“I’ve got the music in me!” - The theory and practice of using music in reminiscence therapy.

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Abstract

Reminiscence therapy is the review and examination of past experiences to improve current mood and psychological functioning, and is an evidence-based treatment for symptoms of late life psychological distress. Music is sometimes used in such therapy to prompt or enhance the recollection of memories of personal experiences; however, there are no theoretical frameworks and there is only limited empirical research on the use, value, and mechanisms of using music in reminiscence therapy. The current project advanced a theoretical model for using music in reminiscence therapy, followed by an examination of the use, feasibility, and neurological mechanisms of music-assisted reminiscence therapy.

This dissertation examined how music can be incorporated in reminiscence therapy, the feasibility of incorporating music in such therapy, and the underlying neurological mechanisms of music-assisted reminiscence therapy for improving psychological distress in older adults across four papers. The first paper involved a narrative review of the empirical literature of music and reminiscence. The paper proposed a theoretical model of the role of music in reminiscence therapy. It proposed that music helps summon autobiographical memories, elicits physiological responses, evokes emotional reactions and pleasure, and defines and describes self-identity and social connectedness. The second paper surveyed 110 Australian workers and volunteers in aged care to explore how music was incorporated into reminiscence activities with older adults. Together, papers 1 and 2 provide a theoretical and empirical overview of the purpose and practices of incorporating music in reminiscence therapy.

The third paper examined if music-assisted reminiscence therapy was a feasible and acceptable intervention for older adults experiencing psychological distress. It also explored how music could be integrated with mastery-related memories in reminiscence therapy. This paper examined patterns of changes in affect and the characteristics of recalled memories for

eight participants randomly assigned to a single session of either verbal reminiscence therapy, or music-assisted reminiscence therapy. The study employed between-subjects mixed methodology design involving quantitative and qualitative data, such as self-report measures and a brief semi-structured interview. Treatment adherence, fidelity, and completion rates were also recorded. Music-assisted reminiscence therapy was observed to be practical, well tolerated, and associated with positive experiences for individual participants.

The final paper explored the neurological activity and changes associated with verbal reminiscence therapy or music-assisted reminiscence therapy for 4 older adults who were experiencing psychological distress. Neurological activity was measured with electroencephalogram for a subset of participants from the third paper. Findings suggested that reminiscence with music is associated with increased and lateralised neurological activation, particularly in frontal and central areas, compared to reminiscence without music. These areas are associated with emotional regulation and meditative states, indicating this may be the underlying mechanism for how music enhances reminiscence therapy.

As the population ages, addressing the wellbeing needs of older adult populations will need creative and evidence-based treatments to meet growing need. This dissertation provided initial evidence to suggest that reminiscence therapy with and without music are widely used, successful, and well-tolerated interventions with older people experiencing psychological distress and in aged care in Australia. Findings suggested that music-assisted reminiscence therapy may provide benefits beyond that of reminiscence therapy without music. Reminiscence therapy, and especially music-assisted reminiscence therapy offer opportunities to recognise the whole person, their rich history, successes, and strengths in the context of meaningful social connection, and therefore can support the wellbeing of older people as they navigate mental health challenges.

Declaration

I, the candidate, declare that this thesis:

- Contains no material which has been accepted by me for the award of any other degree at any other university or equivalent institution;
- To the best of my knowledge, contains no material previously published or written by another person except where appropriate reference is made in the thesis; and,
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28/02/2022

Personal note

Conducting research during 2020-2022 has been challenging. Professor Christine Critchley was a supervisor on this project who assisted in the planning and checking of statistical analysis of the experimental studies, particularly the mixed-method descriptive study, which formed the second paper of this project. However, in November 2020, Professor Critchley died. This loss was felt throughout the department and was personally saddening. The analysis and publication of data were delayed due to the loss of Professor Critchley

The COVID-19 pandemic has caused significant disruptions to the experimental design, access to resources such as equipment, data collection methods, analysis software, and recruitment of participants. Such disruptions have delayed progress on studies and publications related to these studies. The original plan for this dissertation was to explore the effects of including music in reminiscence therapy compared to reminiscence alone and a control condition. This project was intended to include a randomised controlled trial (RCT) involving 64 older people who were experiencing psychological distress. Data collection was ceased for this RCT in March 2020 due to the cessation of all face-to-face research activity on campus, in aged care facilities and retirement villages. Such data collection sites were closed to visitors and researchers for an extended period in 2020 and 2021. Recruitment of participants was stopped during these periods.

We attempted to adapt the project to incorporate telehealth modalities, however, it was deemed that this modality would not allow us to effectively test music-based interventions. A total of 10 participants had completed the RCT prior to the pandemic, two of which were in the control condition. Study 3, originally planned as a RCT, was therefore adapted to a feasibility and acceptability pilot trial to investigate participant experiences in using music-assisted reminiscence therapy. Study 4 was adapted to examine individual differences in neurological mechanisms of music-assisted reminiscence therapy over a number of cases.

Acknowledgments

First and foremost, my sincerest thanks and deepest appreciation to my principal supervisor Professor Sunil Bhar for his endless support and encouragement – he managed to stay even keeled and calm during a lot of upheaval and was incredibly responsive and helpful. He is exceptionally hard working and his passion and knowledge for working with older people is inspiring, and one of the reasons I chose to complete my studies at Swinburne University. These are just some of the qualities that have made him a truly excellent mentor and supervisor. Thank you for helping to guide me along the journey and setting me up for a career in something I love.

My deepfelt thanks must also go to my second supervisor and neuro-imaging extraordinaire - Associate professor Joseph Ciorciari. Joe's encouragement, support and belief in me was pivotal in accomplishing a lot of these tasks, particularly the neuroimaging component. Thank you SO much for being so good humoured, patient and teaching me so much! I would also like to acknowledge and thank my associate supervisor, Christine Critchley, who dedicated her time and energy to help me make sense of statistics – not an easy feat! She will be sorely missed. Thank you to my panel members, past and present, for their guidance and warm encouragement.

There are several others without whom this project would not have been possible. My family – Dr Cappy Engelbrecht, Johan Engelbrecht, Shilo Engelbrecht, Sailor Canac, and Arnold – who have supported me in every way possible during my life and this project. Thank you for encouraging in me a curiosity to seek knowledge, compassion to help others, and the perseverance to see this mammoth task done. Thank you to all my friends who kept me sane through this journey, particularly Jennifer Stargatt, Chantelle, and Rodney Pollak. Special mention to my partner Darren Mulder for reminding me why I am doing this, helping me to rediscover my sense of adventure, and bringing me joy during some of the darker times. Thank you to my project volunteers: Ben Slade, Jen Stargatt, Andrew Tomney and John Fallon, and my fellow PhD students who provided excellent peer support during this time.

Finally, thanks to the individuals who shared their experiences with me in this pursuit of knowledge – the older people and staff who care for them. This work is dedicated to them.

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Presentations

The role of music in reminiscence therapy presented online at the World Congress of Music Therapy, June 2020.

Publications

Engelbrecht, R., Bhar, S. & Ciorciari, J. (2021). Planting the SEED: A model to describe the functions of music in reminiscence therapy. *Complementary Therapies in Clinical Practice, 44*.

Engelbrecht, R., Bhar, S. & Ciorciari, J. (2022). Music-assisted reminiscence therapy with older adults: feasibility, acceptability, and outcomes. *Music Therapy Perspectives, miac021* https://doi.org/10.1093/mtp/miac021

Manuscripts under review

Engelbrecht, R., Bhar, S., Shoemark. H., Elphinstone, B., Ciorciari, J., & Critchley, C (2021). *Reminiscence therapy and music with older adults: A mixed-method descriptive study investigating the current views and practices of Australian aged care workers and volunteers.* [Manuscript submitted for publication to *PLoSONE*].

Engelbrecht, R., Ciorciari, J, & Bhar, S. (2021). *Cognitive processes in reminiscence therapy with and without music: Four case studies comparing the neural effects for older people with psychological distress.* [Manuscript submitted for publication to *Frontiers in Human Neuroscience*.]

Awards

Early career excellence in research award for presentations at the World Congress of Music Therapy, June, 2020.

List of abbreviations

RT	Reminiscence therapy, including all typologies and with any tools or prompts.
MRT	Music-assisted reminiscence therapy, defined as the use of reminiscence with the inclusion of live or recorded music, or music as a discussion topic.
VRT	Verbally-delivered reminiscence therapy, specifically not involving music.
MEQ-SF	Memory experience Questionnaire – short form
MT	Music Therapy
PANAS	Positive And Negative Affect Scale
PAS	Positive Affect Scale, a subset of the PANAS
NAS	Negative Affect Scale, a subset of the PANAS
K10	Kessler Psychological Distress scale
SEED	Acronym for the proposed model outlining the 4 functions of music in reminiscence therapy.
ROME	Reminiscence Of Mastery Experiences protocol
sLORETA	Standardised low resolution brain electromagnetic tomography

Chapter 1. Introduction

1.1 Background

The number of older adults has been increasing over the last few decades in Australia and globally (Australian Bureau of Statistics [ABS], 2018). There are more older adults today than ever before (ABS, 2018), by 2066 the proportion of older adults in Australia is projected to be up to 23% (ABS, 2018). Given the ageing population, the wellbeing and mental health of older adults is an important focus of research. Poor mental health has been associated with detrimental consequences on physical health, functional capacity, cognitive function, and life expectancy (Brummett et al., 2001). Older adults are at risk of developing psychological distress (i.e., symptoms of anxiety and depression) as they are more likely to experience a range of losses, periods of isolation, changes to living arrangements, retirement and changes to social roles, and declining physical health (Australian Institute of Health and Welfare[AIHW], 2015; Moult et al., 2020; Rickwood, 2005).

Reminiscence therapy is an evidence-based treatment for late life depressive symptoms, and has been associated with improvements in cognitive function, loneliness, happiness, and wellbeing for older people (Bohlmeijer et al., 2007; Chaing et al., 2010; Chin, 2007). While music is often involved in reminiscence therapy, little is known about how music is used or works in this context. Specifically, we do not know what purpose music serves, how it works to enhance the experience when combined with reminiscence therapy, or how music and reminiscence therapy are being used in practice. This project explores the theory and practice of using music in reminiscence therapy.

1.2 Dissertation overview

To date, little research has explored the theory and practice of using music in reminiscence therapy to improve wellbeing for older people. The specific aims of this dissertation were to 1) explore how music enhances reminiscence therapy, and 2) investigate

the current practices and applications of this therapeutic modality with older adults. To address these aims, four research questions were posed and addressed over four papers contained within the dissertation (see Figure 1). This dissertation explored the theory, purpose, and application of music in reminiscence therapy with older adults. The research questions and four papers are presented below.

Figure 1.

Dissertation research questions

Theory	1. How does music enhance reminiscence therapy? *(paper 1)*
	2. What are the neurological mechanisms by which music enhances the effects of reminiscence therapy for older adults with psychological distress? *(paper 4)*
Practice	3. How is reminiscence therapy and music in reminiscence therapy currently being used with older people in clinical practice in Australia? *(paper 2)* a. To what extent is reminiscence therapy and music-assisted reminiscence therapy being used by the workforce? b. Which types of reminiscence therapy are being used? c. How are these interventions delivered? d. What are the perceptions of the situations, topics, and outcomes of reminiscence therapy and music-assisted reminiscence therapy?
	4. How feasible is it to integrate music with reminiscence therapy for older people with psychological distress? *(paper 3)*

The first paper explored existing theory and research on the use of music in reminiscence therapy through a critical narrative review, culminating in a theoretical model explaining the functions of music when used in reminiscence therapy. This paper used a clear search strategy approach to identify relevant literature across disciplines. It proposed that music has four functions when used to enhance reminiscence therapy: Music 1) summons autobiographical memories, 2) evokes emotional reactions and pleasure, 3) elicits

physiological responses, and 4) defines and communicates social relatedness and identity. This theoretical model addressed the first research question and provided a theoretical background on how music enhances reminiscence therapy.

The second paper surveyed the way in which music is used in combination with reminiscence activities by aged care workers and volunteers in Australia. A sample of 110 volunteer and paid health professionals who worked directly with older adults completed a survey on their views and use of reminiscence therapy with and without music. This paper examined the extent to which reminiscence interventions were used, the types of reminiscence and delivery methods, and perceptions of the situations in which these strategies were used, the topics raised in reminiscence, and outcomes of using these strategies. The results of the paper suggested that verbal reminiscence therapy (i.e., reminiscence delivered verbally without music), and music-assisted reminiscence therapy (i.e., reminiscence therapy with the addition of live or recorded music, or music as a discussion topic) were widely used interventions that typically occurred spontaneously, across both individual and group modalities. Simple reminiscence therapy (i.e., thematic discussions of memories) was the most used type of reminiscence therapy, and the most common purposes were to facilitate social engagement and to validate identity. Participants identified positive outcomes with both verbal and music-assisted reminiscence therapy, including better care practices, improved mood and affect, and improved social connections. Music-assisted reminiscence therapy was often used as a compensatory strategy when verbal methods were not possible or appropriate. This paper provided insight into the current 'treatment as usual' practises for these interventions.

In the third paper, a single session of reminiscence therapy with or without music was evaluated using a mixed method approach to determine acceptability and feasibility of these interventions, as well as to explore how music could be integrated within reminiscence

therapy. Eight older adults who were experiencing psychological distress were randomly allocated to a single individual reminiscence therapy session with or without music. Participants completed pre and post affect measures, a measure of memory experiences (i.e., vividness), and a brief semi structured interview. Recordings of the sessions were evaluated for treatment fidelity and adherence. Results of this study suggested that both interventions were well tolerated and resulted in positive experiences for the participants. Flexibility was needed when applying reminiscence therapy questions. Verbal and music-assisted reminiscence therapy were found to be feasible and acceptable interventions for this sample.

The fourth paper explored the neurological changes associated with music-assisted reminiscence therapy using electroencephalogram. Recordings were obtained from four participants during a single session of reminiscence therapy with or without music. The results of this study suggested that both verbal and music-assisted reminiscence therapy resulted in widespread and lateralised activation. These activations were stronger for music-assisted reminiscence than for verbal reminiscence, particularly in the central and frontal areas. Participants who received music-assisted reminiscence demonstrated activation in areas associated with emotional regulation and meditation. This paper addresses the fourth research question and provided knowledge on the underlying neurological mechanisms by which music may enhance reminiscence therapy.

This dissertation provided a theoretical framework for, and exploratory analysis of, the functions and importance of music in reminiscence therapy, and examined the underlying neurological mechanisms of music-assisted reminiscence therapy.

1.3 Dissertation structure

As this dissertation is centred on the capacity for music to enhance experiences, each following chapter (excluding those containing the papers) begins with a lyric taken from a song that relates to the topic of the chapter.

This dissertation begins with a literature review (Chapters 2 - 5) of existing theory and research relating to ageing, wellbeing, and using music in reminiscence therapy. Chapter 2 provides a background into theories and research on ageing, older adult population demographics, wellbeing, and psychological distress. Chapter 3 reviews models and existing research on the use of reminiscence therapy with older people. Chapter 4 introduces and reviews theory and literature on music therapy and music-assisted reminiscence therapy. Chapter 5 reviews the neurological process of memory, music, and reminiscence therapy.

Chapter 6 orients the reader to the overall research design, research questions and methodology. This method chapter is separated into two sections. The first section details the method information of the overall thesis, and the second details the methodology and research considerations of the papers.

Chapters 7 – 10 presents four papers, each written and submitted for publication in peer reviewed academic journals. Each paper presents a component of the research conducted during candidature, and when viewed collectively, function to address the research questions. Chapter 7 (Paper 1) comprises a critical narrative review of the literature on reminiscence, autobiographical recall, and music. This paper proposes an original model detailing the functions of music to enhance reminiscence therapy, and therefore provides a theoretical base for the purpose and use of music in reminiscence therapy. Chapter 8 (Paper 2) presents an empirical investigation of the views and practices from the aged care sector on the use of verbal and music-assisted reminiscence therapy with older adults. This chapter provides perspectives from those working and volunteering directly with older adults on how music is used to enhance reminiscence therapy. Chapter 9 (Paper 3) explores the use and application of music to enhance reminiscence of mastery experiences from the perspective of the older adult. This chapter investigates the acceptability, feasibility, and outcomes of verbal reminiscence therapy and two different protocols of music-assisted reminiscence with older

adults experiencing psychological distress. Chapter 10 (Paper 4) employs a single-subject approach to explore the neurological changes for older adults in response to a single session of verbal reminiscence therapy or music-assisted reminiscence therapy. This chapter uses neuroimaging to explore the effects of these interventions on areas of activation to improve our understanding of the neurological mechanisms of how music enhances reminiscence therapy.

Chapter 11 provides a discussion and summary of the research findings. In this final chapter, we provide a critical analysis of the findings, discuss the limitations and strengths of the research program, and propose directions for future research.

1.4 Dissertation style

This PhD is by Publication, in which a series of individual manuscripts were produced and brought together to form a cohesive document. Due to the nature of this process, repetition is inevitable across the dissertation and related papers. This dissertation is formatted in accordance with the American Psychological Association's 7th edition (APA 7), in British English. The content of the included manuscripts are reproduced as they were published or submitted for review, with only the style, abbreviations, and formatting altered for consistency across the dissertation. References for all chapters are combined into the reference list contained at the end of the document.

Chapter 2. Ageing, wellbeing and psychological distress

When I get older,

start losing my hair,

will you still be sending me a valentine,

birthday greetings, bottle of wine

If I'd been out till quarter to three

Would you lock the door

Will you still need me,

will you still feed me

When I'm sixty-four.

– *When I'm sixty-four* (Lennon & McCartney, 1967).

2.1 Chapter guide

This chapter introduces the key topics related to the dissertation. It defines the concept of 'older adults' and describes the population demographics in Australia, including a description of ageing. Then, it describes major theories regarding wellbeing in later life and examines the empirical support for the theories. It also summarises the literature on late life psychological distress, and what factors contribute towards the development of psychological distress for older people. This chapter therefore highlights key information in relation to the older adult population, which is defined as 65 years and over, and defines psychological distress as symptoms of anxiety and depression.

2.2 Defining older adults

There is no clear definition of old age. In western countries, older adult populations are typically defined as people aged 65 years and over, related to societal roles and social

customs such as retirement age, however, globally old age can begin at ages 40, 50 or above (Australia Bureau of Statistics [ABS], 2008; AIHW, 2018). The World Health Organisation (WHO) defines those who are 60 years and over as *older* (WHO, 2018), while the ABS uses 65 years and over as its age classification system for older people (ABS, 2018).

Diversity in functioning is considered a hallmark of the older population. Assuming an *older adult* is someone 65 years and over, this ageing category encompasses an age range of over thirty years (e.g. 65 –100+) and therefore this population can represent a diverse cohort due to the varied life changes, health needs, and frailty experienced over these years (Singh & Bajorek, 2014). Further classification systems that delineate this category into subgroups based on age alone (e.g. young-old 65-74, old-old 75-84 and oldest-old 85+) have been proposed to obtain greater heterogeneity in this cohort. However, age alone does not predict individual differences in life expectancy or physical capacity, resulting in little consensus for specific cut off points for subclassifications of older people based on age (WHO, 2015). In 2015, the European Union funded the five year 'Ageing Trajectories of Health: Longitudinal Opportunities and Synergies' (ATHLOS) research program to compare large scale international research comprising over 340,000 individuals to define *older adults* (AGE Platform Europe, 2020). The latest findings from this project suggest that chronological age is not the best nor most inclusive method of classification for this period of life, instead, *old* should refer to a period of life based on the last 15 years of life expectancy, determined by other factors (AGE Platform Europe, 2020). The ATHLOS approach represents the future of ageing policy and classification, however, until these factors and a clear computation method to define *old* is available, this method is not currently possible for implementation at the individual researcher level. Furthermore, there exists ethical concerns in labelling a person as *old* based on life expectancy, as perceptions of time until death and prognostication have been associated with poorer mental health and wellbeing (Shrira et al.,

2014). For the purposes of this dissertation, older adult is defined as a person aged 65 years and over in accordance with the ABS.

