Adapting the Emobook Life Story Book App for Reminiscence Focused Music Therapy in Dementia Care: An Interdisciplinary Participatory Design Approach

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Abstract. Life Story books are frequently employed to facilitate reminiscence interventions, but their use in music therapy remains limited in the scientific literature. There is a paucity of research detailing the design processes involved in this context. In contemporary music therapy, the effective integration of technology is a significant concern. This paper aims to report on the Participatory Design process used to adapt the Emobook Life Story Book App for a Reminiscence Music Therapy Program for people living with dementia. An interdisciplinary team comprising an interaction designer, a software engineer, a music therapist, and a research assistant engaged in co-design meetings. The interdisciplinary and participatory process yielded four ideas and four lines of action, which evolved iteratively as the work meetings progressed. Points raised by the lines of action were addressed, leading to modifications in the Emobook app and adjustments in the intervention program for seamless integration. Collaborative, interdisciplinary efforts are essential in advancing the incorporation of technology into music therapy practice. This study demonstrates the value of a Participatory Design approach in adapting technology for use in Music Therapy.

Keywords: Music Therapy · Life Story Book · Participatory Design

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1 Introduction

In the field of contemporary music therapy, a notable concern refers to the effective incorporation of technological tools in professional work settings. The discipline has yet to reach a stage where it can be confidently stated that its practitioners have received comprehensive and adequate training for the competent use of technology within their practice [1]. In this context, music therapists are encouraged to network with experts from a wide range of disciplines, thus enhancing the development of their knowledge and skills. The synergies that emanate from such collaborative initiatives not only accelerate the assimilation of technological competencies but also generate knowledge that can be seamlessly integrated into music therapy practice. In other words, the path toward a professional practice that adequately integrates technologies is enhanced by collaborative and interdisciplinary work [1].

This paper aims to provide a comprehensive account of the Participatory Design (PD) process employed to adapt Emobook [2], a life storybook app designed for reminiscence therapy, for integration into a specialized Reminiscence Focused Music Therapy Program for people living with dementia [3]. To do this, an interdisciplinary team was formed, consisting of an interaction designer, a music therapist, a software engineer, and a research assistant. They conducted a series of co-design meetings that mixed meeting discussions, traditional material enactments, and mock-up screen design. These meetings served to elicit and validate requirements and produce a post-prototype of the life storybook app adaptation to be used in a music therapy program.

2 Related Work

2.1 Dementia Care

Dementia affects approximately 50 million individuals globally, with an annual increase of 10 million new cases. Projections suggest that by 2030, there will be 82 million people living with dementia, rising to 152 million by 2050 [4]. Given this growing prevalence, cost-effective and straightforward interventions are needed to enhance the quality of life for dementia patients and their caregivers.

Non-pharmacological approaches, such as reminiscence therapy, have demonstrated positive impacts on cognitive function, reduction of depressive symptoms, and promotion of positive self-esteem [5]. Particularly, music therapy has shown promise in improving mood, particularly depressive symptoms, in dementia patients in care settings [5, 6]. However, questions remain about the duration of these effects and the necessity for ongoing stimulation for lasting benefits [6].

2.2 Reminiscence and Music Therapy

Music therapy often triggers reminiscence naturally through familiar songs, facilitating conversations and the sharing of memories tied to personal and cultural identities. Research has demonstrated the positive effects of combining music and reminiscence therapy in reducing depressive symptoms among people living with dementia [7].

Music and reminiscence are often combined by a variety of practitioners in their work with people with dementia. Among these Music therapy techniques are:

- **Associative Mood and Memory Training (AMMT).** Cognitive rehabilitation technique that uses music to enhance memory processes in three ways - by producing a mood-congruent state to facilitate memory recall, by activating associative mood and memory networks to access long-term memories, and by instilling a positive mood at both encodings and recall enhancing learning and memory function [8]
- **Reminiscence Focused Music Therapy (RFMT).** Combined intervention with the use of associative items. The familiar music provided a supportive framework and acted as an anchor during periods of disorientation, directing the members of the group back to the present moment. The incorporation of associative items in the sessions encourages reality orientation, increased verbal interaction, and cognitive stimulation [7].

The two techniques offer a systematization of the reminiscence-focused process, including guidelines for the selection of music, session planning, and associated protocols [7, 8]. In particular, the AMMT involves a detailed clinical protocol and states that clinicians should discretely monitor patient behavior for affective response during music listening.

2.3 Reminiscence and Life Story Books

Life Story books are widely used to support reminiscence interventions [2]. These books typically contain photos or images of life memories. These help people living with dementia in constructing narrations about their life memories, which in turn has been shown to have positive effects on feelings of well-being and quality of life.

