendations to timely needs and assisting individuals to transition from one phase to the next.
- **Personal Technologies.** (mobile phones and computers) were prevalent throughout the lives of all who participated in this study. They were popular regardless of age, gender, disease activity level or personal interest. Although not always considered to be desirable, evidence identifies a growing dependency on both mobile phones and computers. This prevalence presents significant opportunities for therapeutic interventions. Personal technologies could be used to provide context aware, timely triggers, detailed monitoring and social motivations.

### 3 Conclusions

- **Design Interventions.** Preliminary analysis suggests that existing responsibilities and activities provide opportunities within existing behaviors to introduce therapeutic interventions. Personal hobbies and interests offer powerful intrinsic incentives which could be harnessed to overcome physical challenges introduced as part of therapeutic exercise interventions. Persuasive design strategies could be adopted to raise awareness of RA within society through ‘ambassador products’ - objects that promote understanding and recognition of the needs of others.
- **Persuasive Design model.** Almost all interactions that we have throughout our day, both socially and professionally, are mediated by the designed objects and environments that surround us. Design not only facilitates many of these interactions it can also shape and influence our attitudes, abilities and our willingness to engage with particular behaviors and activities. The persuasive design model presented here identifies the importance of ‘design’ in affecting behavior towards healthy change.
- **Research Methods Used.** The research methods used within this study are an effective method for gaining detailed information identifying the real-life needs of users. The interactive nature of these methods provides the opportunity for patients to identify and report their needs, concerns and experiences in ways that could not be achieved by other means.

#### 3.1 Future Work

This study provides a methodological foundation from which future studies can be built. Planned next steps within this study will take place in two areas:

Firstly, the study will develop a series of design criteria for improving user engagement with therapeutic exercise devices for people with RA. Secondly, the study will develop a series of interactive, conceptual, prototype devices to further extend our understanding of the research. Multiple pieces will be produced to examine the methods and application of this research. Beyond this, the intention is to develop commercial, product outcomes, and to apply our research findings to other conditions requiring physical therapy or physical rehabilitation.

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