2.3 What is ageing?

Ageing is a biological process that is only loosely related to chronological age, and is associated with the accumulation of cellular and molecular damage, ultimately leading to death (Lemoine, 2020; WHO, 2018). Ageing and its processes are not well understood or defined (Lemoine, 2020). Ageing is consistently associated with loss (e.g., damage or dysfunction) and can occur in the presence of disease, or as a normal process. Pathological ageing is often considered ageing that occurs in the context of comorbidities or advancing disease (Lemoine, 2020). Recent work by Lemoine (2020) reviewed the existing literature regarding the definition of ageing, collecting 5 defining aspects of ageing such as structural damage (e.g., a build-up of deleterious damage), functional decline (e.g., the progressive loss of function), depletion (e.g., loss or damage is not repaired), physical traits of ageing and their underlying causes (e.g., inflammation), and increasing probability of death. Lemoine (2020) also proposed a binary view of ageing – progressively moving between derogatory (i.e., promotion of ageing) and compensatory (i.e., protection from ageing) mechanisms. The balance of these strategies (i.e., compensatory vs derogatory) determines the rate at which organisms age. Understanding the normal and pathological courses of ageing is necessary when exploring the experiences, wellbeing, and healthy ageing for older adults, and how interventions can contribute towards the compensatory mechanisms for wellbeing.

2.4 The ageing population

Globally, we have an ageing population. Almost every country in the world is experiencing growth in the size and proportion of older people in their population (United Nations Department of Ecnomic and Social affairs [UN DESA], 2019). The number of people aged 65 and over in 2019 was one in 11, a figure expected to reach one in six by 2050

(UN DESA, 2019). On average, women's life expectancy is 4.8 years higher than men, and in 2050, its expected that women will comprise 54% of the older adult population globally (UN DESA, 2019).

In 2017, people aged 65 years and over made up 15% of Australia's population (ABS, 2018). By 2066, the proportion of older adults in Australia is projected to be between 21% and 23% (ABS, 2018), accounting for a significant percentage of the population. The growth of the older adult population has been attributed to two primary causes: The extension of life expectancy due to socioeconomic development and advances in medicine, and, the slowing birth rate which means that older populations are now outnumbering younger generations (WHO, 2015, 2018).

Life expectancy has been linked to socioeconomic status. Developed and wealthy nations have longer life expectancies and better health outcomes than poorer nations (WHO, 2015, 2018). While most people in developed nations are likely to live into their 60s, they are also at increased risk of developing multiple chronic health conditions or diseases (WHO, 2015, 2018). Large scale systematic reviews based in wealthy countries globally have demonstrated that over half of older people have two or more chronic health conditions (Garin et al., 2014; Marengoni et al., 2011; Wang et al., 2014; WHO, 2015). Interestingly, the health diversity in late life is not random, but due to genetic inheritance and environmental factors (AGE Platform Europe, 2020; WHO, 2018). Factors such as socioeconomic status, physical environment, gender, ethnicity, and social connectedness have been associated with life expectancy (WHO, 2018). These factors are related to health through directly influencing health outcomes or choices, and by indirectly changing opportunities and barriers.

Older adults have unique health and wellbeing challenges. Compared to younger adults, they are more likely to have physical health conditions and chronic pain, and are at an increased risk of dementia (WHO, 2015). Common health issues experienced by older adults

include hearing loss, visual impairments, physical pain and osteoarthritis, ischemic heart disease, cerebrovascular disease, chronic obstructive pulmonary disease (COPD), diabetes, depression or anxiety, and dementia (Sims, 1992). Older age is associated with emerging common multimorbid and complex health symptoms that do not fit into diagnosable conditions (Brown-O'hara, 2013). These symptoms include frailty, pressure ulcers, eating and sleeping disturbances, incontinence, falls, functional decline, and delirium (Brown-O'hara, 2013; Liang et al., 2018; Powers, 2019; Sims, 1992). These health challenges indicate that older adults have unique health and wellbeing needs that need to be considered when providing health services and designing treatments or interventions.

Globally, approximately 7% and 3.8% of older adults experience depression and anxiety respectively (WHO, 2017). In Australia, approximately 10-15% of older adults living in the community report experiencing poor mental health, and over half (52%) of those living in residential aged care settings have significant levels of anxiety and depression (AIHW, 2013, 2015; WHO, 2018, 2013). Likewise, older people who are carers for others (e.g., a spouse or family member) experience a higher prevalence of poor mental health (AIHW, 2015; Rickwood, 2005).

2.5 Wellbeing in older adults

Wellbeing is a complex and multidimensional concept, although it remains ill-defined (Dodge et al., 2012). Ryff (1989) defined wellbeing as a psychological construct involving autonomy, mastery, positive social relationships, purpose, self-acceptance, and realisation of potential. This model emphasises the balance between challenging and rewarding experiences (Ryff, 1989), and possibly reflects a more stable and enduring state of wellbeing.

Diener (1984) defined subjective wellbeing as perceived life satisfaction and happiness, measured through self-reported positive and negative affect, and evaluations of one's satisfaction with life. Subjective wellbeing differs based on the cognitive appraisals or

perceptions of one's own life and emotions (Diener, 1984), has been linked with optimism (Ferguson & Goodwin, 2010), and can be considered as a more fluid and changeable measure than Ryffs' (1989) model. Positive and negative affect have been extensively used as a measure of subjective wellbeing for adult and older adult populations (Humboldt et al., 2017). Research has demonstrated that positive and negative affective dimensions are independent constructs of subjective wellbeing (Kercher, 1992). Affect is a changeable state of perceived wellbeing and a useful measure in exploratory research. It is thought that both psychological (e.g. needs such as autonomy as in Ryffs' 1989 model) and subjective (e.g. appraisals of ones' life as in Dieners' 1984 model) wellbeing are both important determinant factors that contribute to an individuals overall wellbeing.

Wellbeing in older adults can be defined from the perspectives of self-determination theory (Baumeister & Leary, 1995), activity theory (Havighurst et al., 1963), social identity theory (Tajfel & Turner, 1979) and continuity theory (Atchley & Barusch, 2004). These approaches collectively propose that people hold innate psychological and emotional needs, including self-esteem, relatedness and autonomy, and continuation of social roles and participation in meaningful activities. The needs proposed by these theories of ageing, when met, can improve wellbeing and therefore, under Lemoine's (2020) framework of aging, would be considered as compensatory strategies.

Regardless of the definition and dimensions used, poor wellbeing has been shown to have negative consequences for physical health, lead to cognitive decline, and shorten life span (Brummett et al., 2001; Steptoe et al., 2013). Wellbeing has been associated bi-directionally with physical health, indicating that poor physical health predicts poor subjective wellbeing, and positive subjective wellbeing also plays a protective role for physical health (Steptoe et al., 2013). With social and mental health as important determinants for a high-quality of life (AIHW, 2018) effective and timely interventions that

can support older people with these determinants are needed in order to maintain or improve the wellbeing of this population.

2.6 Older adults and psychological distress

Psychological distress can be defined as unpleasant feelings or experiences related to a long list of depressive and anxiety symptoms, but remains distinct from clinically diagnosed conditions of depression and anxiety (Drapeau et al., 2012; Mirowsky & Ross, 2002). These symptoms include: sadness, feeling of hopelessness, emptiness, anhedonia (i.e., lack of pleasure), changes in appetite or weight, sleep disturbances or changes (e.g., insomnia or hypersomnia), fatigue, feelings of worthlessness, difficulty concentrating, suicidal ideation, excessive fear or worry, restlessness, irritability, or muscle tension (American Psychological Association, 2013). Psychological distress can therefore greatly impact on the quality of daily life.

2.7 Factors that contribute to psychological distress

Distress can result from negative life events or psychosocial factors (Taylor et al., 2018). Many factors can lead to the development of psychological distress for older people, including deteriorating physical health, negative health appraisals, ethnicity, losses, stressors, poor social supports, or periods of isolation (AIHW, 2015; Moult et al., 2020; Rickwood, 2005. Older adults are more likely to experience losses (e.g., to mobility, independence, or the death of friends and spouses), significant transitions in work roles or into retirement, and changes to living arrangements or transitions into care (AIHW, 2015; Moult et al., 2020; Rickwood, 2005), therefore, a large proportion of older adults are at risk of experiencing psychological distress.

Subjective age and perceived time until death directly contributes to the development of psychological distress. A study of 1078 Israeli Jewish older people evaluated the impact of subjective age (e.g., how old the person feels) and subjective time until death on

psychological distress, and found that younger subjective age and perceived furthest time till death predicted lower psychological distress (Shrira et al., 2014). This cross-sectional study provided insight into the psychological cost of perceived life expectancy, but does not allow for correlation between other important factors (e.g., social supports) nor the longitudinal outcomes for this sample and those who experience psychological distress (Shrira et al., 2014). Furthermore, the sample was limited to community-dwelling Israeli Jews, and those aged 50 and over, therefore limiting generalisations to other populations.

There is a cyclical relationship between negative health appraisals and psychological distress. Negative health perceptions predicted depression and anxiety symptoms for older people, while depression and anxiety symptoms (i.e., psychological distress) lead to poorer health appraisals (Cappeliez et al., 2004). A survey of 216 older people in Canada documented that psychological distress predicted current and future negative perceptions of health (Cappeliez et al., 2004). Negative health appraisals or perceptions of one's physical wellbeing therefore contributes to psychological distress.

Poor social supports and networks have also been associated with increased risk of developing psychological distress (Henning-Smith, 2016; Taylor et al., 2018). Older adults who live alone or with a non-spouse (e.g. others or family members) experience worse quality of life and psychological distress (Henning-Smith, 2016). A survey of 1439 older adults in America documented that perceived social isolation from friends and family was associated with more depressive symptoms, and isolation from friends was associated with greater psychological distress (Taylor et al., 2018). This cross-sectional study was limited in its ability to detect causality or direction of the differences due to the regression analysis completed, and longitudinal patterns of distress. Furthermore, the sample included a majority of community-dwelling African-Americans, Black Caribbean's, and a smaller number of non-Hispanic white people, and therefore the findings of this study are limited when

generalised to those living in care, or of different ethnicity, however, these results have been supported in subsequent studies. Child and colleagues (2020) demonstrated that for older adults, the presence of supportive networks, emergency helpers, and social companions was directly associated with lower psychological distress. The size, complexity and participation level of the social networks were not associated with changed distress (Child & Lawton, 2020). Furthermore, conflictual or strained social relationships with others were associated with higher rates of distress.

Ethnicity is another factor that can contribute to or modulate the risk of developing psychological distress for older people experiencing life stressors, loss, or pain. A survey of 311 community dwelling White and African American older adults living in the greater New York area documented the social supports, perceived mastery, and psychological distress for these ethnic groups (Morin & Midlarsky, 2016). Mastery was significantly related to lower psychological distress for both groups, indicating mastery as a protective factor, however, social support was positively related to psychological distress for the White Americans only (Morin & Midlarsky, 2016), indicating some differences in ethnic group samples. Further large-scale research (*N*= 226,478) in Australia demonstrated that patterns of social interaction can contribute to or protect against psychological distress, but this did not fully explain the ethnic differences in 19 minority groups, with rates of distress varying for some groups (Feng et al., 2013). A further longitudinal study conducted in America by Bierman & Lee (2018) investigated the extent to which ethnicity moderated the relationship between pain and psychological distress. The study found that severe pain was associated with greater risk of depression symptoms only for African American and Hispanic elders, but not for white older adults. Ethnicity can be related to beliefs regarding social connections, perceived life opportunities or challenges, and familial or religious roles and needs, perhaps explaining the

differences in psychological distress prevalence for different ethnic groups. Hence, predictors of psychological distress may be, to some extent, dependent on ethnic group membership.

With the emergence and global spread of the COVID-19 pandemic, it should also be noted the influence that health pandemics can have on the mental health of this population. Older adults are typically at greater risk of contracting COVID-19, developing a severe infection, and death (Mueller et al., 2020). Peri-traumatic distress is an adverse response to a traumatic experience, such as the stress, worry, and negative affective experiences as a result of a pandemic (Fadila et al., 2021). Recent work by Fadila and colleagues (2021) documented that 60% of older adults in Egypt reported mild to moderate levels of distress, and 30% reported severe levels of distress (Fadila et al., 2021). The proportion of older adults with mild to severe distress was significantly higher for those 70 years and over, in rural areas, who lived alone, with medical comorbidities, with poorer ratings of health, and who watched negative news (Fadila et al., 2021). These findings illustrate how crucial intervention and support services may be for populations at risk of developing psychological distress, such as older people who are isolated during stressful times such as pandemics. Identifying factors that contribute to the development of psychological distress can help to identify persons at risk, and can help drive and inform the interventions used to prevent the development of, and treat, such distress.

2.8 Existing strategies to manage psychological distress with older adults

Recently Moult and colleagues (2020) interviewed 18 older adults living in England who were experiencing distress to determine how primary care services were being used to support this population. Participants consistently reported that various losses, including loss of partners, independence, and mobility were the major causes of their distress (Moult et al., 2020). They reported self-managing their distress through a variety of strategies, including recognising their distress, seeking social support through existing or new networks (e.g.,

church), engaging in independent activities (e.g., gardening), accessing community resources, and finally through visiting their primary care providers. Participants stated the primary care services were lacking in resources and appropriate treatment options (Moult et al., 2020).

Older adults tend to access less psychological supports. The greatest barriers for older adults with anxiety or mood disorders to access mental health services were: the belief that their symptoms were normal, the cost associated with treatment, and fear of medication (Wuthrich & Frei, 2015). Older adults often decline to access psychological therapy (Chaplin et al., 2015) due to the stigma associated with such therapy (Moult et al., 2020). Despite the under representation of older adults in accessing mental health services, recent and large-scale research has suggested that older adults experience better outcomes from psychological support, compared to working aged people (Saunders et al., 2021).

Existing approaches to managing psychological distress for older people include the use of medication or psychotherapy to address the causing factors and symptomology. Pharmacological treatment involves the prescribing of medications to treat symptoms of distress. Acknowledging that this population experience more chronic health conditions, they are often prescribed multiple medications (Wastesson et al., 2018). On average, older adults use 4.6 medications per day (Morin et al., 2018) leading to increased risks of side effects, or adverse drug reactions. Psychological or talking therapy is a non-pharmacological treatment option that does not rely on medication, with some authors arguing that psychological therapy treatment options should be prioritised due to the overmedication of older people (Morin et al., 2018).

Several different psychological therapy approaches have been researched and used successfully to address later life psychological distress. Cognitive behavioural therapy (CBT) is a time-limited and structured therapy that involves altering beliefs and behaviours that maintain psychopathology, such as anxiety and depression (Beck, 2011). CBT has

substantive evidence demonstrating that is an effective intervention for later-life depression and anxiety (Ayers et al., 2007; Beyond Blue, 2016; Frazer et al., 2005; Kropf & Cummings, 2017; Scogin et al., 2005). However, this therapy is time intensive, can be costly, and requires delivery from a trained therapist and extensive homework tasks for the client to complete. Other therapy approaches such as interpersonal therapy (i.e., focused on relationships) and problem-solving therapy (i.e., focused on teaching problem solving skills) have also been found to be effective (Frazer et al., 2005; Scogin et al., 2005). Reminiscence therapy is considered an evidence-based intervention for later-life depression (Frazer et al., 2005; Scogin et al., 2005), and anxiety when included as part of a CBT program (Ayers et al., 2007).

2.9 Summary

This chapter reviewed and described older adults and ageing. Furthermore, theory and research on wellbeing were explored, and delineated into both psychological (i.e., stable and based on psychological needs) and subjective (i.e., more changing based on interpretation of one's life) dimensions that collectively contribute to wellbeing. Psychological distress was introduced, and the contributing factors were reviewed. The existing strategies to treat psychological distress, including reminiscence therapy were presented. The next chapter presents a comprehensive review of reminiscence therapy.

Chapter 3. Reminiscence therapy

Oh when I look back now

That summer seemed to last forever

And if I had a choice

Yeah, I'd always wanna be there

Those were the best days of my life

Oh, yeah!

Back in the summer of '69

- *Summer of '69* (Adams & Douglas, 1984).

3.1 Chapter guide

This chapter defines reminiscence and reminiscence therapy. It defines and examines empirical literature related to reminiscence therapy, including the evolution of reminiscence types and reminiscence therapy interventions, the taxonomy of the different reminiscence therapy approaches, and the existing evidence and issues with these approaches. This chapter emphasises that reminiscence therapy is an evidence-based treatment for later life psychological distress.

3.3 Reminiscence in later life

Reminiscence is the process of recalling significant personal experiences or life events. Reminiscence is both an internal and external (e.g., social) process that occurs across most of the lifespan (Webster et al., 2010). Originally thought to be solely unhealthy or maladaptive, Erikson, (1959) argued that reminiscence was an important psychosocial task for older people, noting that when older people entered the life development stage of "*integrity versus despair*", they tended to review their life to obtain a sense of satisfaction and coherence. Butler, (1963) also recognised the increased incidence of internal and external

reminiscence for older adults, and posited that older adults engage in such review to prepare for their death and to make sense of their lives..

3.4 Reminiscence

Webster (1993) suggested eight functions of reminiscence activities that portrayed both the helpful and maladaptive reminiscence types; these were bitterness revival (ruminating on difficulties or failures), social engagement (communicating with others), boredom reduction (remembering to fill the void of stimulation or interests), death preparation (reflecting on life to deal with thoughts of death), identity (memories for coherence, worth and meaning), intimacy maintenance (holding on to relationships that are no longer part of our lives), problem solving, and to teach others. These different ways of reminiscing have been associated with different wellbeing outcomes, termed self-positive (e.g. identity construction and problem solving) and self-negative (e.g. bitterness revival and boredom reduction) reminiscence (Korte et al., 2012; Westerhof et al., 2010). Maladaptive or self-negative reminiscence types are associated with poorer health outcomes (Hofer et al., 2017), and are associated with greater prevalence of depression, anxiety and psychological distress (Cappeliez et al., 2005).

Webster's (1993) taxonomy was further developed by Webster et al. (2010). They proposed a seminal and comprehensive conceptual model for understanding the circumstances in which reminiscence occurs. These authors neatly delineated how reminiscence might originate (as spontaneous/intentional), the context in which it occurs (public or private), individual moderating factors (e.g., age, gender, personality), functions, and outcomes of reminiscence activities.

3.5 Defining reminiscence therapy

Reminiscence strategies have been used as an intervention for improving late-life health. However, there is little consensus in the literature for terminology used to describe

therapeutic reminiscence activities. Interchangeable language such as reminiscence, life review, autobiographical review, narratives, story-telling, and recalling are regularly used to describe a variety of activities.

Therapeutic reminiscence or reminiscence therapy (RT) involves the use reminiscence to achieve a specific and purposeful therapeutic outcome. The American Psychological Association defines RT as "*the use of life histories—written, oral, or both—to improve psychological well-being*" (n.d.). This definition is useful in describing the general purpose of the intervention, but does not detail the different approaches that such therapy can take to achieve different therapeutic goals.

