

Advancing reminiscence therapy through virtual reality application to promote social connectedness of persons with dementia

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INTRODUCTION

Reminiscence Therapy (RT) is a multi-sensory treatment that uses the combination of sight, touch, taste, smell and sound to help persons with dementia (PWD) remember events, people and places from their past lives [1]. It involves the discussion of past activities, events and experiences with another person or group of people, usually with the aid of tangible prompts such as photographs, household and other familiar items from the past, music and archive sound recordings [2]. In many cases, recent memories deteriorate first for the PWD while their personal identity can slip away as cognitive abilities decline. However, even as individuals begin to lose touch with current events, PWD may hold onto cherished memories. As part of the reminiscence therapy, caregivers may use objects in various activities to help PWD with recall of memories. Reminiscence therapy is commonly conducted employing simple and advanced techniques with the ultimate goal of bring memories from the distant past into present awareness [2]. A simple technique can use conversation to trigger memories [3], while advanced ones make use of strong bonds with diverse media such as pictures, video and audio including favorite songs, and treasured objects to recall personal histories [4]. Independently of the approach, research has revealed that the patient exposure to the chosen materials through storytelling associated to past events can help PWD feel less socially isolated and more connected to the present [5].

Reminiscence therapy is an important evidence-based intervention for PWD as it improves their well-being by providing relief from boredom and symptoms of depression while reducing agitation and maintaining personal identity [6]. Recent literature suggests that technology can enrich traditional reminiscence therapy, foster therapeutic conversations, and support positive interactions between caregivers and PWD [7]. Specifically, exposing people with dementia to virtual reality environments has shown positive benefits for PWD where the new stimulation provided by the virtual reality tours helped them tap into old memories [8]. For instance, recalling buried memories gave PWD positive mental stimulation and helped the caregivers learn more about their lives in the past, which in turn can improve the social interactions between the caregivers and their patients by achieving greater empathetic understanding [9]. As virtual reality hardware and applications continue to advance, our proposed research envisions that the computer-generated environments could enrich the traditional reminiscence therapy by providing customized immersive experiences for the PWD. Moreover, virtual engaging scenarios can transport PWDs to diverse locations including their homes, favorite places or visited points that are relevant and meaningful, under safe, controlled and supervised environments to mitigate their risk of wandering behaviors [10].

Our project aims at developing an innovative, non-traditional framework prototype to improve the implementation of reminiscence therapy for PWD through customizable, immersive, interactive virtual reality (VR) application. The purpose of our study is to understand the effects of virtual reality over traditional forms of reminiscence therapy to help PWD recall memories from the past into present awareness.

METHODS

Our proposed study is an interdisciplinary collaboration between the researchers from Ontario Tech University and healthcare professionals in the Geriatric Dementia Unit (GDU) at Ontario Shores Centre for Mental Health Sciences in Ontario, Canada. We propose a framework for creating immersive and interactive VR experiences to facilitate the dementia care and management of Behavioural and Psychological Symptoms of Dementia (BPSD). A framework approach is chosen as it can empower caregivers, including recreational therapists or family members, to customize the reminiscence experiences by enhancing the computer-generated content with multimedia resources, storytelling evoking places of happiness, meaningful interactions, and engagement in safe simulated platforms. The framework will be modular and will support immersive VR using stand-alone head mounted displays to provide users freedom of movement unconstrained from tethered VR devices. At the same time, non-immersive VR will be developed using monitors, television, or projectors to visualize and engage with the content without the need of wearing any device. In conjunction with natural user interfaces, the virtual experience will provide ease of use and accessibility considering the variability of patients in the proposed GDU. Among the system modules, we propose the following unique features of our innovations:

1. User interface module that supports diverse input methods
2. Seated, standing, and room scale VR interactions that can take advantage of diverse forms of reminiscence therapy
3. Data analytics from non-invasive physical (e.g., data from input devices such as completion time, gestures, button presses, camera focus, number of clicks, efficiency and effectiveness of interactions), as well as physiological measures (e.g., facial and eye tracking) to provide quantifiable metrics for the therapists to assess PWD's physiological behaviours and psychological state when interacting with the reminiscence tool
4. Game system defining elements such as rules, goals, rewards, story
5. Template for creating and editing of interactive experiences importing multimedia (e.g. pictures/360 pictures, videos/360 videos/ audio files) related to hotspots triggers.

