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Technical Report

Development of ProFibro — a mobile application to promote self-care in patients with fibromyalgia

Susan Lee King Yuan*, Amélia Pasqual Marques

Department of Physical Therapy, Speech Therapy and Occupational Therapy, School of Medicine of the University of Sao Paulo, Sao Paulo, SP, Brazil

Abstract

Fibromyalgia is a rheumatic syndrome characterised by chronic widespread pain, often associated with fatigue, unrefreshed sleep and cognitive problems. Effective management of fibromyalgia requires a proactive approach in which the patient takes responsibility for self-care. The purpose of this research was to develop an application (app) for promoting self-care as a complementary Mobile Health resource to physical therapy in the management of fibromyalgia. The app was developed in five stages, according to the prototyping paradigm. In Stage 1, an expert panel of five physical therapists, five patients with fibromyalgia, a digital interface designer and a programmer analysed the requirements and content, and set the software objectives. In Stage 2, the designer created the screen layouts. In Stage 3, the programmer developed the prototype for the Android operating system (Google Inc., Mountain View, CA, USA). In Stage 4, the prototype was pilot tested regarding its quality of use by 10 patients with fibromyalgia. Finally, in Stage 5, the designer improved the interface and the programmer built the final product.

This article describes the development of ProFibro, the first free mobile app in Brazilian Portuguese for fibromyalgia. Its functions are patient education through animation, self-monitoring, sleep strategies, scheduling, graded exercise programme, practice of gratitude, family adjustments and hints through notifications.

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Keywords: Fibromyalgia; Mobile applications; Self-care; Chronic pain; Quality of life

Introduction

Fibromyalgia is a rheumatic syndrome characterised by chronic widespread pain, often associated with fatigue, unrefreshed sleep and cognitive problems. Common comorbidities include psychiatric disorders, headache and irritable bowel syndrome [1]. Fibromyalgia is the second most prevalent pain condition in Brazil with an estimate of 2% in the general population [2].

Management of fibromyalgia requires a multidisciplinary approach with a combination of non-pharmacological and pharmacological interventions. Initial management should focus on non-pharmacological therapies, especially the use

of exercise, which is currently the only strong recommendation from the European League Against Rheumatism; in case of non-response, further therapies should be tailored to the specific needs of the individual [3]. Effective management of fibromyalgia is associated with a proactive, patient-centric approach. The patient should take responsibility for self-care and adherence to all aspects of the treatment plan [4].

Qualitative studies on the experiences of patients with fibromyalgia highlight concerns, such as the lack of information provided by healthcare professionals; lack of understanding by family, friends and society in general; difficulty in adapting to the syndrome; and coping with pain, fatigue and disability [5,6]. Mobile Health (mHealth) is a tool which could address these challenges. Research has demonstrated the effectiveness of health communication (i.e. the study and use of communication strategies to inform and influence individual and community decisions that enhance health). Recently, mHealth, the use of mobile communica-

* Corresponding author at: Department of Physical Therapy, Speech Therapy and Occupational Therapy, School of Medicine of the University of Sao Paulo, Rua Cipotanea, 51 – Cidade Universitaria, Sao Paulo, SP, 05360-000, Brazil.

E-mail address: susanlkyuan@yahoo.com.br (S.L.K. Yuan).

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tions for health services and information, has emerged as an important subsegment of health communication [7].

In 2014, the estimated proportion of mobile phone users, aged ≥ 10 years, in the Brazilian population reached 78%, which corresponds to nearly 137 million people [8]. Most citizens have access to a mobile phone, although other technologies and health infrastructure are scarce. This increase in mobile phone usage has the potential to improve health service delivery on a substantial scale [9].

A systematic review on the effectiveness of mHealth interventions identified seven clinical trials that tested mobile applications (apps) for health behaviour change (reducing calorie intake and/or increasing physical activity), and seven clinical trials that tested apps for disease management (lung transplantation, asthma, diabetes and haemophilia). The reviewers found evidence suggestive of benefit, showing the potential of apps for health behaviour change and disease management [10].

In 2011, Rosser and Eccleston conducted a review of 111 mobile apps for pain management, of which seven were related to specific long-term conditions, such as fibromyalgia, arthritis and degenerative disc disease. Most apps did not report the involvement of healthcare professionals. There were few reports of the origin of the content and its validity. The functions for the majority of apps were limited to information provision or self-reported diary tracking of variables such as pain level and medications. Many apps used the multimedia capacity of the smartphone to illustrate content, and some included the ability to share data with healthcare professionals or through social networks. Although the commercial descriptions promise pain relief, no apps were tested for effectiveness in clinical trials [11].

The purpose of this project was to develop a free mobile app for the promotion of self-care as a complementary mHealth resource to physical therapy in the management of fibromyalgia. The aim was to involve expert physical therapists in the creation of the app, and offer an engaging design, dynamic and interactive experience, high functionality and content based on reliable sources of information.

Due to limited systematic knowledge on design approaches for consumer health information technology (IT) apps, in 2011, the Agency for Healthcare Research and Quality of the US Department of Health and Human Services published a report with recommendations to guide the development of consumer health IT apps, based on findings related to design methods used for the development of successful digital consumer products in industries other than health care [12]. The app was developed in five stages, according to the prototyping paradigm, which is one of the top six design methods recommended. It has a user-centred design philosophy and is characterised by high levels of user involvement and iteration. All stages of the design process were conducted by two physical therapist researchers. This study was approved by the Research Ethics Committee of the School of Medicine of the University of Sao Paulo (Approval No.

20/08/2014). Informed consent was obtained from all study participants.

Stage 1 – software content analysis and setting of objectives

A literature review was conducted to identify current scientific evidence on fibromyalgia and treatment. Based on these findings, a set of open-ended questions was developed for a semi-structured interview with an expert panel composed of: five physical therapists with clinical and research expertise in fibromyalgia; five smartphone users, aged 24 to 59 years, with a medical diagnosis of fibromyalgia and complete primary education; a digital interface designer; and a programmer. The interview was recorded by note taking. The expert panel analysed the requirements and content, and set the software objectives, as follows:

- 1) Patient/user education through animation. Guidelines point out education as a key recommendation in the management of fibromyalgia [3,13].
- 2) Self-monitoring with the Revised Fibromyalgia Impact Questionnaire [14].
- 3) A timer for activity pacing, which is a cognitive-behavioural therapy (CBT) technique, through which the patients learn coping skills to execute tasks that usually increase the intensity of symptoms [15]. There is evidence of benefits of CBT for patients with fibromyalgia [16].
- 4) Sleep strategies with guided imagery relaxation technique, stimulus control therapy and sleep hygiene. These CBT techniques are recommended by the American Academy of Sleep Medicine [17]. CBT showed positive results in randomised trials for sleep disorders in patients with fibromyalgia [18,19].
- 5) Scheduling function to facilitate planning and organise the user's daily routine.
- 6) Graded exercise programme with aerobic, stretching and strengthening exercises. Exercise is strongly recommended in current guidelines [3].
- 7) Practice of gratitude with a diary [20]. The panel decided to include this self-strategy to cultivate gratitude, based on the positive experience of one of the patient panelists.
- 8) Family adjustments [20]. The panel considered it relevant to include a function with activities to undertake with family, in order to facilitate adaptations to a long-term condition and increase understanding, communication and mutual care.
- 9) Hints through notifications. The panel decided that diverse information and activities that could not be converted into functions in the app could be presented to the user as hints.

The name of the app and its logo were defined (Fig. 1) in this stage.

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