3.6 Reminiscence and RT types

There are currently six main typologies of Reminiscence and RT (see Table 1), including the aforementioned theories by Erikson (1959) and Butler (1963). McMahon and Rhudick (1964) discussed the adaptive purposes of reminiscence for providing self-esteem in the face of advancing age and functional decline, coping with grief from losses, and finding ways to contribute. They created three categories of reminiscence, including: 1) story-telling, to share narratives, lessons and wisdoms with others; 2) life review, based on Butler's (1963) theory to accept one's life and create meaning based on their life experiences; and 3) defensive reminiscence, in which people are preoccupied with glorified thoughts of the past and a wish to return to better times (McMahon & Rhudick, 1964). This typology was the first to emphasise the adaptive strengths of reminiscence when used to improve the wellbeing of older people.

Lo Gerfo (1980) presented a similar three factor typology of reminiscence in which they name the factors *informative* reminiscence, *evaluative* reminiscence, and *obsessive* reminiscence. In this typology, similar to that of McMahon and Rhudick (1964), *informative* reminiscence was focused on sharing, reliving and retelling personal history, for the purpose of pleasure, social interaction and to enhance self-esteem (Lo Gerfo, 1980). *Evaluative*

reminiscence was similarly based on theories by Erikson (1959) and Butler (1963), and involved re-evaluating the experiences and meaning of life to accept old guilt, conflicts, or defeats, to reach a stage of acceptance (Lo Gerfo, 1980). Finally, *obsessive* reminiscence could occur in both *informative* or *evaluative* reminiscence types but is viewed as maladaptive or dysfunctional, in which the individual becomes stuck on rehashing past losses, conflicts, or guilts, and is unable to reach acceptance (Lo Gerfo, 1980).

Wong and Watt (1991) conducted a content analysis on the available literature of reminiscence and created a taxonomy of 6 types of reminiscence. The first, *integrative reminiscence*, was focused on self-worth, reconciliation and coherence in preparation for death (Wong & Watt, 1991). The defining aspect of integrative reminiscence was to accept one's life as worthwhile, accepting negative events and resolving past conflicts, and identifying self-meaning and esteem. The second type, *instrumental reminiscence*, focused on problem solving capacities and successes, goals and goal-directed activities (Wong & Watt, 1991). The emphasis in this type of reminiscence was on internal control and capacity that a person has when confronting challenges in a problem-solving approach. The third type, *transmissive reminiscence* focuses on sharing lessons, wisdom, values and histories with others as a means of teaching the audience (Wong & Watt, 1991). The fourth type, *escapist reminiscence,* was focused on glorifying, exaggerating, and boasting about the past and better days. The fifth type, *obsessive reminiscence*, focused on themes of guilt, shame, and regret about ones' past. Finally, *narrative* reminiscence purely describes experiences to share stories only, rather than to reinterpret or create new meaning. Given that this model is based on existing literature, several similarities are evident between Wong and Watt's (1991) typology and that of Lo Gerfo, (1980) and McMahon & Rhudick (1964). *Integrative* reminiscence draws on existing typologies and theories from Erikson (1959) and Butler (1963) and *evaluative* (Lo Gerfo, 1980) and *life review* reminiscence (McMahon & Rhudick, 1964),

while *transmissive* reminiscence is similar to the story sharing types evident in all previous typologies. Wong and Watt (1991) also similarly recognised the dysfunctional type of reminiscence, such as in *obsessive* reminiscence. The Wong and Watt (1991) typology uniquely separates glorifying past experiences (as in *escapist* reminiscence) from *obsessive* reminiscence, and separates that of self-acceptance (i.e. *integrative* reminiscence) to that of adaptive capacity building or problem solving (i.e., *instrumental* reminiscence).

Westerhof and colleagues (2010) proposed three types of reminiscence that occurs solely in therapy, or RT: *Simple* reminiscence, *Life review,* and *life review therapy*. In this typology, *simple* reminiscence involved the thematic discussion of memories (e.g., holidays, food, or particular events or decades) and is focused on story-telling and social interaction. *Life review* involved the detailed story of the person's life focusing on meaning and identity. *Life review* therefore involved activities focused on finding meaning across the whole lifespan, such as autobiographical writing groups or life review interviews to provide insight into personal development and recognise life lessons. *Life review therapy* involved recalling previous memories, strengths, successes, and coping strategies to induce self-change for those with mental illness such as depression or anxiety (Webster et al., 2010). The focus of this type of RT was to induce the positive functions of reminiscence and reduce the dysfunctional or obsessive types of RT, and as such, is a flexible intervention to meet the needs of the older adult (Webster et al., 2010). This typology positioned RT as an intervention tailored to meet the dynamic needs of the person, and therefore is useful in describing the different interventions that fall under the RT umbrella. Several base similarities are evident between this and previous typologies. *Life review* overlaps with *integrative* reminiscence (Wong & Watt, 1991) and to theories by Erikson (1959) and Butler (1963), and *life review therapy* draws similarities to *instrumental* reminiscence (Wong & Watt, 1991).

Table 1.

The Evolution of the taxonomy of reminiscence types and purposes

Authors	Term for reminiscence	Purposes
Erikson (1959)	Ego integrity versus despair	Older adults enter the life stage that focuses on reviewing their lives to obtain satisfaction to prepare for death.
Butler (1963)	Life review	Accepting ones' life as worthwhile in preparation for death and to share lessons with others.
McMahon & Rhudick (1964)	Story telling	Sharing of oral histories, wisdom and lessons to others.
	Life review	Based on Butlers life review, accepting ones life experiences and meaning.
	Defensive	Focusing on glorifying the past and a desire to return to the old days.
Lo Gerfo (1980)	Informative	Recollection for the pleasure of reliving and sharing the story for social interaction and self-esteem.
	Evaluative	Revaluating past experiences to come to terms with past guilt, conflicts and defeat.
	Obsessive	Maladaptive patterns focused on rehashing failures, loss and guilt from past experiences.
Wong & Watt, 1991	Integrative	Focused on self-worth, reconciliation and coherence in preparation for death
	Instrumental	Focused on problem solving capacities and successes, goals and goal-directed activities
	Transmissive	Sharing lessons, wisdom, values and histories with others as a means of teaching the audience

	Narrative	Descriptive experience rather than a reinterpretative, for example, in sharing stories only for social reasons.
	Escapist	Glorifying, exaggerating and boasting about the past and better days
	Obsessive	Themes of guilt, shame, and regret about ones past, with the purpose of rehashing these experiences.
Westerhof et al., 2010	Simple	Thematic discussions and narrative or story telling about specific time periods or experiences for social interaction and enjoyment.
	Life review	Detailed evaluative story of ones life focused on finding coherence, meaning and identity.
	Life review therapy	Focused on changing reminiscence habits to recall personal strengths, successes, and problem-solving capacity/ solutions.

3.7 Evidence on the use of RT

Research supporting the use of RT to improve the health and wellbeing of older adults living in residential aged care facilities and community dwellings is growing. Chin (2007) and Pinquart and Forstmeier (2012) conducted meta-analyses of controlled trials on RT to improve the psychosocial outcomes of older people. Chin (2007) found those who engaged in RT experienced more happiness and less depression, however, methodological issues limited the conclusions that could be drawn on the effects of RT. Results from research by Pinquart and Forstmeier (2012) indicated that compared to non-specified control conditions, RT resulted in moderate improvements for ego-integrity and depression, and small improvements for life purpose, death preparation, mastery, mental health symptoms, positive wellbeing, social integration and cognitive performance (Pinquart & Forstmeier, 2012). Participants with depression and chronic physical disease showed greater improvements than healthy participants (Pinquart & Forstmeier, 2012), a consistent finding among other similar studies (Chaing et al., 2010). Similarly, *life review therapy* demonstrated greatest therapeutic improvements with moderate effects of reminiscence compared to control conditions (Pinquart & Forstmeier, 2012), and greater effects of *life review therapy* compared to *simple* reminiscence on psychological wellbeing (Bohlmeijer et al., 2007). Likewise, both *integrative* (re-evaluating interpretations and emotions of prior life experiences) and *instrumental* (reviewing previous successes) RT activities have demonstrated significant improvements for older people with depression (Watt & Cappeliez, 2000). While these analyses used a small number of studies for some variables (e.g., ego integrity) and did not limit their pooled studies to those of high quality, they provide insight into the ameliorative effects of RT on the health and wellbeing outcomes of older people (Pinquart & Forstmeier, 2012).

Further research can be found that supports the use of RT with older people. RT has been found to improve levels of depressive symptoms, affect, mood, cognition, quality of life, neuropsychological symptoms and self-esteem (Ashida, 2000; Chaing et al., 2010; Chin, 2007; Li et al., 2020; Lök et al., 2019; Zhou et al., 2012). Results from a Cochrane systematic review and meta-analysis conducted by Woods et al. (2018) found that, while the quality of studies to date ranged from low to moderate, RT resulted in improvements on quality of life, cognition, communication, and mood for older people with dementia as well as older adults living in care. Few studies have documented the outcomes of RT on agitation (Thomas & Sezgin, 2021). For other clinical populations, group RT has resulted in significant improvements to post-stroke cognition (Cheng et al., 2021). There is little consensus on the changes to cognitive function from RT for those with dementia, with some studies finding significant changes (Lök et al., 2019), while others demonstrated no such effects (Siverová & Bužgová, 2018; Thomas & Sezgin, 2021). Due to the lack of consistency in how these interventions are delivered, it is difficult to reach consensus regarding the cognitive outcomes of these interventions.

When using RT, the therapist is able to acknowledge the rich history of the individual, and to recognise and validate their personal strengths, experiences, and identity. Rathbone and colleagues (2015) investigated the role of semantic self-images - that is autobiographical knowledge of the self, including: memories, traits, relationships, and roles related to self-identity - on wellbeing. In their study, higher ratings on emotional valence for semantic self-images were associated with increased wellbeing (Rathbone et al., 2015). This study suggested that RT may play a role in improving the wellbeing through validating how older people perceive their self-image.

Despite the evidence that RT can improve the wellbeing of older people, gaps in knowledge remain for the types of populations and problems such therapies can effectively

address. Woods and colleagues (2018) found that, compared to 'standard care' group, RT was not effective for reducing anxiety in individuals diagnosed with dementia and in their carers. While these authors acknowledge positive benefits of reminiscence for those with dementia, issues such as inconsistencies in methodology and intervention protocol greatly limited any conclusive outcomes across the literature. Likewise, Bennett and Maas (1988) found no significant effects of reminiscence on the wellbeing variables of ego-integrity for older people. Limitations in research methods, such as using healthy populations (e.g., ceiling effects) and small sample sizes lacking power may have contributed to the lack of significant findings. Further difficulties in recruitment, high attrition rates, and poor sampling within the aged care and older adult populations have added to a lack of homogeneity within the field (Rawtaer et al., 2011). Furthermore, Hofer et al., (2017) have noted that RT associated with the negative functions of reminiscence (e.g., bitterness revival) lead to worsening of depressive symptoms, indicating that caution is needed when applying reminiscence therapy. If implemented incorrectly, such therapy can have negative outcomes (e.g., reviving bitterness increases leading to worsening depression), therefore, adequate training for clinicians implementing reminiscence therapy programs is needed to ensure these interventions are applied to improve wellbeing in older people.

Further disparity in the field has been identified, with little consensus on long-term effects of reminiscence (Chaing et al., 2010). Few studies have investigated the long-term effects of reminiscence on wellbeing for older adults. Azcurra (2012) demonstrated enduring improvements in wellbeing of older adults after 6 months of terminating RT, while others have not found these longer term effects (Sun et al., 2013). These inconsistencies have persisted within the recent systematic reviews (Liu et al., 2021).

3.8 Methodology of RT

Several structured programs with vastly different methodologies of RT have been proposed and evaluated for working with older people, and therefore best practice for implementation remains unclear. A meta-analysis by Bohlmeijer et al., (2007) examined the moderating factors for life review therapy and found no significant differences in effect size when such reminiscence was administered in group versus individual contexts. Systematic reviews and meta analyses have identified both individual and group sessions resulted in small effects on the wellbeing of older people (Woods et al., 2018). Furthermore, this meta-analysis revealed no moderating effects of number of sessions for changes in wellbeing (Bohlmeijer et al., 2007), indicating that reminiscence has and can be applied successfully in different ways (i.e., number of sessions) with this population. Recently, Macleod et al. (2021) reviewed 22 studies to explore how RT was used, the delivery methods, and any commonalities between studies and programs. The authors identified very little consistency between studies in delivery, content, and outcomes, and called for greater theoretical clarity, and consistency in delivery and content.

We do not yet know how RT is used within clinical practice with the aged care sector. In the literature, various protocols have been described. Some describe group programs that occur weekly over 6 – 12 weeks (Chaing et al., 2010; Li et al., 2020; Lök et al., 2019; Stinson, 2009). Others describe individual sessions that are administered daily or weekly. Others have proposed a single session of RT (James & Bhar, 2016). Programs are often implemented by existing care staff, with little training, or do not report on training procedures.

Many examples of structured group programs can be found. For example, Stinson (2009) proposed a 6-week model for reminiscence for nurses to use with older people living in care, with clearly delineated guidelines for the preparation and implementation of a structured group program. This program included six themes for discussions and sharing

memories with the group (e.g., holidays). The outcomes of this program resulted in significantly lower self-reported depression scores for participants in reminiscence groups compared to standard care following three and six weeks (Stinson, 2009). Similarly, Chaing et al., (2010) investigated an 8 weekly group RT program compared to a control condition for 92 older men in care homes, resulting in the significant improvements in depression, wellbeing, and loneliness compared to the waitlist control group after 3 months. Digital applications of RT (e.g., online or delivered via a phone application) have also demonstrated significant improvements to depression, with high levels of engagement from older people with dementia and their carers (Moon & Park, 2020). From these studies we can conclude that individual and group-based RT are appropriate interventions to improve the wellbeing and psychological distress of older people.

3.9 Summary

This chapter provided an overview of the different reminiscence and RT approaches, and defined the different types of RT and contrasted these models for similarities and differences. This chapter also reviewed the existing evidence-base for the use of RT to improve wellbeing, and identified several theories related to why these therapeutic benefits might occur. Several issues and gaps in the existing knowledge were also identified. This chapter therefore provided key background information on the existing knowledge of RT interventions. The next chapter presents an introduction to music therapy and the use of music in reminiscence therapy.

Chapter 4: Music therapy and music in reminiscence therapy

One fly tune

That have black and white vibe in one room

No confrontation, parlay all night

It's just the sensation (just like music)

Music is the soul of the man

Music makes a, happy day

Music makes the clouds roll by baby

Your music is my tears in-side my eyes (just like music)

Your music makes me want to sing

Girl, music is a joy to bring (just like music)

Music is my heart and soul, more precious than gold (Turn on some music, I got my music)

Happiness today is just a song away, just a song (Turn on some music, I got my music)

I love your music baby (I got my music)

I don't worry 'bout a thing (Turn on some music, I got my music - just like music)

- *Music* (Sermon & Gaye, 2001).

4.1 Chapter guide

This chapter introduces the key topics of music therapy, and music in RT. This chapter begins by defining music therapy, and how music can be applied in therapy to improve the wellbeing of older people. This chapter then presents knowledge and evidence on the use of music in RT. This chapter highlights that music may be usefully applied within therapy and to RT to enhance the therapeutic outcomes for older people, and therefore is a useful intervention that requires further exploration.

4.2 Music in therapy

Music is meaningful to people across the lifespan (Wigram et al., 2002), and is often used to mark or celebrate meaningful social and cultural events, such as weddings, large sports or cultural events (e.g., the Olympics), or funerals. Music can reflect sociocultural and generational experiences for older people (e.g., wartime), as well as their own personal and individual memories, lived experiences, and identity (Brandellero & Janssen, 2014). With streaming, digital media and technological infrastructure such as Wi-Fi readily available, individuals now have widespread and immediate access to music in daily life, as well as in clinical contexts such as therapy.

Music therapy is the intentional use of music and its structures (e.g., pitch or rhythm) to achieve non-musical therapeutic outcomes (Wigram et al., 2002). When delivered by a trained and registered music therapist, music therapy is an evidence-based allied health profession governed by standards of ethics and competencies (Australian Music Therapy Association, N.D). When not delivered by a registered music therapist, music used in a therapeutic context will be referred to as 'music in therapy' in this dissertation.

Music is a powerful tool for change; For older people, music therapy and music in therapy has resulted in significant improvements in low self-esteem and insomnia (Lai & Good, 2005), depression (Erkkilä et al., 2011; Hanser & Thompson, 1994), anxiety (Guétin et al., 2009), quality of life (Chan et al., 2009; Coffman, 2002), mood (Hars et al., 2014; McDermott et al., 2013), pain (McCaffery & Locsin, 2006), agitation (Nugent, 2002), as well as reductions in medications needed (Romo & Gifford, 2007) and improvements in other negative health symptoms and consequences (Jentzsch et al., 2013).

Across several studies, individuals allocated to music-making groups appear to report more positive wellbeing than individuals allocated to control (e.g., non-music) groups. The benefits associated with participation in music groups over non-music groups include: A

more positive outlook on life, more positive ratings of social relationships, and higher levels of perceived autonomy (Creech, Hallam, Varvarigou, et al., 2013). Music groups have also been associated with development of self-awareness, improvement in mood and arousal regulation, and enrichment in social relatedness (Schäfer et al., 2013). Further research into the functions of community singing groups for older adults demonstrated that group active music-making resulted in social connection, improved mood, expression and validation of grief, life review, physical rejuvenation and renewed interest in life (Davidson, 2016). It is possible that active making music with others provides older adults with opportunities for purpose through creative expression, cognitive stimulation and learning, and a sense of accomplishment, contribution, and social validation (Creech, Hallam, Varvarigou, et al., 2013).

Music is also sometime used in therapy due to its ability to elicit emotional, physiological, and cognitive responses (Engelbrecht et al., 2021). Music is important for older adults in identity formation, connecting with others, and expressing self and emotional constructs (Belfi & Jacubowski, 2021; Coffman, 2002; Cohen et al., 2012; Creech, Hallam, Varvarigou, et al., 2013). Music can also trigger emotional states such as nostalgia (Barrett & Janata, 2016; Janata, 2009) and therefore poses a unique addition to therapy that uses memories and recalled personal narratives. It is then reasonable to question the role and function that music may play when used to facilitate reminiscence.

4.3 Music in reminiscence therapy

The successful use of triggers or prompts has been related to the successful implementation of RT (Syed Elias et al., 2019). RT often involve tools that are used to prompt discussions and memories, for example, photos, smells, and items from the past (Webster et al., 2010). Many of these programs use music as a prompt, for example, songs

about the holidays (Stinson, 2009) in order to prompt memories within simple reminiscence tasks (see Clyburn & Cohen, 1996) and life review therapy (Nguyen, 2003).

Music-assisted reminiscence therapy (MRT, see Table 2) is the inclusion of live music, recorded music, or the discussion of music topics to reminiscence (Engelbrecht et al., 2021). Several examples of MRT are evident within the literature. Such examples include life-review song writing delivered by a registered music therapist (Baker & Ballantyne, 2012), reminiscence with music listening or active music making, and music-assisted counselling (Nguyen, 2003). Furthermore, Duffey et al. (2008) used music playlists to assist participants to recount personal narratives and life stories by listening to recorded music from childhood, and discussing the associated memories. In this protocol, maladaptive or unhelpful narratives were discussed using music and reconstructed to improve wellbeing. Using MRT to assist individuals to share personal narratives has been echoed in further studies (Otera et al., 2013).