Phase 1- Scalability Assessment

Scalability phase will include assessment of user needs, co-design and expectations regarding the development of immersive, interactive virtual reminiscence experiences to facilitate the caregiving and management of BPSD. In-depth interview and focus groups will be conducted with 5-7 PWD and their caregivers in GDU respectively. Interview and focus groups will emphasize on identifying factors that need to be included in the customization of virtual reminiscence experiences (ie. computer-generated content with multimedia resources, storytelling, meaningful interactions, and engagement in simulated platforms).

Phase 2- Prototype Development

Using Human Computer Interaction and Human-Centered Design principles [11, 12], the prototype of the virtual reminiscence therapy for PWD will be developed. This phase will involve the co-design by gathering of artifacts, prompts and components of the therapy from 5-7 PWD and their caregivers to determine the framework for accessibility, inclusion and multicultural features. The framework development will be based on feedback from the focus group session in GDU, and translated into immersive, interactive and engaging reminiscence therapy experiences for PWD.

Phase 3- Usability Testing and Evaluation

Usability testing and evaluation of the prototype will be conducted with 5-7 PWD and their caregivers (i.e. recreational therapists or family members) in the GDU. The goal is to evaluate the safety, appropriateness, acceptability, feasibility and effectiveness of the virtual reminiscence intervention. Non-invasive data analytics based on user interactions and physiological measures, including facial and eye tracking, will be used to provide quantifiable metrics for the evaluation of the technological innovation to assess the effects of virtual reality on reminiscence therapy. This will be facilitated by review of the video recordings of the usability testing. Comparison of the frequency of responsive incident behaviours and medication use to support responsive behaviours pre and post the intervention will provide details as to the effectiveness of this non-pharmacological intervention.

ANTICIPATED OUTCOME:

Our proposed research will support the development, implementation and evaluation of virtual reminiscence intervention for PWD, in collaboration with the front-line care providers at GDU in Ontario Shores and researchers in Ontario Tech University. Our project is expected to achieve the following goals of developing a new and emerging technology for older adults: (1) To develop experiential learning experiences for PWD through the enrichment of reminiscence therapy using immersive and interactive VR applications; (2) To integrate the use of VR technology to improve the effectiveness of reminiscence therapy with the aim of promoting the quality of dementia care in GDU; and (3) To realize the technological innovation using knowledge co-creation principles to engage PWD and their caregivers with diverse background, while building research capacity throughout the development, implementation and evaluation of our project.

The anticipated outcome of our project is to facilitate the complementary utilization of pharmacological and non-pharmacological interventions for dementia care in GDU. Specifically, our project will aim at adopting a proactive approach to optimizing the increased utilization of reminiscence intervention as an evidence-based, non-pharmacological measure to promote PWD's social connectedness. PWD's symptoms of dementia, including agitation, aggression, restlessness, lability, exit-seeking and impulsivity, can be triggered by the sense of boredom associated with loneliness, depression and social isolation [13]. The strong bond to familiar people and

places is the essence of reminiscence therapy which helps support PWD to recall their personal histories. Reminiscing about memories can positively impact GDU patients by instilling increased self-confidence in their capabilities, becoming self-aware of their own strengths, as well as providing PWD with the opportunity to explore with their caregivers about what holds meaning for them [14]. At the present, mostly conventional, analog media is being used for reminiscence intervention [1]. Enriching the traditional form of reminiscence therapy with VR can empower the caregivers in GDU to customize the virtual reminiscence experiences, which is expected to help PWD with maintaining and preserving their personal identity during disease progression and challenging circumstances associated with BPSD. The positive mental stimulation associated with virtual reminiscence experiences will have the potential to improve PWD's quality of life and recovery trajectory by promoting their increased sense of social connectedness, which is anticipated to have a direct impact on facilitating safe and seamless transition of care from GDU to long-term care facilities in the future.

CONCLUSION:

Engaging PWD to virtual reality environments can help them recall memories that can reduce their risk of social isolation and enable them to become more connected to the present [14]. Ultimately, we anticipate that our technological innovation holds the potential for improving PWD's interactions with caregivers, as well as developing their positive sense of wellbeing and social connectedness while reducing stress and agitation.

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