Emobook is a digital life story app designed to support reminiscence therapy. It aims to help therapists labor by giving them more control over multimedia stories and photos so that the reminiscing experience becomes stimulating and interactive (i.e., music, sounds, movie clips) and capturing activity records, which opens the opportunity for therapists to study the progress of the disease [2]. Its features include multilingual support, enable/disable settings for higher flexibility of the tool, full-screen support, and several mood meters to gather emotional responses from people living with dementia.

The utilization of such technologies in music therapy remains relatively underrepresented in the scientific literature. There is a notable scarcity of studies that specifically document the intricate design processes associated with these endeavors.

2.4 Participatory Design Methodology

Participatory design (PD) is a methodology that promotes the participation of users in the design process of health-related applications [3, 9]. It is an iterative process where each phase is planned by reflecting on the results from the previous phase concerning the participant's contribution.

Key activities of a PD process include fieldwork; literature reviewing; and development and testing. All activities must be applied with a participatory mindset that will ensure genuine participation throughout the project. For each of these activities, various methods are applied throughout the phases of a PD project to enhance user participation. These can be categorized under the headings of telling, making, and acting [3]:

- **Telling.** Practitioners are given a chance to share their knowledge.
- **Making.** Tools allow the ability to create, for example, through creative workshops conducted to generate ideas.
- **Acting.** Explore how new designs could affect practice, for example, by testing ideas in laboratories.

3 Interdisciplinary Participatory Design Process

The objective of this PD process was to merge different knowledge domains to co-design a post-first prototype of Emobook. It is worth highlighting that, given the application's purpose of aiding caregivers in the advancement of reminiscence therapy, the primary end users in this specific case were the music therapist and the research assistant. The process was developed in five working meetings. Each one was planned by reflecting on the results from the previous one. Key activities included fieldwork; literature reviewing; and development and testing. Below, we describe its attributes, encompassing the setting, team composition, tools employed, procedural steps, materials, schedule, and evaluation methods.

3.1 Setting

The first meetings were held online through the Teams platform, with access provided by the University of Santiago de Compostela. Starting with the second meeting, the meetings were held onsite at the CiTIUS (Singular Research Center for Intelligent Technologies), an institution belonging to the same University.

The meeting room was well-equipped to facilitate collaboration and productivity. It featured a spacious worktable, synchronized screens that mirrored the designer's tablet, and individual tablets for therapists' use. Additionally, traditional tools like paper and pens were readily available for sketching diagrams or notes. To ensure comprehensive documentation and continuity, we maintained diaries where we recorded key discussion points and identified areas for further exploration after each meeting. This blend of modern technology and traditional notetaking ensured a comprehensive and effective working environment.

3.2 Team

The team comprised four members: a music therapist responsible for designing and implementing the intervention program as part of her doctoral studies a research assistant with institutional experience and participant familiarity; the software developer and creator of the Emobook application; and a computer engineer and project collaborator. Additionally, the process received oversight from an experienced music therapist and the director of the Doctoral Program.

3.3 Tools

The co-design tools were thoughtfully selected to effectively amalgamate knowledge from diverse fields and foster collaborative problem-solving:

- **Brainstorming:** Within this tool, the "technology domain" encompasses emerging technologies that may stimulate innovative design concepts. Simultaneously, the "social health domain" focuses on health aspects open to potential adaptations.
- **Timeline:** These minute-by-minute diagrams outline the actions to be executed during the intervention. They prove invaluable in aligning the application's adjustments with the specific phases of the therapeutic process.
- **Work Diaries:** These serve as comprehensive records, documenting the subjects discussed, ideas generated, and future action plans emerging from meetings.

3.4 Procedure

Five meetings were convened at biweekly intervals, lasting approximately one and a half hours each. These work meetings followed a structured format divided into three distinct phases:

1. **Introduction (Telling)**. The meeting began with an introduction to the topic at hand. This phase often involved the presentation of findings from literature reviews or research results, and it also included updates to the project timeline.
2. **Brainstorming and Idea Generation (Making).** The second phase involved a brainstorming meeting aimed at finding solutions to any issues or challenges that surfaced during the presentation. This creative process generated a pool of ideas and potential solutions.
3. **Action Plan (Acting).** The final phase focused on defining concrete steps and action plans for upcoming meeting.

Table 1 provides a concise overview of the meeting objectives. Meeting specifics are delineated in Sect. 4.

Table 1. Meetings objectives.