Table 2.

Definitions of reminiscence therapy (RT), verbal reminiscence therapy (VRT), and music-assisted reminiscence therapy (MRT).

RT	RT refers to all reminiscence therapy interventions and typologies, inclusive of all reminiscence activities designed to improve the wellbeing of the client, and with or without aids or tools (e.g., photos, music, etc).
VRT	VRT refers to all reminiscence therapy interventions that are verbally delivered and specifically do not involve the use of music in any way.
MRT	MRT refers to all reminiscence therapy interventions that make use of live or recorded music, or music as a topic of discussion.

Bennett and Mass (1988) conducted one of the first experimental studies that

compared six-weekly MRT versus verbal reminiscence therapy (VRT; see Table 2) groups with 26 older women living in care settings, who were matched on initial life satisfaction scores and then randomly assigned to one of the two groups. The VRT group were involved in structured group discussions on life events, changes and attitudes during their lifetime, while MRT involved listening to a selected song, followed by discussion on thoughts and feelings related to the music and memories (Bennett & Maas, 1988). Results indicated significant improvements in life satisfaction for participants in the MRT condition only, with participants in the MRT group also rating their experiences as significantly more enjoyable and beneficial (Bennett & Maas, 1988). This seminal work was the first to suggest that MRT enhances the therapeutic effects above and beyond VRT.

Other studies have continued to provide evidence that MRT enhances the wellbeing outcomes of older people, over and above reminiscence alone. Istvandity (2017) conducted a systematic review that explored the outcomes of MRT compared to reminiscence without music or control conditions, and found that MRT resulted in significantly greater outcomes in four out of five identified studies. MRT resulted in improvements in mood, depression, anxiety, stress, social interaction and group identity, blood pressure, and saliva cortisol levels to a greater extent than VRT (Ashida, 2000; Haslam et al., 2014; Mohammadi et al., 2011; Rawtaer et al., 2015; Takahashi & Matsushita, 2006).

It appears to be highly important that the music played in MRT interventions are tailored and personalised to the individual. Clyburn and Cohen (1996) compared the effects following six weeks of either MRT, VRT or a control group on psychological wellbeing of 14 older adults living in residential aged care. Participants receiving MRT reported experiencing greater enjoyment and happiness than those in the VRT condition; the difference between groups approached significance (Clyburn & Cohen, 1996). The music was based on popular songs related to age, and not tailored to meet the individual preferences

of each participant, thereby possibly accounting for the near-significant findings. This has been confirmed in subsequent studies that have shown individually preferred music has the most therapeutic benefit (see El Haj et al., 2012; Wilkins et al., 2014). Furthermore, this study used a small sample, and therefore may not have obtained power to detect significant differences. While not overtly stated, it appears that this study used *simple reminiscence* (Webster et al., 2010; Westerhof et al., 2010) activities as their intervention, and the order of when music is presented within the reminiscence therapy was also unclear. Further research by Gerdner (1997) also suggested that music that is personally meaningful (e.g. linked with specific memories or time periods) resulted in lower agitation and stress for older adults with dementia. Given that there is minimal evidence that VRT strategies improve agitation for this population (Thomas & Sezgin, 2021), this provides a strong argument for using MRT with those with dementia and agitation.

Music when used with reminiscence therapy appears to serve both social and psychological functions – to describe identity and connect to others. Recent research by Belfi & Jakubowski (2021) has collected the findings of existing research exploring the use of MRT, and documented the importance of identity and how music may influence aspects of memory. Music has a particularly strong social function. Many studies have documented that being reminded of people and life events was a key motivator for listening to music (Hird & North, 2021; Schafer & Eerola, 2020). Furthermore, high rates of social participation, engagement and musical expression have been observed in weekly MRT sessions with those with dementia (Kelly & Ahessy, 2021). The application of reminiscence and music to an interactive game has resulted in increased social participation (Unbehaun et al., 2020), indicating that different applications of MRT retain the psychological and social functions provided by this intervention.

To date, research has focused on the use of music as a prompt for recalling autobiographical memories, that is, music is used first to open or prompt reminiscence discussions. However, the use of music to enhance reminiscence (e.g., during or after discussion), how music is chosen, and how it can be connected to the specific memory being recalled within therapy remain poorly understood. Within the literature there is no explanation for how music is connected to memory recall in therapy, a lack of understanding of the type of memories recalled by participants when prompted by music to reminiscence, nor any measure of success in prompting recall specifically within reminiscence therapy.

Despite the promise offered by the benefits of combining RT and music therapy, several issues are evident within the field. Like the existing body of research on RT, the field of MRT research has little consistency, with no clear conclusions decisively drawn on its clinical utility (Soufineyestani et al., 2021). Furthermore, methodology issues and vague reporting have limited the quality of the research (Istvandity, 2017).

4.4 Summary

This chapter provided an overview of music therapy and MRT, and why these interventions may be applied to improve the wellbeing of older people. It identified several theories related to why these therapeutic benefits might occur, and issues and gaps within the current knowledge. This chapter concluded that MRT is a useful intervention that deserves further exploration. The next chapter summarises the neurological processes of memory, RT and MRT.

Chapter 5: The neurological process of memory, reminiscence, and music

What good is melody, what good is music

If it ain't possessin' something sweet?

Nah, it ain't the melody and it ain't the music

There's something else that makes this tune complete

-Don't mean a thing, if you ain't got that swing (Ellington & Mills, 1943)

5.1 Chapter guide

This chapter introduces memory, RT and music from a neurological perspective to provide key information to further study the mechanisms and theory behind how music may enhance RT. The chapter begins by introducing and exploring theory on the neurological processes of memory and reminiscence. It then reviews the theory and evidence relating to the neurological activity previously associated with music therapy and music in reminiscence. This chapter highlights the gap in current knowledge regarding the neurological activity underlying MRT with older people.

5.2 The neurological process of memory and reminiscence.

Recalling memories is a highly complex cognitive task, with conflicting findings related to the neural architecture (i.e., what parts of the brain) and lateral direction (i.e., left or right hemisphere) of the activity involved. Autobiographical memory involves an integration of both episodic (specific time and place) and semantic memory (general knowledge), with further modulating factors that alter memory retrieval and storage such as emotion, vividness, and remoteness (Cabeza & St. Jacques, 2007). The hippocampus, prefrontal, frontotemporal and medial temporal lobes are critical for memory construction, searching and retrieval (Graham et al., 2003; Holland et al., 2011). Furthermore, the posteromedial cortex and default mode network play an important role in episodic and autobiographical memory

(Shapira-Lichter et al., 2013). Collectively, this body of literature illustrates the multiple and integrated areas and cognitive structures involved in processing and retrieving autobiographical memories, and continues to reinforce the growing recognition of global and lateral cognitive processing, as we move away from the concept of "memory centres" and towards more integrative and complex modelling (McIntosh, 2000). Research by Sreekumar et al. (2018) and Ahmed et al. (2018) has begun to establish the posterior parietal and precuneus contributions to imagery and memory, and the representations of personal semantic self-images. It has also been suggested that cognitive therapies such as reminiscence may cause changes in brain activity patterns (Van Os et al., 2015).

When asked to remember events from ones life, older individuals appear to recall experiences that occurred between their adolescence and young adulthood (Krumhansl & Zupnick, 2013; Rubin et al., 1986). Similarly, older adults are more likely to recall events, and information learnt during this period, a phenomenon termed "reminiscence bump" (Krumhansl & Zupnick, 2013; Rubin et al., 1986). The reminiscence bump phenomenon has been related to the age in which development of sense of self or self-identity occurs (Rathbone et al., 2015).

A key concept in memory formation and retrieval is the self. As coined by Conway (2005), memory is motivated, and there exists a reciprocal connection between the self and memory, involving active goals and related self-images, combined with long-term memory. The self-to-memory relationship is circular – our conceptualised sense of identity (e.g., as a 'music lover') provides context and control over memory retrieval (Conway, 2005). Ultimately, this translates to our most important memories being coded in a way that helps to form our identity, and our identity impacts on our memory retrieval patterns. It has been proposed that new memories related to how we perceive our selves and identity are encoded

in such a way that they remain highly accessible and remembered in later life (Rathbone et al., 2008)

EEG studies can provide insight into the brain activation of memory search and retrieval processes. An EEG study by Ros et al., (2017) explored the retrieval for specific and general memories for 14 young adults performing an autobiographical task. The EEG data suggested differences in activation to the frontal areas between specific and general memories immediately prior to the memory being retrieved, indicating divergent searching mechanisms (Ros et al., 2017). Retrieving specific memories was associated with increased activation to the left prefrontal cortex, an effect that was less intense when retrieving general memories, suggesting the prefrontal area is necessary for searching and retrieval of specific memories (Ros et al., 2017). This finding supports those derived from a study that used positron emission tomography (PET) to explore memory recalled for different purposes (Conway et al., 1999). In that PET study, the left frontal lobe was significantly active during autobiographical recall but not during a memory control task (Conway et al., 1999). With advancements to low-cost and portable EEG equipment, this method of data collection is more accessible than ever and poses an avenue for further exploration of interventions such as RT and MRT.

Little research is available exploring the neurological activation during RT, which differs in process (i.e., answering specific questions related to the memory such as skills used, or personal strengths) and purpose (i.e., to reconceptualise and make new meaning from the memory) to autobiographical recall. For reminiscence therapy, autobiographical recall is required, followed by reinterpreting or finding new meaning associated with that memory (Pinquart & Forstmeier, 2012; Webster et al., 2010; Westerhof et al., 2010). A pilot RCT study compared the EEG neurological activation for 29 older adults engaging in RT or a control memory task. Areas associated with positive emotions and physical security

(Brodmann areas 5, 18, and 31) were activated during RT (Bhar et al., 2012). Further research into the neurological activation and source of this activity is warranted.

5.3 Music and memory

Music elicits responses in widespread and lateralised regions, structures, and neural pathways of the brain, particularly those associated with memory, emotion, and higher executive functions (Koelsch, 2010; Särkämö et al., 2013). Listening to or playing music activates the auditory cortex, frontal, temporal, parietal, cerebellar and limbic areas that are involved in motor coordination, attention, memory, emotion, mood, and information processes (Koelsch, 2010; Levitin, 2006; Särkämö et al., 2013). Furthermore, music stimulates physiological changes in the body, including changes to heart rate, respiration rate (Gomez & Danuser, 2007), blood pressure (do Amaral et al., 2016; Sutoo & Akiyama, 2004), and hormone levels (Menon & Levitin, 2005). Music listening triggers the release of endorphins and dopamine neurotransmitters (Tarr et al., 2014), inducing a sense of pleasure and activating the nucleus accumbens and dopaminergic reward system (Laukka, 2007; Zatorre & Salimpoor, 2013; Bennett & Mass, 1988; Coffman, 2002). Music triggers arousal responses and mimics emotion (Zentner et al., 2008), as well as autobiographical memories with greater emotional valence and reactions compared to memories recalled without music (El Haj et al., 2012). Any unexpected changes in musical structures (e.g., a new instrument, melody or dynamics) result in clear neurological emotional responses demonstrated via peak frontal asymmetry through EEG imaging (Arjmand et al., 2017).

Music that is personally preferred demonstrates different neurological changes. Further neuroimaging research using functional magnetic resonance imagines (FMRI) has demonstrated that listening to preferred music results in higher connectivity in the default mode network, areas associated with self-reflection (Wilkins et al., 2014). Furthermore, listening to a favorite song resulted in greater connectivity between the auditory processing

areas and the hippocampus, which has been associated with social and emotional memory (Wilkins et al., 2014). These results were consistently demonstrated regardless of the musical genre or elements (e.g., lyrics, pitch, or tempo) of the favorite music selected by participants.

EEG is a suitable neuroimaging technique for use in music therapy. Fachner and Stegemann (2013) reviewed the use of EEG recording in music studies, and identified that EEG offers many advantages, including that it is cost-effective, non-invasive, and easy to implement in clinical settings. EEG recording can also be time-locked to particular events, such as during musical shifts in continuous music recordings (Poikonen et al., 2016). This locking function makes it a useful and appropriate data collection method for creative experiences and cognitive tasks, such as listening to music or undergoing music therapy.

To date, the majority of neuroimaging studies exploring music and music therapy have focused on music perception (Banerjee et al., 2016; Bhattacharya & Petsche, 2001; Omigie et al., 2015; Petsche, 1996; Schaefer et al., 2011), emotion (Bhatti et al., 2016; Koelsch, 2010; Lin et al., 2010), training (Cheung et al., 2017), familiarity (Tseng et al., 2019), attention or arousal (Kay et al., 2012; Kumagai et al., 2018; Ramirez et al., 2018), and clinical outcomes associated with particular issues or populations such as those with depression or minimally conscious patients (Fachner et al., 2013; Fachner & Stegemann, 2013; O'Kelly et al., 2013; Rojo et al., 2011; Särkämö et al., 2008, 2013). Further research by Byrns et al. (2020) explored the use of VR delivered relaxation and popular music (e.g., within the average age of participants for their reminiscence bump years such as age 10-30). The VR environment was created to look like a seated theatre with a red curtain, with 8, 30 second snippets of music provided. EEG data was used to record emotional responses, and suggested that emotional states and performance on cognitive measures improved following the intervention (Byrns et al., 2020). Currently, no research is available that explores the

neurological activity during or after the delivery of MRT. Such research could highlight the underlying neurological mechanisms for how music can enhance reminiscence therapy.

5.4 Summary

This chapter reviewed the current research and theories on the neurological processes involved in memory recollection, RT, music, and MRT. This chapter proposed that the neurological processes and structures differ between general memory recall and RT, and reviewed knowledge on the neurological activation during RT and MRT, identifying several gaps. The next chapter will provide an overview of the methodology used in the dissertation and associated papers.

Chapter 6: Methodology

Oh, I'm buzzing because

This is how we do it

South Central does it like nobody does

This is how we do it

- '*This is how we do it'* (Jordon et al., 1995)

6.1 Chapter guide

The purpose of this chapter is to introduce the methodology and design employed in the studies that constitute this dissertation. There are two sections in this chapter. In section one, this chapter describes and justifies the overall research design and research questions of the dissertation. Section two describes the design, research questions, and hypotheses in each study (where appropriate). Due to the concise nature of writing for publication, several important methodological issues and decisions were excluded from the published or submitted papers, which are presented in section two.

Section 1: The PhD dissertation

6.2 Research aims

The aim of this dissertation was to explore the theory and practice of using music-assisted reminiscence therapy (MRT) with older adults. See Figure 1 in Chapter 1 for the research questions.

6.3 Mixed method design

This dissertation involved mixed method research designs. Mixed method research is defined as research that combines aspects of qualitative and quantitative research approaches, including theoretical perspectives, data collection and analysis methods, and integration techniques (Johnson et al., 2007). Mixed methods are an appropriate approach for

psychological and health research as it can allow for the discovery of quantifiable information as well as exploration of subjective experiences (Carr, 1994). This methodology is useful when studying multilayered phenomenon such as health (Östlund et al., 2011).

Quantitative methods are widely used in psychological research; these methods involved measuring and analysing numerical data (Norkett, 2013). Common methods include descriptive, correlational, quasi- and experimental research (Cormack, 2000). Originating from traditional science paradigms, these methods can be considered rigorous, and when implemented correctly, can achieve good validity and reliability due to controlling and manipulating the environment and variables within study conditions (Carr, 1994). However, most quantitative methods are limited by dismissing the experience of the individual as less important, and minimising the whole person to just limited data as they react or respond to the controlled environment (Cormack, 2000).

Conversely, qualitative data are more concerned with exploring the perspectives, contexts, and experiences of individuals, stakeholders, and groups (Carr, 1994). Qualitative methods vary, and can include a range of data collection and analysis methods such as in depth interviews, focus groups, ethnography, or narrative enquiry (Liamputtong, 2020). The strengths of qualitative approaches are in the flexibility of responding and exploring phenomena at the level of the individual, providing deeper understanding, however, this approach limited by the biases of the researcher (Carr, 1994). In qualitative research, the researcher makes inferences based on their own world perceptions, and therefore the data are susceptible to researcher biases.

When these two research approaches are combined into mixed methods paradigms, the strengths of these approaches are combined and several of these limitations are minimised or overcome entirely (Carr, 1994; Johnson & Onwuegbuzie, 2004). Johnson and colleagues (2004) and Carr (1994) provide a comprehensive comparison of the strengths and weaknesses

of the three research approaches (qualitative, quantitative, and mixed). Mixed methods allow for greater richness of data to be described in both numerical and contextually-rich ways. Furthermore, mixed methods allow for more diverse research questions to be addressed, and contribute more complete knowledge to the field (Carr, 1994; Johnson & Onwuegbuzie, 2004).

The flexibility offered in mixed-methods research is both a strength and limitation of this approach. Such research allows for more comprehensive and holistic exploration of findings, but the process of integration is less standardised (Östlund et al., 2011). Few guidelines are available in regards to the collective analysis and integration of mixed methodology (Östlund et al., 2011). A systematic review by Östlund and colleagues (2011) identified 3 existing approaches to mixed methods within healthcare, including parallel, concurrent, or sequential analysis. Parallel analysis was the most common method of integration and triangulation, involving the full and separate analysis of both (e.g. qualitative and quantitative) methods before consolidating findings together (Östlund et al., 2011). This approach is limited as it does not allow for insights from the different methods to contribute to the findings, for example, the qualitative data to inform the analysis of the quantitative data (Östlund et al., 2011). Concurrent and sequential analysis are considered more illustrative but are more time consuming (Östlund et al., 2011). Despite the limitations with parallel analysis, this approach is commonly used within mixed-method research in health (Östlund et al., 2011), and was employed within the dissertation due to candidature time constraints.

The mixed methodology employed for this dissertation involved both descriptive and experimental psychological research using multiple data collection methods such as surveys with closed and open-ended questions, psychological assessment scales, neuroimaging data, and interviews. Descriptive research is useful when too little is known about variables to conduct experimental research in which these variables are manipulated or evaluated (Nelson

et al., 2017). Univariate descriptive studies aim to characterise prevalence and establish norms within samples, providing necessary information to build future and more rigorous experimental research projects (Nelson et al., 2017). This approach was used in paper 2 as little was known about how VRT and MRT are used in clinical practice.

Experimental research adheres to strict scientific enquiry design principles, and involves hypothesis testing by manipulating independent variables, and measuring observable change on the dependent variables (Howell, 2002). Pilot and single-subject research is useful for testing the methodology, acceptability, feasibility, and basic outcomes when testing interventions (Robb, 2013). An experimental research design was chosen for papers 3 and 4 to test the specific neurological mechanisms and implementation methods for when using VRT and MRT in a controlled environment.

Multiple methods of integration and analysis of collected data was used within this thesis. Termed *triangulation,* using multiple methods gathers information from differing perspectives and integrates them in meaningful ways. Denzin (1973) proposed four types of triangulation, including: *data source* (multiple times, or places of data), *method* (using mixed and multiple methods of data collection), *investigator* (using multiple researchers to collect and analyse data) and *theory* (employing more than one theory, perspective or hypothesis).

