European Journal of Integrative Medicine 8 (2016) 182–187

Contents lists available at ScienceDirect

European Journal of Integrative Medicine

journal homepage: www.elsevier.com/eujim

Research paper

A patient-controlled, smartphone-based music intervention to reduce pain—A multi-center observational study of patients with chronic pain

Stéphane Guétin[a,b,c,*], Emmanuelle de Diego[d], Frédérique Mohy[e], Claudine Adolphe[e], Gwenaelle Hoareau[e], Jacques Touchon[a], Julian F. Thayer[f], Julian Koenig[f]

[a] Department of Neurology, Centre Mémoire de Ressources et de Recherches (CMRR), Inserm U1061 Montpellier University Hospital, Montpellier, France
[b] Association for Music Therapy Applications and Clinical Research (AMARC), France
[c] Department of Psychologie (LCPL), EA 4056, Université Paris 5—Renée Descartes, Paris, France
[d] Department of Pain, Groupe Hospitalier Sud Reunion, Réunion, France
[e] Department of Pain, Félix Guyon University Hospital, Réunion, France
[f] Department of Psychology, The Ohio State University, Columbus, Ohio, USA

ARTICLE INFO

Article history:
Received 23 October 2015
Received in revised form 7 January 2016
Accepted 12 January 2016

Keywords:
Music
Pain
Anxiety
Chronic pain

ABSTRACT

Introduction: Music is widely used to reduce patients' pain and discomfort within clinical settings. The smartphone-based, patient-controlled *Music Care* application has previously been evaluated in Alzheimer's type dementia, patients with chronic low back pain, mechanical inflammatory, non-malignant, musculoskeletal, or neurological pain, as well as for its use to reduce acute pain in the intensive care unit. The aim of the present, multi-center observational study was to evaluate the feasibility and general usability of the application in a sample of patients with different chronic pain conditions, and to conduct a preliminary exploration of potential predictors of outcome response.
Methods: Fifty-three patients from two university hospitals (*Centre Hospitalier Universitaire*; CHU) de La Réunion in France participated in the trial. Patients completed several questionnaires on their musical preferences and experiences and provided self-reports on pain intensity, anxiety and satisfaction with the intervention before and after the use of the application. Each patient used the application at least once (data for 7 sessions reported).
Results: Listening to self-selected music for 20 min, significantly reduced pain and anxiety. Responders (defined by a 33% reduction of pain intensity) reported significantly greater satisfaction with the intervention. Analysis of responder characteristics further revealed that patients who indicated to play a musical instrument were unlikely to report a clinically relevant decrease in pain intensity.
Conclusion: The use of the *Music Care* application within this setting proved good feasibility. The limitations of the present study and recommendations for future evaluations incorporating physiological outcome measurements are discussed.

1. Introduction

The treatment of pain has grown to be an important field of alternative and complementary treatments such as music medicine and music therapy. Music therapy interventions are defined by the presence of a trained music therapy professional who is involved in the therapeutic process. Widely applied techniques can be categorized as either active (or interactive), where the client and therapist play music together, which may include vocal and instrumental performances to produce sound or music, or receptive, where the patient listens to music provided by the therapist (pre-recorded or played live by the therapist).

Music medicine based interventions, where the client listens to pre-recorded music, are of growing interest to reduce patients' pain and discomfort within medical settings. The majority of research studies within this particular field of music medicine evaluate the use of listening to music in medical or dental treatment settings, to distract from painful medical procedures or nursing interventions. In adults, music listening interventions are used to decrease pain and anxiety in patients with burn injuries during burn dressing changes or burn debridement processes [1,2]. Furthermore, music listening interventions are applied within pre- [3], peri- [4,5] or post-operative [6,7] settings, to support patients' recovery after surgery and to ease postoperative pain.

* Corresponding author at: 8 rue la Vacquerie, 75011 Paris, France.
E-mail address: s.guetin@music-care.com (S. Guétin).

http://dx.doi.org/10.1016/j.eujim.2016.01.002
1876-3820/

While in such cases, acute pain is related to a certain clinical condition or medical procedure, music listening interventions are also used in the treatment of patients with chronic pain due to long-term illness. For example, music listening may be beneficial for elderly patients with chronic osteoarthritic pain [8]; patients with chronic nonmalignant pain [9]; hospitalized individuals with cancer pain [10–12]; home-dwelling persons with dementia [13]; or patients with likewise long-term and life-threatening illnesses in palliative [14,15] or hospice care [16].