Meeting	Objective
1	Introduction of music therapy program with Emobook
2	Presentation of minute-by-minute timeline and assessment scales
3	Sharing results from literature review on emotional assessment scales
4	Integration of Emobook into intervention timeline
5	Discussion of configured Emobook post-prototype

3.5 Strategic Meeting Design and Evaluation

Each meeting was strategically designed to build upon the outcomes of the previous one. This deliberate sequencing aimed to facilitate the seamless integration of idea generation and the formulation of action plans, enabling well-informed decision-making for the successful Emobook integration within the music therapy program. To assess the

effectiveness of our PD process, we considered several critical factors: the quantity and quality of ideas generated, their alignment with the defined lines of action, and their overall influence on shaping the new Emobook prototype.

4 Results

In this section, we focus mainly on presenting the outcomes of each meeting that followed the PD process. Moreover, we also present the process evaluation (Sect. 4.2).

4.1 Participatory Design Process

Meeting 1

Introduction. The music therapist outlined the program's objectives and components, designed under the AMMT technique, which includes the detailed clinical protocol [8]. Additionally, she clarified that the implementation would take place within a group setting, involving three older adults living with dementia, with a specific emphasis on social interaction outcomes [6]. The research assistant provided details about the institutional context.

Brainstorming. The technologists asked questions about the music therapist's presentation, the technique, and the processes involved. They also requested a copy of the protocol involved. They were interested in understanding the different stages of the session.

Action Plan. For the next working meeting, the music therapist should develop a minute-by-minute timeline of the intervention and state: what questions will be asked to the patients, when measures will be taken, and what instruments will be used (LA1).

Meeting 2

Introduction. The music therapist presented a minute-by-minute timeline in accordance with the clinical protocol, ensuring precise data correlation to meet the technical team's requirement for a comprehensive schedule. Subsequently, the technologists explained how to choose and preset the emotional assessment scales included in the app [2]. The data collection architecture of the application was elucidated, focusing on how Emobook facilitates the organization of memories, incorporating pictures or videos, into themes/chapters. This feature includes the ability to attach audio to each memory, intending to construct the life story of an individual user through these curated chapters.

Idea Generation. After listening to the clinical and technical explanations, the team came up with an idea to adapt Emobook, since the modality would be in a group of three participants. The first idea generated was: to group individual profiles into groups of three (IG1). Given the group setting, the chapters will encompass shared memories, featuring a combination of individual and group experiences.

Action Plan. Since the application allows selecting between different scales to assess emotions, it was considered necessary to carry out a literature review to find out which scales are most convenient for each moment and why. To undertake this endeavor, the music therapist and the assistant were tasked with a concise umbrella review, guided

by the technical team members. This approach, distinct from a systematic review, was initiated based on the technical team members providing pertinent literature relevant to the subject. The line of action derived from this meeting was: to carry out a literature review of the emotional assessment scales included in the application to analyze which ones should be used and when (LA2).

Meeting 3

Introduction. The umbrella literature review uncovered various mood meters, ranging from simple like/dislike models to more intricate frameworks such as Plutchik's 8 basic emotions and Desmet's Pick-a-Mood to the Dementia Mood Picture Test [10–12]. It is worth noting that a preceding study that utilized Emobook supported the use of simplified mood meters for the precise capture of responses from individuals with dementia through direct questioning [2]. Moreover, therapists engaged in that study suggested incorporating a secondary mood meter to encompass a broader spectrum of emotions, thereby enhancing the emotional assessment process [2]. In response to this recommendation and the literature review, the music therapist proposed integrating a secondary mood meter for comprehensive emotion assessment.

Idea Generation. It was determined that the Ekman Scale would serve as the primary mood meter, employed each time a multimedia file was utilized to evoke a memory. This selection is based on its simplicity, as it offers fewer options compared to the other mood meters included in the app. Conversely, the Pick a Mood scale was suggested as the Secondary Mood Meter at the beginning of each session through the question "How are you feeling today?" to evaluate the mood before the intervention. The Pick a Mood User Manual advises that "given the relative stability of mood, it is advisable to inquire about it no more than twice around the event of interest" [10]. It also emphasizes that reporting moods immediately after an emotional event, such as a social interaction, may lead individuals to express their feelings about that anticipated event rather than their current mood [10]. Therefore, the idea generated in this meeting was to incorporate two emotional assessment scales into the music therapy program (IG2).

Action Plan. Consequently, for the next meeting, the action line involved creating a new timeline incorporating the use of Emobook, taking into consideration each of the moments of the meetings and the use of the assessment scales included in the app (LA3).

Meeting 4

Introduction. The music therapist presented the intervention timeline with Emobook integrated as a tool. In the second part of this meeting, the technologists showed how a smartwatch with a built-in scale would work to assess the emotional responses of people with dementia. Such a smartwatch interface suffers from touch overshooting and divided attention as the user has to look down the wrist for longer and maintain the arm in an inconvenient position. Further, unlike the tablet, the smartwatch would not allow the multimedia material to be manipulated, it would only incorporate the emotional assessment scale.