This thesis employed several triangulation methods as a means to develop a comprehensive understanding of the interventions (Carter et al., 2014). Methodological triangulation (e.g., the use of multiple data collection methods) was used to seek a more in-depth and nuanced understanding of the research findings, than could be offered through a single method of data collection (Carter et al., 2014; Denzin, 1973; Mertens & Hesse-Biber, 2012). Triangulation s considered a useful method for corroborating findings and gaining multiple perspectives and data validation (Carter et al., 2014; UN Aids, 2010). The diversity obtained with this method allows for a more detailed and extensive look at the study

phenomenon (Carter et al., 2014; UN Aids, 2010) in using the qualitative data to enhance and provide context for interpreting the quantitative findings (Flick et al., 2012) within and between the papers contained within this thesis. For example, method triangulation was used by combining interview data with observation measures (see section 2). Despite the benefits of using multiple data sources, the usefulness of this methodology depends entirely on the quality and quantity of the data collected (Carter et al., 2014; UN Aids, 2010).

Investigator triangulation was also employed as a means of increasing rigor in the qualitative coding (Carter et al., 2014; UN Aids, 2010). For one project, two researchers independently coded participant responses and then met to reach consensus in the themes identified (see section two for further information). *Theory triangulation* was used to pull together research across several domains, such as psychology, music therapy, and neuroscience. These methods ensure a wider and more balanced perspective of the findings to reduce bias, and increase reliability and validity (Carter et al., 2014; UN Aids, 2010).

The sampling methods used within the dissertation varied according to the research questions and study designed employed. In the research included in this dissertation, we recruited older adults as well as aged care workers and volunteers. This approach allowed for richness in data given multiple perspectives (Carr, 1994; Johnson & Onwuegbuzie, 2004). In this project, we were able to appreciate perspectives on the outcomes and experiences in using reminiscence from the perspectives of older clients and their service providers. The specific methodology for each research question and associated study is addressed below (see Table 3). Previous research exploring the use of MRT employed a variety of methods, including self-reported psychological and cognitive intelligence tests (Ashida, 2000; Haslam et al., 2014; Mohammadi et al., 2011; Rawtaer et al., 2015), observation of social behaviour in group settings (Ashida, 2000), and saliva sampling and blood pressure readings (Takahashi & Matsushita, 2006). The details of how these interventions were specifically applied to older

adults were omitted or vaguely described (Istvandity, 2017). To date, studies have focused solely on the quantitative outcomes of MRT with older people. This dissertation addressed several gaps within the literature in methodology, including collecting data on the experiences of MRT and VRT from multiple perspectives, and mixed methods to provide an in-depth understanding of the research findings

6.4 Interventions

This dissertation aimed to explore the theory and practice of using music in reminiscence therapy. MRT involves verbal reminiscence tasks in addition to the inclusion of live or recorded music, or the discussion of music. In order to explore what music adds to reminiscence therapy, comparisons are made by MRT and VRT. For this dissertation, reminiscence therapy that is verbally delivered is referred to as VRT. General reminiscence therapy, for example when discussing the typology related to both VRT and MRT is referred to as RT.

Table 3.

Overview of the research questions, approaches, methods and a justification of why these were chosen.

Research question	Research approach	Methods	Justification of methods and approach
How does music enhance reminiscence therapy?	Literature review.	Narrative literature review.	Quality and quantity of existing research is poor, and the topic has multiple variables, therefore a systematic review approach was unsuitable.
How is reminiscence therapy and music in reminiscence therapy currently being used with older people in clinical practice in Australia? To what extent is reminiscence therapy and music-assisted reminiscence therapy being used by the workforce? Which types of reminiscence therapy are being used? What methodology is being used?	Mixed-method descriptive study (survey with open and closed questions).	Researcher-developed survey, with 8 open ended questions. Survey was piloted with 6 allied health experts. Parallel mixed analysis was completed in this project. Quantitative data analysis was exploratory with comparisons made between RT and MRT methods using descriptive statistics and repeated measures analysis of variance.	Mixed methods selected in order to address the comprehensive dimensions of the use and views of RT and MRT. This is the most common method of integration of mixed-methods (Östlund et al., 2011). Quantitative data were used to address the use of RT and MRT questions to quantify behaviour and rates.

What are the perceptions of the situations, topics and outcomes of reminiscence therapy and music assisted reminiscence therapy for the workforce?		Qualitative findings were analysed using an inductive content approach, and triangulated by 2 independent researchers to reach consensus.	This approach allows the themes to emerge from the language of the participants. Triangulation allows for more rigor in the themes identified.
How feasible is it to integrate music with reminiscence therapy for older people with psychological distress?	Mixed-method experimental pilot study exploring feasibility and acceptability.	Brief telephone interviews Psychological self-report surveys (e.g., affect) Semi-structured interviews	Mixed methods selected to provide multiple perspectives on the feasibility and acceptability of these interventions. Quantitative measures selected included a measure of affect as an immediate variable of wellbeing. Semi-structured interviews (qualitative measures) were used to gather individual perspectives on the user success and satisfaction with the experience.
What are the neurological mechanisms by which music enhances the effects of reminiscence therapy for older adults with psychological distress?	Experimental case study	EEG neuroimaging recording.	A single-subject case study approach was used due to the small sample and to compare pre, during and post intervention neurological activation during each intervention as a way of describing the role of music in RT.

Section 2: Method for each paper

6.5 Paper 1 Planting the SEED: A model to describe the functions of music in reminiscence therapy for older adults.

Music can be used to enhance reminiscence, but the rationale for, and effectiveness of, using music to enhance reminiscence is unclear. Similarly, the mechanisms underlying the purported effectiveness of music for enhancing reminiscence is poorly specified. Drawing on interdisciplinary research in music therapy, psychology, sociology, gerontology, and neuroscience, this paper proposes a theoretical model for the multiple functions of music when used in reminiscence therapy, and describes how the hybrid of music and reminiscence therapy – or "music-assisted reminiscence therapy" – might be used to improve the wellbeing of older people.

6.5.1 Research questions

The primary research question for this review was: "How does music enhance reminiscence therapy for older people?" The paper brought together theory and research, culminating in a theory of the role of music in this therapeutic context. The paper added to the knowledge base by creating a theoretical picture of what is occurring (e.g., cognitively, socially, physically, or emotionally) when music is used in reminiscence therapy.

6.5.2 Methodological and research considerations

This review used a critical narrative format, however, made use of clear search strategies (e.g., reported on search terms and databases used) to include a wide ranging and relevant body of work to build the model (see Table 4). Systematic reviews and meta analyses are considered gold standard methodologies for review papers (Ahn & Kang, 2018). These methods involve collecting all available research evidence on a given topic and assessing the quality of the evidence, and combining the findings (Ahn & Kang, 2018). Systematic reviews and meta analyses are therefore considered to be valid, rigorous, and

scientific approaches to summarise research (Ahn & Kang, 2018). A systematic review or meta-analysis approach was not employed in this review due to the widely ranging topics (e.g., music and autobiographical memory, emotion, and physiological responses) and paucity of research directly involving music and RT. It was therefore concluded that further primary research and theory development were needed before a systematic review could be illustrative (Thomas et al., 2021). This paper proposed a new theoretical model to conceptualise the outcomes and functions of music when used with RT.

Table 4.

Literature search strategies and results.

Database	Search terms used	Articles identified
EBSCO	"Music" OR "song" AND "Reminisc*" OR "life story" OR "biograph*" or "autobiography*" OR "memory" AND "older adult" OR "Older person" OR "elderly" AND Emotion OR memory OR Identity OR Heart rate OR Hormone* OR Breath OR Respiration OR Blood pressure	172 total 27 relevant
SCOPUS	TITLE-ABS-KEY ("older adult*" OR "elder*" OR "older person*" OR "older people*" OR "dementia") AND TITLE-ABS-KEY ("life story" OR "reminisc*" OR "biographi*" OR "biography*" OR "auto biograph*") AND TITLE-ABS-KEY ("music" OR "song") AND Emotion OR memory OR Identity OR Heart rate OR Hormone* OR Breath OR Respiration OR Blood pressure	185 total 63 relevant (13 no full text available)
Pubmed	As above	15 relevant articles

6.6 Paper 2. Reminiscence therapy and music with older adults: A Mixed-method investigation of the current views and practices of Australian aged care workers and volunteers.

Little is known about how RT is used in clinical practice. Music is often used to prompt autobiographical memories and RT for older people, however the specific implementation protocols remain unclear. This descriptive and exploratory mixed-method study sought to investigate how MRT and VRT were being used in the aged care sector. It was anticipated that the findings of this study could be used to guide the duration, dose, or context of treatment for how music and reminiscence is employed in future research and practice for diverse older populations. For example, deciding whether to test or use VRT or MRT interventions in a group or individual setting, or when music is presented (i.e., before or after) in MRT.

6.6.1 Research questions

This paper explored how people working or volunteering with older adults viewed and used VRT and MRT. This paper therefore sought to answer the research question: How are VRT and MRT currently being used with older people in clinical practice in Australia? More specifically, the study explored: 1) The extent to which VRT and MRT were being used by the workforce; 2) which types of RT were being used in VRT and MRT; 3) how the interventions are delivered, and 4) the perceptions of the situations, themes, and outcomes of using VRT and MRT with older people.

6.6.2 Methodological and research considerations:

Descriptive research is concerned with observing phenomenon, answering the question "what" in the natural setting rather than why or how (Nassaji, 2015). For this reason, descriptive research often involves data collection methods such as observation and survey tools, and quantitatively explores data frequencies and averages to describe variables and

relationships (Nassaji, 2015). In mixed-methods descriptive research, the qualitative data add individual perspectives that provides context, and in this case, the views of aged care service providers about these interventions (e.g., the situations of use, topics of discussion, and outcomes) when used in health settings.

This project involved a researcher-developed survey tool that was shared online and in hard copy to workers and volunteers who worked with older adults as a means of quantifying the views and practices of VRT and MRT. Researcher-developed surveys are useful when no existing or validated tool is available to collect the appropriate data (Kelley et al., 2003). The development of surveys requires several steps to ensure reliability, validity, and rigor, including planning content based on previous literature and research questions, choosing an appropriate questionnaire layout, clear language for questions, and piloting the questionnaire (Kelley et al., 2003).

The study survey was developed from the research questions and in consultation with the authors. An initial list of questions was proposed to determine the information required for both VRT and MRT, primarily the frequencies of use, the types of reminiscence activities and frequency of these types, and the contexts in which VRT and MRT interventions are used. Demographic information was also collected, including: age, gender, country of birth, language spoken at home, occupation, work setting, years of work experience in current role, and location (state or territory). The initial survey was then shared with the co-authors, and revised for clarity of language, question layout, and scoring.

6.6.2.1 Focus group methodology The survey was then piloted with 6 allied health clinicians using focus groups. Piloting the questionnaire with a sample of the target population is a validated method of identifying whether respondents will understand the instructions, response scales, and questions of the survey (Kelley et al., 2003). The focus group participants volunteered from the allied health departments at Calvary Healthcare

Bethlehem, a specialist palliative care and progressive neurological disease service in Melbourne, Australia. Participants were recruited via email and verbal invitations in team meetings. Interested individuals were provided with a plain language statement (see appendix B) which described the eligibility criteria, purpose of the focus groups, and details of what participation would involve. Individuals were eligible for the groups if they were over 18 years old, worked or volunteered directly with older adults, and could read and speak English. Eligible participants signed and returned a consent form (see appendix B).

Two focus groups were conducted, with two and four participants respectively. Focus groups involved completing the survey online using the Qualtrics platform via computer or mobile tablet in the presence of the researcher to note any issues with the questionnaire layout, language, or response scales. Focus group participants were then interviewed to collect information on their experience in completing the survey online, completing the questions, and on the content of the survey (see Table 5 for questions). Focus groups were audio recorded and transcribed. Suggestions and issues were then addressed based on the participant feedback (See Table 4).

The major changes that resulted from the focus groups included: 1) changing the flow of the survey so that if "never" is selected in VRT or MRT use, then the following questions on VRT or MRT are skipped; 2) have larger text boxes for the open ended questions so that participants can easily view and edit their responses, particularly for those using mobile devices to complete the survey; 3) the questions related to both VRT and MRT questions wording was too similar, and to make it clearer that the RT questions are referring to RT without music, 4) the drag and drop layout of the frequency questions should be changed to be a numbered box, 5) make the lottery prize draw terms and consent page look different from each other, 6) contact information for the lottery draw and survey findings report does not need to be collected twice, collect it once and have two yes/no response options for each;

7) give simple definitions of the differing types of reminiscence under each frequency question; and finally 8) make the purpose of reminiscence activities question on a frequency 5-point scale. The updated survey was resubmitted for review by the co-authors and Swinburne University Human Research Committee, and approved for use (see Appendix B for final survey).

Table 5.

Focus group questions for allied health clinicians to review the researcher developed survey tool for exploring the use and views of reminiscence and music-assisted reminiscence.

Topic of question	Focus group questions
The online survey platform	• What did you think of the survey? • Please describe your experience in navigating through the survey? Was it easy or difficult? • Did you have any technical difficulties accessing the survey, online link or inputting any of your responses? • What did you like best about the survey? What did you like the least? • What needs improvement? Suppose you were running this study, what one change would you make to make the program better?
The survey questions	• Please describe your experience in answering the items on the survey? • Were the questions easy to understand and respond to? • Were the instructions clear and easy to follow? • Were any of the questions difficult to respond to? • Did you have trouble with any of the response scales or options? • Did you feel that the questions of the survey covered all aspects of your experience and views of reminiscence and music in reminiscence?
The survey content on VRT and MRT	• How do you apply reminiscence in your work? • How and when do you use reminiscence in your work? • How and when do you use music in reminiscence in your work? • What information, if any, helps you to decide whether or not to use music in your reminiscence work? • What are the benefits and limitations of reminiscence in your work? • What have you noticed about using music in reminiscence work? • Are there any benefits or limitations of using music in reminiscence work?

Table 6.

Issues identified by focus group participants for the researcher developed survey, and how these were resolved for the final survey.

Participant quote and context	Identified issues	How it was resolved
Participant demographic question – work setting: "Just trying to work out which setting I work the most in, because I work in all three of those. Probably…." "I work in both, so do I put palliative care or community care?"	Demographic question on work setting unclear.	Instructions were clarified to illustrate how participants who work across setting should respond.
RT/MRT use survey flow "so if we don't use music do we just skip these? Oh. Yeah so these ones all say that with music, so I don't I use music so I cant kind of answer those. It says I cant move, I cant go on (in the survey) without… Yeah so that should skip (to the next set of questions) so obviously that's not working."	Survey flow – issue with questions about RT and MRT use being presented even if participants report never using these interventions	Qualtrics survey mechanism put in place so that participants skip any subsequent questions on interventions if they report never using them. Written instructions to this effect were included in the hardcopy survey.
Open ended questions text box "You cant go back to see what you've written, which is quite…I cant remember what I've written. [sighs loudly]"	Issues with scrolling back in the open-ended questions text boxes on mobile devices.	Larger text boxes provided.

Repeated questions for RT and MRT "I've got the same question twice. Are there any barriers that stop you from using reminiscence in your work. And then: Are there any barriers that stop you for using reminiscence.."Ahh see im getting mixed up" "Um, I had to read each questions sometimes carefully because sometimes I thought the questions were repeated themselves but one question was about the use of reminiscence and the other was about the use of music, so yeah." "No I thought some of them were very similar so you just had to make sure you were looking at, cuz they seemed to be two sets there that repeated themselves."	Similar language used in RT and MRT questions.	Language and formatting changed (e.g., bold and underlining "with music" and "without music") to make these differences more obvious.
The frequency of RT and MRT question – drag and drop to order from most to least used methods "I found the drag and drop thing um a little bit counter intuitive um it might just be easier to get people to number it or something." "So what are we doing here? Sorry how to click and drag it? Umm…do I just put something or not? I don't know" "Its more about the structure of the actual questions and how to drop and drag."	Issues with the response scale in the frequency question	Response scale was changed from ordering in a drag and drop 1 – 3 in rate of frequency of use to a 5 point frequency scale for each of the 3 types of RT and MRT.
Lottery draw and study findings report consent "Its asking me to consent again, I have already done this. It says would you like to participate? And I said yes, and then I need to do it again?" "its taking me back to the start again?"	Lottery prize draw consent form looks like first page.	The lottery prize page was changed to look different to the front consent page. The lottery and project report section was changed, with a

"I'm not sure if you did this and I skipped through too quickly, but maybe have a finished page where you can say now you can go into the draw. I don't know how you can differentiate it a bit but maybe if you put "prize drawer" in big letters or something up to top so people are aware we haven't gone back to the first page, which obviously we haven't"		single entry of contact information and two y/n tick boxes to opt in to participate in the lottery and survey findings report.
Reminiscence frequency questions "ahh. And we are saying that what we did is reminiscence, is that what you were saying? When we talk about music that they've had in their lives?" "I suppose when I answered the reminiscence one in my mind I clearly differentiated from when I use music from when I didn't. and I don't know how applicable this will be to the majority of people youre surveying, but if you want the reminiscence ones to be reminiscence without music, then I would make that clear. Maybe include a definition of reminiscence too? If depending on who you're looking to target."	Participants were unclear what defined the 3 different RT types.	A brief definition and example was provided for each of the 3 types in the RT and MRT frequency questions so that participants could accurately report how frequently these separate types were being used.

6.6.2.2 Sampling The identified sample for this study was the care workforce and volunteers who work directly with older adults in Australia. This sample was chosen as a means of providing valuable information on the practices with respect to using VRT and MRT interventions. This study was expected to clarify the treatment as usual paradigms for those directly implementing these interventions with older people. Adding the voice and perspective of the worker allows for a holistic and comprehensive exploring of the interventions and further data triangulation in the dissertation (Flick et al., 2012).

Currently, there are 245 911 residential and community-based direct aged care workers in Australia. Of these, 74% are personal care attendants or similar, 19% are nurses, 2% are doctors, and 5% are allied health workers (Mavromaras et al., 2017). Given time constraints for completing this project within the candidature time, this study was an open trial for recruiting as many respondents as possible within an 11-month time frame. The final sample comprised 110 workers or volunteers. Financial incentives (offering a lottery draw to win a $250 gift card), extended data collection periods, and multiple recruitment and data collection methods were employed to attempt to overcome these difficulties.

6.6.2.3 Investigator triangulation methods. As a means of investigator triangulation, two investigators completed independent qualitative coding on the participant responses for the open-ended questions generated by the mixed-method survey. Each investigator completed the coding according to the data analysis plan, namely relating to topics of discussion, situations of use, and outcomes (positive and negative). The two coders then shared their analysis and met on two occasions to reach consensus on the themes identified.

6.7 Paper 3. Music-assisted reminiscence therapy with older adults: feasibility, acceptability, and outcomes.

To date, little attention has been given to how music can be purposefully applied in RT to improve the wellbeing and treatment outcomes for older people. This pilot study explored the feasibility and acceptability of MRT when applied with older adults experiencing psychological distress, such as anxiety, stress, or depression. This study assessed the feasibility and acceptability of two ways of delivering MRT.

6.7.1 Research questions

This paper aimed to answer the third research question of this dissertation: "How feasible is it to integrate music in reminiscence therapy for older people with psychological distress?" To answer this question, this paper: 1) explored the feasibility and acceptability of two MRT protocols to link meaningful music to the intervention; and 2) provide preliminary analysis of the outcomes of these protocols on affect and memory experience for older adults who have mild to severe levels of psychological distress.