Recent technological developments (i.e., handheld devices and smartphones), allow for the patient-controlled use of music within a large variety of clinical and ambulatory applications. Within the present, observational study we aimed to assess the effectiveness of the *Music Care* application in patients with chronic pain that received consultation at two different sites of the university hospital (*Centre Hospitalier Universitaire*; *CHU*) *de la Réunion France*. *Music Care* is a smartphone-based, patient-controlled application that allows clients to listen to a variety of professionally pre-recorded music pieces of their choice. While the application has previously been evaluated in patients with chronic low back pain [17] Alzheimer's type dementia [18] acute pain in intensive care units [19] and mechanic inflammatory, non-malignant, musculo-skeletal, or neurological pain [20], the aim of the present study was to evaluate the feasibility and general usability of the application in a sample of patients with different chronic pain conditions (i.e. rheumatic pain, primary headache disorders), and to conduct a preliminary exploration of potential predictors of outcome response within a responder analysis.

2. Methods

2.1. General procedure and enrollment

Patients at the CHU *de la Réunion France* (*Centre Hospitalier Félix Guyon* and *Groupe Hospitalier Sud Reunion*) were enrolled in this multi-center, observational study. All subjects used the *Music Care* application for at least one session (i.e., listening to a standardized musical sequence of 20 min in length), in addition to their usual treatment. Before inclusion in the study, patients potentially eligible for inclusion were informed about the possibility to participate and provided informed consent. The study falls under the regulation for "non-interventional" studies by the National Health Authority (HAS) in France. In the case that treatment is administered according to its indications and methods of usual prescription, and it is not assigned randomly, no specific provision governs this type of research. Thus, no formal approval by the local ethics committee was required.

2.2. Music intervention

The *Music Care* application is a receptive music intervention, allowing the patient to listen to a standardized musical sequence of 20 min in length. All the music is specially composed and recorded for the application. Each standardized music session of 20 min is broken down into several phases, which gradually help the patient to relax, according to the so called "U" sequence [17–19]. The effect of this technique is achieved first through a reduction in musical tempo, orchestral size, frequencies, and volume (descending arm of the "U"), reaching a phase of maximum relaxation (bottom of the "U") before a redynamizing phase (ascending arm of the "U"). All the musical sequences constructed for the "U" technique were specially composed and recorded by the music publication company Music Care [www.music-care.com].

The *Music Care* application is not meant to be a form of music therapy – that would involve the presence of a trained music therapy professional – rather it enables the patient-controlled therapeutic use of music within various settings. The client can chose from a variety of 20 different musical styles (e.g., classical: piano, violin, flute, etc.; jazz: trumpet, saxophone, trombone, etc.; world music: India, Andes, Africa, etc.). All musical pieces have been recorded in high-quality recording studios with professional musicians to meet the demands of the application and its clinical use. The music has solely been recorded for the use within the application, to ensure that patients are not familiar with the music, avoiding potential memory effects or later conditioning. In this regard and given the large variety of musical pieces that patients can choose from, the *Music Care* application is distinguished from other forms of music medicine interventions using prerecorded music from commercial CDs etc.

During an initial interview with a nurse, a questionnaire was completed to obtain a clearer understanding of the patient's musical tastes. The patients were trained in using the audio equipment, and were asked to note the duration, frequency of listening and type of music chosen.

Patients were enabled to use the application at the CHU de la Réunion France within an examination room at both study sites. Patients were instructed to lie down flat in a comfortable position, with their eyes masked, while they listened to the music via high-quality headphones, which were provided. Most of the participants enrolled within the present study used the application for more than one session over the time of receiving consultation at the hospital (mean 7 sessions, range 1–16).

2.3. Data assessment

During the first enrollment interview with a study nurse, patients were asked to complete a questionnaire on their musical experience and preferences (i.e. *do you like music?*; *how important is music in your life?*; *are you a musician?*;*do you have a music preference or preferred instrument?*), and a socio-demographic questionnaire (i.e. current job description and occupational status). All included patients underwent a clinical study evaluation and were asked to complete self-report questionnaires during the course of the study. Before the start and at the end of each use of the application, patients were asked to rate their current pain intensity on a visual analogue scale (VAS) integrated within the application, with anchors at 0 (*no pain*) and 10 (*most intense pain*). Secondary outcome measures included the assessment of anxiety and satisfaction with the intervention. Anxiety was rated before and after the music intervention on an 11-point scale from 0 (*no anxiety*) to 10 (*most intense anxiety*). Satisfaction with the intervention was rated after each session on a VAS ranging from 0 to 10 (10 = greatest satisfaction). Data obtained from the first session is reported in greater detail, while analyses on pooled data over 7 consecutive sessions further adds to the present analysis.

2.4. Statistical analysis

Descriptive statistics on ratings of pain intensity and anxiety were expressed as means and standard deviations (SD) before and after each use of the application. Differences between measures taken before and after the intervention (pre-post comparisons) were analyzed using paired Student's test. Furthermore, data were analyzed using a response criterion of a 33% decrease in pain intensity (clinical relevant change), classifying patients as *responder* vs. *non-responder*. Differences between responders and non-responders on baseline or session variables were analyzed using Chi-Square tests or Fisher's Exact *F* tests for categorical variables and independent *t*-tests for continuous variables. All tests were two-sided, with a level of significance set at 0.05. Statistical analyses were performed using SPSS (IBM, version 21.0).