Idea Generation. Following a constructive exchange of viewpoints and a thorough review of the intervention timeline, a consensus emerged. It was collectively decided

that equipping both the music therapist and the assistant with tablets featuring the new Emobook prototype was the optimal choice. The primary rationale behind this decision was to ensure that the assistant also had access to the application and an updated data backup, enhancing the overall effectiveness of the intervention. Therefore, the idea generated was related to the device selection: to use two tablets featuring the Emobook post-prototype for the music therapy pilot program (IG3).

Action Plan. One of the technologists commented that it would be convenient to have at least one additional measurement instrument or tool for more objectivity regarding the data collected. The music therapist recalled that the data could also be correlated with a music therapy assessment tool that would be used. The line of action derived from this proposal was to determine how the validated music therapy assessment tools complement the records obtained through Emobook (LA4).

Meeting 5

Introduction. Concerning the line of action that emerged in the previous meeting, the music therapist presented MiDAS [13], a validated music therapy tool developed to measure the observable musical engagement of persons with moderate or advanced dementia who may have limited verbal skills to directly communicate their musical experiences. "MiDAS focuses on capturing what people with dementia value in music (the "enjoyment")" [13] using a Visual Analogue Scale (VAS). It also allows qualitative data to be recorded.

Idea Generation. After the music therapist's presentation, it was decided that it would be positive to correlate the data obtained through the Emobook application with those obtained from the MiDAS assessment toolkit (IG4). Especially, considering that it allows qualitative data to be recorded, a relevant aspect facing the challenges and limitations of quantifying significant emotional experiences. In this sense, this assessment tool is adequately complemented by the scales incorporated in Emobook.

Action Plan. Finally, the technologists delivered the configured equipment with Emobook post-prototype. They explained that they configured the package to be updatable without deleting data, although previous tests must be carried out by creating three profiles. At the end of this meeting, the process was concluded with a post-prototype of Emobook ready to be tested by the music therapist before the start of the pilot program.

4.2 Process Evaluation

The results of the PD process include the generation of four ideas and four lines of action. The iterative condition of the process was reflected in the concatenation of LA and IG, as shown the Fig. 1.

As the work meetings progressed, several enhancements were identified for Emobook, including: (1) the development of a detailed schedule to ensure precise correlation of intervention-related data, (2) the addition of a secondary mood meter to enhance emotion registration, (3) the decision to correlate data with MiDAS Assessment Toolkit, (4) the configuration of Emobook Post-Prototype for group testing.

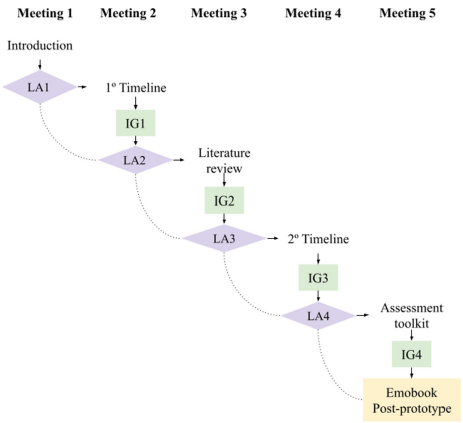

Fig. 1. PD process flowchart: lines of action (LA) and ideas generated (IG) achieved.

These enhancements collectively contribute to the integration of Emobook in a music therapy pilot program.

5 Conclusions and Future Work

The interdisciplinary collaboration in the participatory design (PD) process proved fruitful, leading to valuable adjustments in the Emobook post-prototype and its integration into reminiscence-focused music therapy programs. The collaborative process accelerated the assimilation of technological competencies, yielding knowledge seamlessly integrated into music therapy practice. Despite significant progress, the study emphasizes the need for further exploration, acknowledging the limited scope in connecting the experience with existing music therapy (MT) or technology literature. Challenges in literature research were acknowledged due to several unknown topics, influencing study decisions, highlighting the scarcity of scientific literature on the specific subjects in the initial review. Nevertheless, the study contributes valuable insights to the intersection of music therapy and technology.

The next phase involves initiating a pilot study to assess the viability of the new Emobook version, monitoring mood effects during and after the intervention, evaluating persistence, and determining the need for continued treatment. Additionally, assessing therapist acceptance, especially for this version in music therapy, is a key objective. The approved protocol for evaluating Emobook's efficacy in Music Therapy for older adults living with dementia has received Ethics Committee approval from the University of Santiago de Compostela (USC53/2023, December). The protocol ensures adherence to rigorous ethical standards. Integrating a qualitative research approach into the design and content analysis of life story books in reminiscence-focused music therapy settings will provide a deeper understanding. Advanced tools like NVIVO or ATLAS.ti will be employed for meticulous qualitative data analysis, enhancing the depth and reliability of findings.

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