6.7.2 Methodological considerations

While randomised controlled trials (RCTs) are considered gold standard to explore the efficacy of intervention studies, a key element of high-quality research is pilot feasibility studies. Such studies allow for testing of user experiences, and refining of intervention applications (Bowen et al., 2009; Robb, 2013). According to Bowen and colleagues (2009) acceptability and feasibility studies provide information about whether an intervention is appropriate for further and more rigorous testing, particularly when there are few published studies using a particular methodology. In this case, the pilot study investigated the acceptability (e.g. the extent to which the intervention was satisfactory to participants) and feasibility (e.g. to what extent the interventions were successfully used with participants) of VRT and MRT, and the integration of two different ways of using music with RT (Bowen et al., 2009; Robb, 2013).

6.7.2.1 MEQ-SF. To examine any differences in memories experienced through VRT and MRT, a measure of memory characteristics was included in the post-test evaluation. The Memory Experience Questionnaire- Short Form (MEQ-SF) developed by Luchetti and Sutin (2016) was selected to be used in paper 2 to investigate any memory characteristic differences experienced by participants between the VRT and MRT conditions. The MEQ-SF assesses 10 aspects of memory, including: vividness, coherence accessibility, time perspective, sensory detail, visual perspective, emotional intensity, sharing, distancing, and valence, with a balance of negative (e.g. reverse scored) and positively scaled items (Luchetti & Sutin, 2016). The MEQ-SF has many advantages over the longer, original MEQ, which poses a significant time burden to research participants to complete, particularly with clinical populations where literacy, attention, and cognition are limited (Luchetti & Sutin, 2016). Internal consistency of the MEQ-SF was similar to the MEQ, with alpha internal consistencies generally above .70. Correlations between the MEQ-SF and MEQ subscales were high (> .91) except for sensory details (=.88). The MEQ-SF has subsequently been validated and used in a large scale survey (N = 1120) of adult memory characteristics stratified by age (Luchetti & Sutin, 2018). This measure was therefore an appropriate tool for inclusion in the research contained within the dissertation.

6.7.2.2 PANAS. The Positive and Negative Affect Scale (PANAS) was selected as a measure of subjective wellbeing to record any changes as a result of the VRT and MRT interventions used. Originally developed by Watson and colleagues (1988) to categories and assess affective responses and states based on a two-dimensional conceptualization of mood and emotion: Positive affect (high energy, enthusiasm, positive engagement, and alertness) and negative affect (subjective distress, unpleasant engagement, aversive mood states and lethargy). Individuals are rated on a continuum of high to low on each of these dimensions (Watson et al., 1988).

The PANAS was developed by assessing over 60 mood descriptors from past research by Zevon and Tellegen (1982) through principle-component analysis, and selecting mood descriptor terms that were unrelated to other terms. The final PANAS was created with two scales, the Positive Affect Scale (PAS) with 10 items including mood descriptors such as attentive, interested, alert, excited, enthusiastic, inspired, proud, determined, strong and active; and the Negative Affect Scale (NAS) with 10 items including irritable, ashamed, nervous, jittery, afraid, distressed, upset, guilty, scaled, hostile (Watson et al., 1988).

The PANAS has been validated for reporting affect during different time periods, including right now, today, over the past few days, over the past few weeks, over a year, and in general. The internal reliability for all time periods was acceptable high for both the PAS and NAS with college students, ranging from (Cronbach's coefficient α = from .84 to .90). The correlation between the two scales was low (=<-.23), indicating good discriminant validity between the PAS and NAS scales. Likewise, there was stability in test-retest reliability for participants across all time periods (Watson et al., 1988). There was good external validity with other measures of affect, including the Hopskins Symptom checklist, Beck depression Inventory, and State-Trait Anxiety Inventory (Watson et al., 1988). This was confirmed in subsequent research by Rossi and Pourtois (2012), who reviewed studies using the PANAS to assess fluctuations in anxiety compared to other state-dependent measures of affect such as the State-Trait Anxiety Inventory, Profile of Mood states, and Visual Analog Scale. The review found that all four measures of rapid state-dependent variations in anxiety were reliable and valid (Rossi & Pourtois, 2012). Other researchers have also validated the use of the PANAS with older adult populations, therefore validating this as a suitable measure of wellbeing for this paper.

6.7.2.3 Sample. The targeted population for this project were older adults (65 years and over) who were experiencing psychological distress. The older population is skewed

towards women, with 53% of women making up the older adults in Australia (AIHW, 2021). The sample was representative of the target population, as they were aged 65 years and over (age $X = 75.9$; $SD = 7.29$), included 5 women and 3 men, and were experiencing psychological distress as determined by a score of 16 or higher on the K10 during the screening telephone interview. Approximately 15% of the community dwelling older adult population, and over half (52%) of those living in residential aged care in Australia are experiencing psychological distress, such as stress, anxiety, or depression (AIHW, 2013, AIHW, 2015; WHO, 2018). This criteria for the sample was chosen as the tested interventions, RT and MRT, have been validated in previous literature as a treatment for later life depression and anxiety (Chaing et al., 2010; Chin, 2007; Istvandity, 2017; Pinquart & Forstmeier, 2012; Watt & Cappeliez, 2000).

Mild or major cognitive impairment can impact on the capacity to recall meaningful autobiographical memories (Leyhe et al., 2009; Lopes et al., 2016; Murphy et al., 2008). Older adults without any known cognitive impairment or dementia were selected as the target population for this sample as a way of controlling for variables that may influence the outcomes associated with these interventions this pilot study. Due to the memory-based tasks to be completed by participants in this research project, and the small sample size, a cognitively healthy sample was selected by excluding those who self-reported a known or diagnosed cognitive impairment. Taking this approach allowed the participants agency in deciding whether they had capacity to participant in the project, therefore allowing them to choose for themselves. This was chosen to reduce the burden of testing on participants (e.g., rather than spending time assessing cognitive status) in the telephone interview, and to empower participants.

6.8 Paper 4. Cognitive processes in reminiscence therapy with and without music: Four case studies comparing the neural effects for older people with psychological distress.

RT and MRT are interventions that are feasible and possibly effective methods for improving the wellbeing of older people. This paper used a single-subject research case study design to explore the neurological changes to connectivity and coherence for 4 older adults with psychological distress during and following a single session of VRT or MRT.

6.8.1 Research question and hypotheses

This paper investigated the neurological mechanisms by which music enhances the effects of RT for older adults experiencing psychological distress. This paper explored 1) the neurological activity associated with MRT, 2) the neurological activity associated with different types of RT, and 3) the source localisation of activity for individuals during the interventions in order to explain how music may enhance RT. The four hypotheses were:

- RT will result in changes to neurological activity compared with baseline cognition (e.g. eyes closed task).
- Differences in activation will be evident between the start of the RT and instrumental reminiscence question (e.g. problem solving question).
- During music presentation, individuals in the MRT condition will demonstrate greater and more widespread activation for alpha, theta and beta compared to during VRT, particularly in the frontal sites for alpha.
- Alpha EEG will decrease during RT (de-synchronisation), beta and theta may increase between RT and RT problem solving for each individual.

6.8.2 Methodological considerations

6.8.2.1 Single-subject research. Single-subject research designs have often been employed in neuroimaging research as a teaching tool, to explore unique pathology of individuals, and has contributed significant advances to our understanding of the functions of brain structures (Danckert & Mirsattarri, 2012; Yin, 2012). Multiple single-subject research paradigms allow for comparisons between different treatment conditions, individuals, and

phenomena. The advantage of this design approach is that each participant is their own control, therefore allows for an exploration of individual differences in response to an intervention that is tailored at the individual level, therefore this research design was selected for this research.

6.8.2.2 Telephone-delivered Kessler psychological distress Scale (K10). The K10 was selected for this research as a measure of psychological distress. The K10 is a brief, self-reported measure that asks participants to rate the extent to which they have been experiencing psychological distress (e.g. "How often have you felt tired out for no good reason?") on a scale of 1 (*not at all*) to 5 (*all the time*) over the last 30 days (Kessler et al., 2003). The K10 has been validated for use with older adults and over the telephone, with scores ranging from 10 – 50 (Andrews & Slade, 2001; ABS, 2012). A higher score indicates higher levels of distress. In accordance with the ABS, a minimum score cut off of 16 was used to select eligible participants who were experiencing moderate psychological distress or higher (ABS, 2012).

The K10 has demonstrated good concurrent validity with other measures of psychological distress, such as the General Health Questionnaire (GHQ) and Short Form Health Survey (SF-12) (Andrews & Slade, 2001). It also showed significant capacity to detect mental disorders such as anxiety and depression as per the DSM-IV (Andrews & Slade, 2001). The K10 was therefore chosen as a measure of psychological distress for this paper as it has been validated for delivery via the telephone, with older adults, and is an appropriate measure of psychological distress.

6.8.2.3 Sampling A subset of four participants (two in each treatment condition) from the sample in study 3 were selected based on the quality of the EEG data recorded. One participant was also excluded based on behavioural observations of his emotional lability and difficulty in staying orientated to task during the session (see Table 5). In the general

population, over 68% of older adults reported low levels of psychological distress, with 15% experiencing moderate distress in 2018 (AIHW, 2021). Just under 10% of older adults report high or very high levels of psychological distress on the K10 (AIHW, 2021). The participants scored between 21 and 34, ranging from *Mild* distress (Scores 16 - 24), to *Moderate* (K10 scores of 25-29) and *severe* (K10 scores 30 -50; see Table 7). To maintain an equal number of participants across both treatment conditions (RT and MRT), a choice was made between retaining participant 47 and 36 in the sample for the RT condition. Participant 47 was chosen due to her *severe* level of psychological distress at the time of the K10 assessment as a way of exploring any differences in her neurological connectivity following the treatment of RT.

Table 7.

A description of the decision-making for which participants were chosen for the EEG study subset.

ID	**Tx Condition**	**K10 scores**	**Quality of the EEG data notes**	**Included in paper 4 (Y/N)**
22	RT	21 (mild)	Complete data.	Y
56	MRT 1	21 (mild)	Complete data. Difficulty staying on task and emotionally labile. Excluded from analysis.	N
35	MRT 1	24 (moderate)	Complete data.	Y
69	RT	16 (mild)	Incomplete data. EEG failed to record during repeated eyes open.	N
51	MRT 2	29 (moderate)	Complete data.	Y
31	MRT 2	28 (moderate)	Incomplete data. EEG failed to record during repeated eyes open and closed.	N

47	RT	34 (severe)	Complete data. Chosen for inclusion in this study due to *severe* level of distress on the K10.	Y
36	RT	19 (mild)	Complete data. Excluded to keep equal number of participants between RT and MRT conditions.	N

**K10 scoring: 0 – 16 no distress, 16--24 mild distress, 25-29 moderate distress, 30-50 severe distress.*

6.8.2.4 Electroencephalogram (EEG). EEG is a neuroimaging technique that uses electrodes placed on the scalp to record the macroscopic electrical activity of the surface of the brain (Ray & Cole, 1985; Stern, 2013). EEG methods are often employed in studies investigating the wave band and neurological activity of music listening and music in therapy (see Banerjee et al., 2016; Byrns et al., 2020; Fachner et al., 2013; Koelsch, 2010; Kumagai et al., 2018; Lin et al., 2010; Lu et al., 2019; Omigie et al., 2015; Poikonen et al., 2016; Ramirez et al., 2018; Sanyal et al., 2017; Schaefer et al., 2011; Sun et al., 2013). EEG is also used to assess the cognitive changes that result from psychotherapy methods such as reminiscence, for example, research by Moscovitch et al., (2011) who investigated the neural changes using EEG recordings for those with social anxiety disorder following Cognitive behavioural Therapy treatment.

EEG is an accessible method of neuroimaging that provides information on the cognitive processes involved in human functioning, pathology and treatment (Fachner & Stegemann, 2013). EEG data therefore may answer questions regarding how and why interventions work (Fachner & Stegemann, 2013). For this project, EEG recordings were chosen as the method of data collection to address the gaps in the literature, namely what are

the underlying mechanisms that causes therapeutic changes for RT and MRT, and real time data detailing areas of activation for individuals engaging with these interventions.

This study generated large volumes of data, with over an hour of EEG data recorded over 64 electrodes during several cognitive tasks or event-related potentials (ERPs - a measurement timepoint locked to a particular stimulus such as the beginning of RT, or when music was played) for each participant. Several methodological choices were made as a way of organising the data into a smaller and cohesive narrative for publication. As such, the analysis was limited to several key ERPs – namely eyes closed as a baseline measure of cognitive activity, the beginning of the RT intervention protocol, the instrumental reminiscence question, and for participants in the MRT condition, the beginning of the music played. Furthermore, EEG data were condensed into rolling averages of 10 seconds for each ERP to obtain an average for that particular stimulus event. This ERP approach for analysis has been used in many similar publications, such as work by De Pascalis et al., (2020); Gordon et al., (2018) and Lawrence et al., (2014).

Initial analysis of the pre and post eyes open EEG recordings demonstrated minimal and insignificant differences for all participants in most areas, therefore this was excluded from further analysis (See appendix C for examples of Alpha wave EEG data). Eyes closed was chosen as the baseline measure as it represented resting states, and demonstrated more consistent changes between pre and post recordings. Recordings were also taken before and after the intervention session for verbal lexical fluency tasks, however, this fell outside of the scope for this paper and was not analysed.

For all statistical analysis conducted on the rolling averages for the band waves (e.g., alpha) for each ERP (e.g., eyes closed) the 64 electrodes were topographically aggregated into left and right lobe areas. The left/right frontal lobe each contained 7 electrodes, the left/right frontocentral areas contained 3 electrodes, the left/right central areas contained 3

electrodes, the left/right centro-parietal areas each contained 3 electrodes, the left/right parietal areas each contained 4 electrodes, the left/right parietal-occipital areas each contained 4 electrodes, and the left/right temporal areas each contained 3 electrodes. A midline area was also created using 3 electrodes (Fz, FCz and Cz). This echoes methodology from other similar studies such as work by Goodin et al., (2012) and Grabner & De Smedt, (2012) who grouped the electrodes into lobes areas. This approach allows almost all data to be retained, and allows for meaningful exploration for areas of peak activation.

Low resolution brain electromagnetic tomography (LORETA) is an algorithm that provides source localisation for surface level neurological activity identified by EEG (Pascual-Marqui, 2002). Standardised LORETA (sLORETA) provides estimated current density images with zero localization errors, meaning the internal source of the activity can be identified using EEG methods (Pascual-Marqui, 2002). EEG recording with sLORETA analysis was selected as it is less invasive than other neuroimaging methods (e.g., fMRI), reasonably low cost, and provides better temporal resolution that monitors instantaneous activation (Harmon-Jones & Amodio, 2012).

6.9 Ethics clearance

All original research contained within the dissertation was cleared and reviewed by The Swinburne University Human Research Ethics Committee. Ethical approval was obtained for the studies reported in paper 2 (2018/258), and 3 and 4 (2019/071). All conditions pertaining to the clearance were met. All submission documents and approvals can be found in Appendix D.

6.10 Context and contribution of the candidate

The dissertation was completed in partial fulfillment of the requirements for a Doctor of Philosophy (Clinical Psychology) program of study. The contributions of all authors

named on the manuscripts associated with this dissertation are outlined in the signed Declaration of Authorship forms.

6.11 Summary

This chapter provided and overview and justification of the methodology employed within the dissertation and across the associated manuscripts prepared during candidature. The following chapter presents the first published paper explore the role of music in RT.

Chapter 7. The role of music in reminiscence.

7.1 Chapter guide:

This chapter contains the published manuscript in the peer reviewed journal *Complementary Therapies in Clinical Practice.*

7.2 Paper 1. Planting the SEED: A model to describe the functions of music in reminiscence therapy for older adults.

Key words: Reminiscence therapy, music, wellbeing, autobiography, older adults

Authors: Engelbrecht, R., Bhar, S, & Cioriari, J.

Highlights:

- Music enhances reminiscence therapy for older people
- Why and how music is used to enhance reminiscence therapy is unclear
- A model is presented to explain the four functions of music when used to enhance reminiscence therapy.
- Music in reminiscence therapy helps to: 1) summon autobiographical memories; 2) evoke strong emotional reactions; 3) elicit physiological responses; and 4) define identity.

7.3 Abstract

Music-assisted reminiscence therapy involves the use of music, in any form, to prompt and augment the recollection of autobiographical memories and therapeutic reframing of the meaning of one's life and experiences. Music can be used to enhance reminiscence, but the rationale for using music to enhance reminiscence, and functions underlying the effectiveness of music as a way of enhancing reminiscence remain unclear. Drawing on interdisciplinary research in music therapy, psychology, sociology, gerontology, and neuroscience, this paper proposes a theoretical model for understanding the multiple functions of music when used in reminiscence therapy, and describes how music-assisted reminiscence therapy might be used to improve the wellbeing of older people. The SEED model proposes that music, when used in reminiscence interventions, helps to: 1) summon autobiographical memories; 2) evoke strong emotional reactions; 3) elicit physiological responses; and 4) define identity. Evidence for the four proposed functions of music is presented and how they work together in reminiscence therapy is discussed. The SEED model expands on previous research and theory on music and reminiscence, neural and cognitive processing, and the use of music in other therapeutic contexts. While further research is needed, the SEED model maps the benefits and indicators for the use of music in the context of reminiscence therapy.

Music is enjoyed by people across the lifespan (Wigram et al., 2002) and is embedded in our memories, culture and daily life. Music can represent not only sociocultural and generational experiences (e.g., protests, cultural shifts or world wars), but one's personal memories, lived experiences, and identity (Brandellero & Janssen, 2014). Music is used in psychological interventions such as reminiscence therapy (Istvandity, 2017) although the function of music in such treatment, and the mechanisms by which it enhances reminiscence are not widely understood.

Reminiscence is the act and process of recalling past experiences and self-narratives (Webster et al., 2010). As people age, they tend to reminisce about past experiences to arrive at a place where they can view their life as a whole, and reflect on meaning. Such reminiscence can provide a sense of continuity, purpose and mastery of one's life (Erikson, 1959) and hence has been regarded as beneficial in fulfilling these needs in later stages of life (Erikson, 1959; Butler, 1963).

Reminiscence therapy (RT) is an intervention for improving the wellbeing and quality of life for older people. There are three types of RT: *Simple reminiscence* (unstructured autobiographical recall, often loosely based on a simple theme such as holidays, for the purpose of social interaction and short-term wellbeing), *life review* (focusing on life meaning and identity), and *life-review therapy* (a therapeutic reframing of life narratives or reflection on past successes; Webster et al., 2010). RT has been found to be effective for improving multiple aspects of wellbeing in late life, including life satisfaction (Cappeleiz et al., 2005), quality of life (Woods et al., 2018) and mood (Cotelli et al., 2012; Chin, 2007; Pinquart & Forstmeier, 2012). Prompts such as music, objects, pictures, scents and technology applications can be used to foster reminiscence (Cuevas et al., 2020).

Music-assisted RT involves the use of music to prompt or augment the recollection of memories and thus therapeutic outcomes. Music has been used in various interventions

involving reminiscence: Life-review song writing (Baker & Ballantyne, 2012), reminiscence with music listening or active music making, and music-assisted counselling (Nguyen, 2003). In their life-review therapy protocol, Duffey (2005) and colleagues (Duffey et al., 2008) used music playlists to help participants recount their personal histories. Participants listened to music and songs from their childhood, and talked about the memories associated with them. Unhelpful narratives about the past were reconstructed, and goals for the future were expressed and discussed.

The use of music to prompt reminiscence has helped individuals to share personal narratives (Otero et al., 2013). Music with reminiscence has been shown to reduce perceived loneliness (Millet & Fiocco, 2020) and psychological distress (Ashida, 2000; Mohammadi et al., 2011; Rawtaer et al., 2011). Listening to music has been associated with the formation of identity, increased life satisfaction (Bennett & Mass, 1988; Haslam et al., 2014; Millet & Fiocco, 2020; Nyugen, 2003) and improved physiological outcomes such older people's cortisol levels, measured in saliva, and blood pressure (Takahashi & Matsushita, 2006). Istvandity (2017) conducted a systematic review of studies comparing the effects of RT with and without music and, in four of the five studies reviewed, music-assisted RT was significantly more effective than RT without music for improving late-life wellbeing. While the published literature suggests that music adds to the effectiveness and enjoyment of reminiscence, further research is needed to clarify *how* music enhances RT.

This paper proposes a model for understanding the functions of music in music-assisted RT. Such a model is needed to improve the consistency of future research in this domain, and to inform professional practice, given that MRT is an intervention that requires specialist knowledge across multiple fields such as psychology and music therapy. Although RT uses other prompts, the present review focused on music only because it is connected

with aspects of wellbeing and memory (Chanda & Levitin, 2013; El Haj et al., 2012), has an established clinical utility in therapy (Wigram et al., 2002).

The literature reviewed for the purposes of developing the model was sourced from databases such as EBSCO, SCOPUS and PUBMED, using key words such as: "older adult" or "elder*" and "wellbeing," "music" or "song" and "reminiscence," "life stor*," or "autobiograph*". Studies were excluded from the literature review if they did not involve either personal recall or reminiscence, or music. Results are organized into categories of autographical memory and recall, emotion, physiological wellbeing, and identity.

7.4 Autobiographical memory and recall

Autobiographical recall is a key component of RT. Past experiences, self-narratives, accomplishments, and problem solving are themes in RT that are central to improve self esteem, mastery, and self-efficacy (Mills, 1997; Webster et al.). Music appears to play two roles in summoning recall: it *prompts* the retrieval of autobiographical memory, and *enhances* the vividness, accessibility and impact of retrieved memories. One of the primary functions of listening to music during RT is to assist older people summon their autobiographical memories. Multi-process retrieval theory proposes that there are numerous ways to recall autobiographical memories: strategies can be *direct* (involuntary), *hierarchical* (effortful ordered searching through levels of memory; Haque & Conway, 2005), *repeating* (internally or verbally repeating cued phrase or prompt until memory is found), and/or *temporal* (using a calendar, the seasons, or related to time; Mace et al., 2017).

Acknowledging the variety of strategies that are available for retrieving memories, it could be argued that music is a flexible cue for autobiographical memory in RT, serving as an archive (Istvandity, 2015) that can be searched in multiple ways. Music prompts autobiographical memory by enabling the individual to access both direct and involuntary memory retrieval (El Haj et al., 2012). A chorus or repetitive song lyric could be used as a

repeating prompt for recall, and songs in particular genres from particular time periods (e.g., from the 1960s), or the content of their lyrics, can be temporal triggers (e.g., songs that remind one of past events or experiences; Ford et al., 2011; Mace et al., 2017). Older adults report that their primary motivations for listening to music are to reminisce, recall memories, and reflect on their own lives and experiences (DeNora, 2000; Schäfer et al., 2013).

Music has been found to prompt increased recall of autobiographical memories, particularly when memory may be impaired. In a study on autobiographical recall, the amount of autobiographical memories recalled was compared between 12 healthy older adults and 12 with dementia in three conditions: Silence, with participant-chosen music, and with classical music chosen by the researcher (El Haj et al., 2011). Participants diagnosed with dementia demonstrated significantly more autobiographical memory recall in their chosen music condition only. This finding has been consistent across multiple studies and applications of music and reminiscence for song-related and autobiographical memory for those with mild Alzheimer's dementia (Basaglia-Pappas et al., 2013; Irish et al., 2006; Särkämö et al., 2014). Music appears to assist with retrieval of autographical memories, particularly for individuals with cognitive impairment.

Why does music help retrieve autobiographical memories? Several mechanisms have been suggested to mediate the relationship between music and memory recall, namely emotion and improvements in cognitive function. Improvements in executive function, mood, stress, and anxiety have been associated with listening to music, which is purported to enhance general cognitive function and therefore one's ability to recall autobiographical memory (Allen et al., 2018; Brancatisano et al., 2019; Kubit & Janata, 2018; Irish et al., 2006). Likewise, music evokes emotional states including nostalgia (Zentner et al., 2008), and emotion is linked to memory storage and retrieval (Tambini et al., 2017; Sheldon & Donohue, 2017). The emotions of memories are a strong cue to prompt recall and are an

integral part of the recounted story within reminiscence (Mills, 1997). Individuals are more likely to recall autobiographical memories when cued by songs that are emotionally meaningful to them (Schulkind et al., 1999). Such memories are also likely to be congruent with the emotion induced by the music (Bower, 1981; Sheldon & Donahue, 2017; Knight et al., 2002). The emotional reaction to the music appears to be a key trigger for summoning memories (Garcia et al., 2012).

Music can also change the vividness, accessibility, and impact of autobiographical memories retrieved (Baumgartner 1992; El Haj et al., 2012). In one study, 16 young adults, 16 older adults, and 16 people with probable Alzheimer's dementia were asked to remember autobiographical events in two experimental conditions: with individually-preferred music or in silence (El Haj et al., 2012). Memories prompted through music were significantly more vivid, were retrieved faster, and had a more soothing effect on mood. In another study, older participants with and without dementia rated music-evoked autobiographical memories as more vivid compared to younger adults (Cuddy et al., 2017).

7.5 Emotion

Emotion plays a strong role in RT. Cappeliez and colleagues (2008) noted that emotion was a central experience and outcome related to the different types of RT. RT can occur in the context of positive or negative affect, by eliciting, maintaining or amplifying feeling (Cappeliez et al., 2008). Likewise, Williams et al., (2014) documented the high prevalence of emotion in life review, narration, and self-revelation for those with early-stage dementia. Both positive and negative affect played an important role in the therapeutic process, including for expression, release, and therapeutic reframing (Williams et al., 2014). Listening to music evokes emotional reactions during RT. Music can evoke and modulate emotions through the activation of limbic and paralimbic brain structures, regions of the brain that are important for the regulation, initiation, detection, generation, and termination of

emotions (Koelsch, 2010). Juslin and Våstfjåll (2008) suggest six mechanisms for how music elicits emotion: 1) Sounds trigger arousal responses; 2) Learned pairing and conditioning of positive stimuli associated with particular songs; 3) Emotional contagion in which the person mimics perceived emotions expressed by the music; 4) Visual imagery is conjured to accompany the music; 5) Music triggers episodic memory of a particular event or time; and 6) Musical expectancy, when the expectations of the music are not met or surprise occurs. Evidence for this model has shown that music triggers autobiographical memories with greater emotional valence and reactions (El Haj et al., 2012), music mimics emotion (Zentner et al., 2008), and unexpected changes in musical structures (e.g. new instrument, melody or dynamics) resulted in emotional responses demonstrated via peak frontal asymmetry through electroencephalogram imaging (EEG; Arjmand et al., 2017). This model can be used to explain the various ways music may augment RT through emotion, which may be particularly helpful for RT types such as *life review therapy* involving reframing of past experiences and interpretations (Webster et al., 2010).

Emotions evoked by music are more frequently reported to be perceived rather than felt. Research into the emotional content of music listening demonstrated that perceived emotions (e.g. recognition of sadness) differed significantly from the felt emotions (e.g. feeling sad), particularly for negative or unpleasant emotions (Zentner et al., 2008). Music can symbolically represent the full range of human emotion, and offers detachment from actual real-life threat or emotional distress (Zentner et al., 2008). This may explain why listening to sad music can elicit perceived sad emotions, but is often reported and viewed as a positive experience for older people (Cuddy et al., 2017; Laukka, 2007).

Older adults have been found to respond differently to music compared to younger adults. In one study, older participants demonstrated greater emotional reactivity for happy music compared to the other emotional dimensions (termed a *positivity effect*), and showed

decreased responsiveness to scary and sad musical excerpts compared to young adults (Vieillard & Gilet, 2013). Some researchers have questioned the validity of this positivity effect (López-Cano et al., 2020).

Listening to music induces a sense of pleasure and enjoyment, improves mood, and activates the dopaminergic reward system, increasing the motivation of listening (Laukka, 2007; Zatorre & Salimpoor, 2013; Bennett & Mass, 1988; Coffman, 2002). In studies comparing music-assisted and verbal reminiscence, participants consistently rated music-evoked memories as more engageing or enjoyable than verbal reminiscence alone (Bennett & Mass, 1988; Clyburn & Cohen, 1995; Brancatisano et al., 2020). Research by Zatorre and Salimpoor (2013) has shown that subcortical systems such as the nucleus accumbens may play a mediating role in facilitating the reward and motivation drive of music listening and the resulting dopamine release. Collectively these findings establish that music may induce strong emotional reactions and pleasure, thereby possibly increasing therapeutic effects of RT.

7.6 Physiological wellbeing

Little is known about the physiological or physical health outcomes of RT. A pilot study conducted by Shellman and colleagues (2019) investigated the use of group reminiscence on physical activity compared to a health information control group to improve physical pain and participation in physical activity. Student-nurse facilitated and conversational reminiscence did not increase physical activity, but instead lead to increased reported pain intensity (Shellman et al., 2019). Recent work by King and colleagues (2019) showed that self-positive (e.g. focused on life meaning, identity and problem solving) and self-negative (e.g. rehashing negative experiences, filling a void of stimulation, and lost relationships) reminiscence patterns predicted long-term physical health outcomes for older people. While this research explores reminiscence in the general sense, it clearly indicates

that RT as a intervention could influence physical health, though the mechanisms for this influence remains unknown.

Music elicits autonomic physiological changes during RT. Music alone stimulates physiological changes in the body, including changes to heart rate, respiration rate (Gomez & Danuser, 2007), blood pressure (do Amaral et al., 2016; Sutoo & Akiyama, 2004), and hormone levels (Menon & Levitin, 2005). Musical elements (e.g. rhythm) are interpreted by the subcortical structures (e.g. brain stem and cerebellum) before moving to the auditory systems, resulting in cued motor coordination and physiological responses (such as influencing heart rate; Levitin, 2006). Recently, Mütze and colleagues (2020) found no straightforward or simple correlation between rhythmic cues (e.g. a simple djembe drum beat) and heart rate synchronization (Mütze et al., 2018), suggesting other variables are also involved in this physiological response.

Very little research has explored the physiological outcomes of music-assisted RT. Takahashi and Matsushita (2006) compared the physiological outcomes of group music therapy for older people with moderate to severe dementia living in residential aged care in Japan. The results showed systolic blood pressure was significantly reduced over a period of 2 years for those in the music therapy condition, which included active singing, reminiscence, and instrument play. Those in the music therapy group also tended to have lower cortisol in saliva samples over the two years compared to the control group, although this difference was not significant. Given the mixed intervention involving both music therapy methods and reminiscence, it is unclear what is responsible for the trend towards physical improvement. For older people, music without reminiscence impacts on physical wellbeing, including reduced pain (Zhao & Chen, 2009), reduced medication use (Romo & Gifford, 2007), improved immunity, and can play a protective role against the negative effects of ageing and stress (Chanda & Levitin, 2013). Chanda and Levitin (2013) reviewed a small number of

studies that investigated the neurochemistry of music to reduce stress and improve immunity for older people. Preliminary results showed participation in music interventions improved markers of innate immunity (e.g. through increased cytokines with anti-inflammatory properties), although further testing is required. It is plausible that these effects would occur when music is used in RT with older people.

7.7 Self-identity

A strong and coherent sense of identity is an important contributor to wellbeing (Rathbone et al., 2015) and is a core concept in RT. Continuity theory states that successful ageing involves adaptive choices to maintain internal characteristics and external activities (Atchley, 1989), and that identity influences post-retirement self-esteem (Drentea, 2002). For older adults, music plays an important role in both formulating a sense of wellbeing and continuing engagement in preferred activities. In their Australian study of 52 older people, Hays and Minichiello (2005) investigated the musical identities of novices, amateurs, and professional musicians, and found that both listening and actively making music were associated with wellbeing for all groups. This association was attributed to the capacity for music to communicate key social information regarding their sense of self (personality, core traits, and experience) and to connect to others (Hays & Minichiello, 2005).

Music is intrinsically linked with concepts of identity. When viewed from a social identity theory perspective, music preferences clearly show characteristics of social group identity, defining both the in- and out- group (Tajfel & Turner, 1979; Tekman & Hortaçsu, 2002). Evaluations of people with similar musical preferences are more favorable than of people liking different music. Music preferences are formed through both intrinsic characteristics of the music (e.g. perception of musical elements) and extrinsic factors such as character traits, life experiences, culture, and symbolically represent ourselves and others (Bonneville-Roussy et al., 2017; Ruud, 1997; Rentfrow & Gosling, 2006). Research into

topics of conversations for adult psychology students becoming acquainted with strangers showed that music dominated conversation in all introductions and conversations, and across all six weekly meetings (Rentfrow & Gosling, 2006). Music preferences therefore play a key role in connecting with others, forming social perceptions, and describing identity. Taking this a step further, sharing music creates social cohesion and evokes emotions, self-esteem and empathy (Elvers, 2016), and social bonding with music listening results in endorphin release (Tarr et al., 2014). While these findings are yet to be replicated with older adults, music remains prevalent across daily life for older people, defining their sense of identity, and providing opportunity for self-recognition, reflection, social connection, and for pleasure (Amir, 2012; Creech et al., 2013; Laukka; 2007).

Identity is also linked with autobiographical recall (Conway, 2005). Music heard in childhood and young adulthood is more likely to be recalled (termed the *reminiscence bump*; Rubin et al., 1986; Platz et al., 2015) and to trigger autobiographical memories (Krumhansl & Zupnick, 2013; Schulkind et al., 1999). The *reminiscence bump* has been related to the age in which sense of self, or identity develops (Rathbone et al., 2008). The relationship between how we view our self, and our memory is bi-directional; our memories provide meaning and context for our sense of self and identity (our experiences, preferences, beliefs and characteristics), and equally, our identity provides context and control over how we retrieve and store our memories (Conway, 2005). New self-image memories (e.g. how we see ourselves) are encoded in such a way that they remain highly accessible and remembered in later life (Rathbone et al., 2008). When applied to music-assisted RT, this self-memory relationship implies that our most self-salient memories will be coded in a way that forms both our sense of identity and also our retrieval patterns. El Haj and colleagues (2011) found that older participants in self-selected music conditions recalled significantly more *self-defining* memories, described as an event related to personality development, unresolved

conflicts, or that contributed towards the way in which participants viewed themselves, compared to recall conditions without music.

Music also allows for greater linguistic expression of autobiographical memory. Participants with Alzheimer's dementia in music and reminiscence conditions were able to recall more language and words to describe memories, thereby enhancing not only their memory recall, but also their capacity to communicate memories (El Haj et al., 2013). More recently, digital life stories with music have been used to help those with dementia and their carers to communicate concepts of identity and memories, and build resources (e.g. videos) that can be used regularly outside of the therapeutic context (Kindell et al., 2018). When used in RT, it is therefore possible that music helps to define and represent identity, establish and maintain social connections, and improve communication.

7.8 The function of music in reminiscence therapy: The SEED model

Music effects memory, attention, emotion, and the development and communication of self-identity. The SEED model proposes these are the underlying mechanism music's capacity to enhance RT. Music has the capacity to activate multiple regions, neural pathways, and structures of the brain, such as the auditory cortex, as well as widespread and bilateral areas of the parietal, temporal, frontal, cerebellar and limbic regions, areas involved in perception, processing, attention, memory, emotion, mood and motor coordination (Koelsch, 2010; Särkämö et al., 2013). Put simply, music uses regions of the brain associated with higher executive function, memory and emotion.

The SEED model provides an overview of the mechanisms by which music is proposed to enhance RT. They include summoning autobiographical memories, evoking emotions, eliciting physiological responses, and defining and describing identity and social relatedness (see Table 8).

Table 8.

The SEED model: The four functions of music in reminiscence therapy.

Function	**Underlying Mechanism**	**Literature**
Summon and enhance autobiographical memories	Music has the capacity to summon autobiographical memories through widespread and bilateral activation of large-scale regions of the brain, including the auditory cortex, parietal, temporal, frontal, cerebellar, and limbic regions. Autobiographical memories retrieved with music have been shown to be retrieved significantly faster and are significantly more vivid than those retrieved without music.	Istvandity, 2015; El haj et al., 2012; Ford et al., 2011; DeNora, 2000; Schäfer et al., 2013; El Haj et al., 2011; Basaglia-Pappas et al., 2013; Irish et al., 2006; Särkämö et al., 2014; Allen et al., 2018; Brancatisano et al., 2019; Kubit & Janata, 2018; Irish et al., 2006; Zentner et al., 2008; Garcia et al., 2012; Baumgartner 1992; Cuddy et al., 2017.
Evoke strong emotional reactions and pleasure	Music evokes strong emotional reactions by both mimicking and eliciting emotional content, and activates the limbic and paralimbic neural structures that are known to be used for emotional processing. Music induces pleasure through dopamine release.	Koelsch, 2010; Juslin &Våstfjåll, 2008; Zentner et al., 2008; El Haj et al., 2012; Arjmand et al., 2017; Cuddy et al., 2017; Laukka, 2007; Vieillard & Gilet, 2013; Zatorre & Salimpoor, 2013; Bennett & Mass, 1988; Coffman, 2002; Clyburn & Cohen, 1995; Brancatisano et al., 2020.
Elicit autonomic physiological responses	Music stimulates autonomic physiological changes in the body, including changes to the heart and respiration rates, blood pressure, and hormone levels, through activating subcortical structures. Music improves immunity and	Gomez & Danuser, 2007; do Amaral et al., 2016; Sutoo & Akiyama, 2004; Menon & Levitin, 2005; Mütze et al., 2018; Takahashi & Matsushita, 2006; Zhao & Chen, 2009;

	reduces the need for medication to control pain.	Romo & Gifford, 2007; Chanda & Levitin, 2013
Define and describe identity	Music plays a role in describing and communicating our identity and social connections, is linked with our social and psychological wellbeing, and the coding of self-identity memories.	Hays & Minichiello (2005); Tajfel & Turner, 1979; Tekman & Hortaçsu, 2002; Bonneville-Roussy et al., 2017; Ruud, 1997; Rentfrow & Gosling, 2006; Elvers, 2016; Tarr et al., 2014; Amir, 2012; Creech et al., 2013; Laukka; 2007; Conway, 2005; Rubin et al., 1986; Platz et al., 2015; Krumhansl & Zupnick, 2013; Schulkind et al., 1999; Rathbone et al., 2008; El Haj et al., 2013; 2011; Kindell et al., 2018.

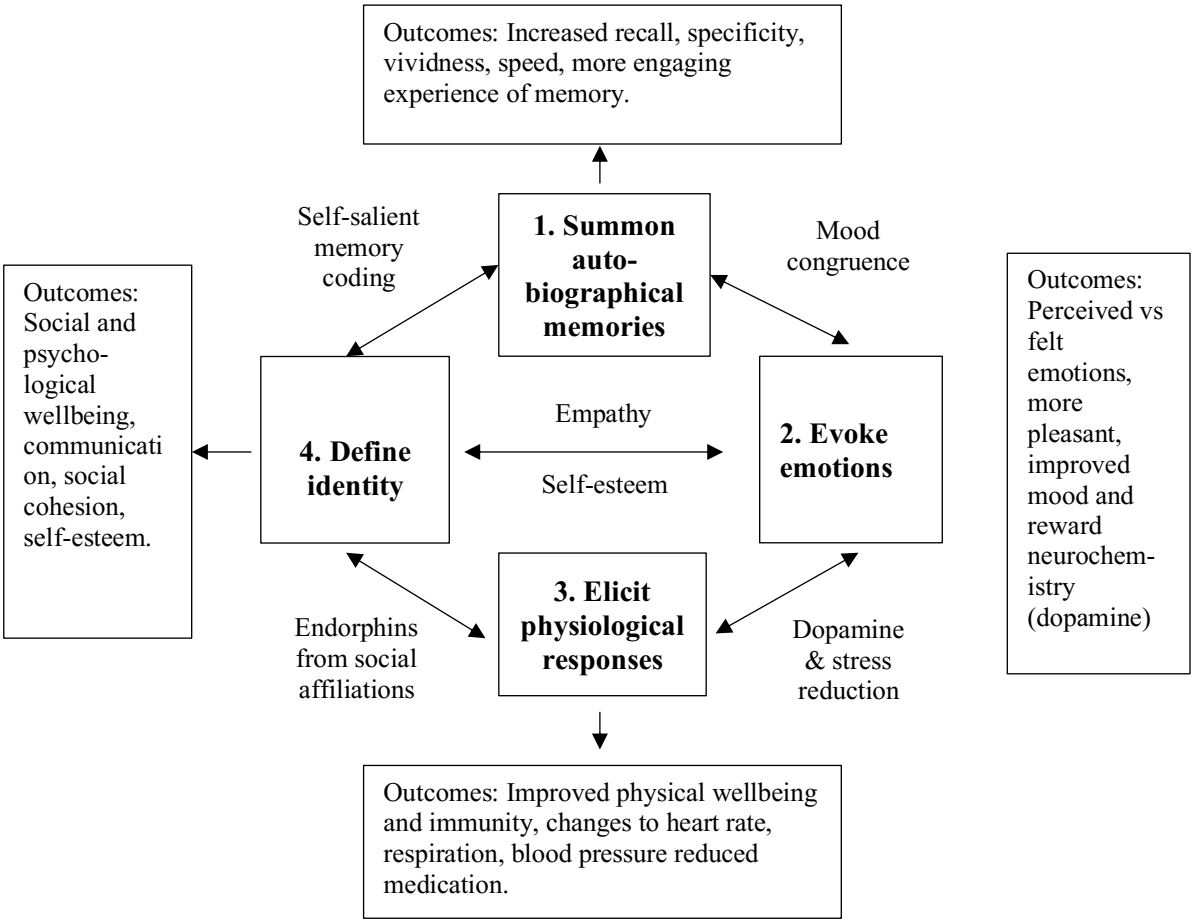
7.9 Discussion

This model uses theory and research from differing perspectives across cognitive, psychosocial, emotional, and physiological domains, which allows for a holistic and comprehensive view of the functions of music in RT. The four factors of this model work as an intersecting and sometimes simultaneous process: Music provides varied prompts for recall and enhances memory experiences, elicits emotion, influences our physiological wellbeing and functioning, and is intrinsically linked to our sense of identity (see Figure 2). Underlying all four functions is widespread neural activation. As shown in Figure 2, the four functions are related and overlap. The emotions evoked by music impacts on the type of autobiographical memory that is recalled (mood congruence; Knight et al., 2002). Social identity affiliations and emotions (e.g. empathy) result in neurochemistry changes to our

physiology such as dopamine release and stress reduction (Elvers, 2016; Tarr et al., 2014). The encoding procedure for new self-salient memories indicates a strong relationship between concepts of identity and memory recall (Rathbone et al., 2008; See Figure 3).

Figure 2.

The SEED model: The four functions, related outcomes, and relationships between functions of using music in reminiscence therapy.



The order in which the functions operate in music-assisted RT is hypothesized to be flexible and may vary with each unique experience, as in Mace and colleagues (2017) multi-process theory of recall. It may be that emotion plays a role in initiating what music is selected, which then impacts on the memory recalled, the subsequent physiological responses, and psychosocial factors such as identity. At other times, the music may give rise

to the entirety of the four factors. Further research is needed to clarify whether consistent patterns or a sequential order of factors exist, and how the different reminiscence activities (e.g. *simple, life review, life review therapy)* map onto these factors.

This model taken in its entirety remains untested. However, the SEED model builds on previously validated functions of music in other contexts. Schäfer and colleagues (2013) demonstrated that, for older people, recreational music listening has the underlying functions of arousal and mood regulation, to achieve self-awareness, and to express social relatedness. More recently, Brancatisano and colleagues (2020) proposed a model to explain the broad therapeutic role of music in the treatment of neurological disorders, in which they discuss the seven capacities of music to make therapeutic change, and the underlying neurological and emotional mechanisms for this change. The SEED model is consistent with this approach, with several similarities, such as cognitive functions (summon memories), emotional functions (evoke emotions), physiological functions (elicit physiological responses), and psychosocial functions (defines identity and social relatedness). The SEED model offers a unique perspective by focusing on music in the context of RT, and goes further by discussing the relationship and connection between the functions and incorporating the outcomes for older adult populations. Despite this contribution, this model does not consider other prompts such as objects, scents, or pictures, and is therefore limited in its scope.

Previously, the function of music varied based on the specified outcomes to be measured within studies, such as anxiety, stress, depression (Ashida, 2000; Haslam et al., 2014; Mohammadi et al., 2011; Rawter et al., 2015), identity, life satisfaction, cognition (Haslam et al., 2014) and physiological outcomes (Takahashi & Matsushita, 2006). When comparing the existing body of literature against the SEED model it becomes clear that the focus to date has been on proving the use of music and RT for a single factor of wellbeing (e.g. anxiety), or improving the recall of autobiographical memories for those with dementia

(El Haj et al., 2015). While these outcomes represent areas of significant hardship facing the older adult cohort, the SEED model reminds us of the varied benefits associated with including music in RT, which warrant further and more detailed exploration. Furthermore, given the paucity of research investigating the physiological responses to music and RT, this factor represents an area of relative weakness compared to the other factors of the model, and further research is needed.

The growing field of literature for music-assisted RT is theory poor. As an intervention that combines two modalities (music and psychotherapy), the SEED model allows for a much needed marriage of knowledge and theory from a variety of specialist fields in order to guide future clinical practice and research. The SEED model can also indicate when music may be used to increase treatment efficacy for RT. For example, those with dementia, memory impairments, difficulties with emotions, social difficulties, or communication limitations would clearly benefit from greater prompting of memories, emotions, and linguistic expression that music may be able to provide during reminiscence. Music is not appropriate in all situations, and considerations of personal preference and history are essential. Consider what may happen if music was used to strengthen unpleasant or disturbing memories, for example, with those who have lived through war or trauma, or if a vulnerable person became overstimulated. Caution is therefore advised when implementing these two therapeutic modalities together. Further investigation into validating this model is required, including exploring how the factors work together and map onto the three reminiscence therapy types. Further work is needed to consider what, if any, negative outcomes are associated with using music to enhance RT. Randomised-controlled trials with clearly delineated and replicable methodology are warranted to determine the treatment effects across all four factors, outcomes for different types of music and RT combinations,

how technology could be used with music-assisted RT, and the short- and long-term outcomes for reminiscence with and without music.

7.10 Conclusion

The role of music in RT relies on its bilateral and widespread activation of nearly every structure and region of the brain. The SEED model proposes that music's specific functions in RT include: Summoning and enhancing autobiographical memories; Evoking strong emotional reactions; Eliciting physiological responses; and Defining and communicating self-identity and social-relatedness. The SEED model therefore attempts to create a theoretical and functional picture of what is occurring when music is used during RT. While music may be an enhancing factor in RT, further research is needed to continue to develop our understanding of why and how music could be used intentionally to improve the wellbeing of older people in reminiscence.

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Declarations of interest: none

Chapter 8. The use of reminiscence and music in reminiscence.

8.1 Chapter guide

This chapter presents paper 2, reporting on the descriptive study conducted with those who work and volunteer with older adults. This paper has been formatted and submitted for review in a peer-reviewed journal.

8.2 Paper 2. Reminiscence therapy and music with older adults: A mixed-method descriptive study investigating the current views and practices of Australian aged care workers and volunteers.

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8.3 Abstract

Aims

Reminiscence and music are often used together to improve the wellbeing of older people, however we do not know how reminiscence is used or combined with music in practice. This descriptive study explored how those working with older people view and use verbal Reminiscence Therapy (VRT) and Music-assisted Reminiscence Therapy (MRT).

Method

A total of 110 participants who worked with older people in Australia were surveyed in this mixed-method study on their practices in using VRT and MRT. Participants were asked to identify the purpose and frequency of use for these interventions, and to describe an experience in which they had used VRT and MRT with an older person.

Results

Eighty-four percent of participants used RT frequently in their work, and 82% of respondents who used VRT also reported commonly using MRT. '*Simple reminiscence'* was the most reported intervention for both VRT and MRT. Both VRT and MRT were used most frequently to facilitate social engagement and to validate identity. VRT and MRT were also often used spontaneously as ameliorative and preventative interventions. Memories elicited in VRT and MRT were primarily about *family* and *places.* Participants considered VRT and MRT to lead to positive outcomes including: better care practices, positive affect and mood, and improvement in social connections. MRT was used as a compensatory strategy when traditional VRT was not possible. This study provides a snapshot of current practices involving VRT and MRT, and thus provides an overview of how reminiscence-based approaches are used in Australia.

8.4 Introduction

Australia has an ageing population. Current projections estimate that Australians aged over 65 will account for more than 25% of the population by 2057 (Australian Institute of Health and welfare, 2018), indicating a growing need for infrastructure, healthcare services, and a skilled workforce to meet increasing demands. The psychological wellbeing of older adults impacts on physical health, functional and cognitive decline, and life expectancy (Brummett et al., 2001). In Australia, approximately 10-15% of older adults living in the community report experiencing poor mental health, and over half (52%) of those living in residential aged care settings have significant levels of anxiety and depression (Australian Institute of Health and welfare, 2013, 2018). It is imperative that direct care workers such medical clinicians, allied health practitioners, nurses and personal care assistants have effective strategies to support the mental health of the ageing population.

Reminiscence therapy (RT) - an intervention that uses purposeful and directed reminiscence (Webster et al., 2010) - has been found to be effective in improving mood, cognitive function, loneliness, quality of life, mental health, happiness and well-being for older people in care and living at home (Bohlmeijer et al., 2007; Brooker & Duce, 2000; Chaing et al., 2010; Gudex et al., 2010). Reminiscence is the act of recalling past experiences or events, as an internal process of recollection or a story that is shared with others (Webster et al., 2010). Different types of RT exist, each with different purposes and outcomes on the wellbeing and psychological adjustment of older people (Wong & Watt, 1991). When using the model developed by Webster and colleagues (Webster et al., 2010) RT can take the form of simple discussions around a specific topic, such as 'holidays' (*simple* reminiscence), a review of one's life focused on finding meaning and identity (*life review*), or a reflection of past problem solving successes and achievements (*life review therapy*).

Music and its application in health and therapy has also been linked with wellbeing, often leading to therapeutic outcomes such as improved mood, self-esteem, depression, cognitive function and anxiety (Coffman, 2002; Hanser & Thompson, 1994; Hars et al., 2014). Music is important for older adults in identity formation, connecting with others, and expressing self-identity and emotions (Coffman, 2002; Cohen et al., 2012; Creech, Hallam, McQueen, et al., 2013; Engelbrecht, Bhar, et al., 2021).

The use of music in RT has been found to improve the psychological wellbeing outcomes of older adults. Music-assisted RT (MRT) is the use of music in any form (e.g., recorded, live, or as a topic for discussions) to enhance the reminiscence therapy experience. A systematic review of studies that compared RT alone (VRT) or with music (MRT) found that in four out of five studies reviewed, the inclusion of music listening or making resulted in significantly greater wellbeing outcomes for older people (Istvandity, 2017). The outcomes associated with MRT ranged from the psychosocial: such as improvements to mood, depression and anxiety (Ashida, 2000; Mahendran et al., 2017; Mohammadi et al., 2011; Rawtaer et al., 2015), group coherence, and life satisfaction (Haslam et al., 2014); to the cognitive and emotional, including: increased memory recall (El Haj et al., 2011); strength of emotional responses; and speed, vividness and pleasantness of recalled memories (El Haj et al., 2012).

Music is also highly motivating and engaging. Potts and colleagues (Potts et al., 2020) recently developed a reminiscence app using a combination of prompts with written questions, such as pictures (general or personal), or music (general or personal). The researchers then looked at the acceptance (e.g., participation) or dismissal rates of the reminiscence prompt questions delivered to those with dementia and their carers on their phones. The results showed that app users were more likely to respond to reminiscence questions when they followed general musical prompts, compared to photos, specific music

or other media (Potts et al., 2020). The inclusion of music appears to increase the efficacy of treatment effects and level of interaction with reminiscence activities (Istvandity, 2017).

Music is often included as a tool to prompt memories and enhance experiences in RT, however, the use of music in RT is varied and poorly reported (Istvandity, 2017). Studies have used VRT over single sessions (James & Bhar, 2016), time-limited programs from six weeks (Stinson, 2009) up to 8 to 12 weeks (Cuevas et al., 2020), or as part of the ongoing lifestyle program. For healthy young adults, a single session of VRT improved ratings of pessimism, depression and mastery (James & Bhar, 2016), however, this study is yet to be replicated with MRT, or with older people. Studies directly comparing MRT with either a control or VRT condition have also used varied methodology (Istvandity, 2017), including group and individual sessions across time limited session (e.g. 5 x daily, up to 6 to 10 weekly sessions)(Ashida, 2000; Duffey et al., 2008; Haslam et al., 2014; Mohammadi et al., 2011), or long term regular programs for 6 up to 12 months (Mohammadi et al., 2011; Rawtaer et al., 2015).

The extent to which research investigating the use of VRT and MRT mirrors clinical practices is unknown. Specifically, questions remain about how reminiscence therapies with and without music are being used in practice. Only one study to date has provided insight into the usual practices of such interventions. Kris et al., (Kris et al., 2017) surveyed 43 caregiving nurses working at nursing homes in Connecticut, USA, and found that less than half frequently engaged in reminiscence with their clients. The most commonly reported reasons for staff to use RT was to help residents to relax, to reflect on the meaning of life, and to feel more oriented (Kris et al., 2017).

Given the paucity of such research, the aim of this study was to quantify and qualify the usual practices of aged care workers with respect to using VRT and MRT. Such an exercise was expected to clarify the treatment as usual paradigms for those in aged care in

Australia. The aims of this study were to investigate: 1) The extent to which VRT and MRT were used by direct care workers in the aged care sector, 2) How such interventions were delivered and viewed, and 3) The purpose and observed benefits of such interventions.

8.5 Method

This study involved a mixed method design, involving quantitative data collection (e.g, self-report surveys) integrated with qualitative data (e.g., a brief semi-structured interview). This study was descriptive; therefore, there were no hypotheses.

8.5.1 Participants

Individuals were eligible to participate if they were 18 years or over, working in a paid or volunteer capacity with adults aged 65 years and over, and were able to read and speak English. The sample comprised 110 participants. Of these, 18 participants did not answer any questions after consenting to participate, and were removed for analysis. The sample analyzed comprised the remaining 92 participants (See Table 9 for participant demographic information).

Table 9.

Participant demographic information.

Participant variables	Mean (SD)	N (%)	Range
Age	42.6 years (14.4)		19-79
Gender			
Male		17 (19%)	
Female		74 (81%)	
Language spoken at home			
English		86 (95.6%)	
Other		4 (4.4%)	
Years of work experience	8.5 years (7.63)		0.5 – 40
Occupation			
Personal carers		8 (8.7%)	
Nurses		22 (22.8%)	
Doctors		1 (1.1%)	
Allied health		41 (44.6%)	

Volunteers	5 (5.4%)
Lifestyle	6 (6.5%)
Others	10 (10.9%)
Work setting	
Residential aged care	48
Community care	17
Hospitals	35
Palliative care	27
Private clinics	8
Location in Australia	
VIC	54 (59.4%)
NSW	15 (16.5%)
QLD	6 (6.6%)
SA	2 (2.2%)
WA	0
NT	0
TAS	3 (3.3%)
ACT	11 (12.1%)

Note: participants could select multiple work settings.

The allied health sample comprised workers such as psychologists, social workers, pastoral carers, music therapists, occupational therapists, and art therapists. Participants could select multiple work settings, and worked across settings such as residential aged care, community care, or hospitals. The majority of participants (66%) worked in one setting only (e.g., residential aged care only).

8.5.2 Materials

Data were collected using a purpose-built survey. The survey was refined through two small focus groups, involving six allied health workers (in 2 small groups) in aged care who consented to participate. The aim of these groups was to help improve the clarity, suitability and accuracy of the survey. Focus group members completed an online survey in the physical presence of the researcher, who noted any questions or difficulties experienced by the participants, and obtained feedback on the layout, questions, and outcomes of the survey.

Using this data, the survey questions and response scales were refined, and the final modified version was distributed to prospective participants.

The survey comprised 20 multiple choice and 8 open-ended questions. The survey took approximately 20 minutes to complete. Multiple choice questions were used to assess if participants delivered VRT and MRT, the frequency of such delivery, the mode of delivery (group, individual, or both), and if prompts were employed to trigger memories (e.g., objects or pictures). Open-ended questions on VRT and MRT asked participants to define the interventions, provide reasons for their use, identify barriers to implementation, and describe a situation when they have used them with an older person. Participant demographics such as age, gender, relationship status, country of birth, language spoken at home, occupation, work setting, years of work experience, and state or territory of work location were also obtained.

8.5.3 Procedure

The survey (online and hardcopy) was distributed to care organisations, social networking groups, education providers and professional bodies through an email, online post, flyer, or in-person. Multiple distribution methods were used to maximize the number of potential participants. Data were collected between October 2018 and August 2019. As an incentive, participants were offered the opportunity to win one of two $250 gift cards in a lottery draw. Ethical clearance was approved for this study by the Swinburne University Human Research Ethics Committee (2018/258).

8.5.4 Planned analysis

Patterns of missing data were analyzed using Chi square tests. No participant demographic variable was associated with missing data on the independent variables (e.g., purpose of task, and frequency of task), indicating data were missing at random. Data analysis strategies for this study were exploratory, with comparisons made between the variables of frequency, purpose, and type between VRT and MRT methods using descriptive

statistics and repeated measures analysis of variance. The assumption of normality for all 'Type' and 'Purpose' scores was approximately satisfied as assessed by visual inspection of Normal Q-Q Plots. There were no outliers in scores except for VRT purposes 'To complain' as assessed by examination of studentized residuals for values great than ±3. The outliers were retained for analysis. Quantitative data were analyzed using IBM SPSS (version 27).

The qualitative data generated by the open-ended questions were analysed using an inductive content analysis approach (Saldaña, 2009). This approach allowed for the themes and codes to emerge from the data. Coding of participant responses was conducted using Quirkos software with manual '*in vivo'* coding of the participants language and terms used, and pattern coding to group similar terms and language together for situations of use, topics of discussion, and outcomes were used to code responses (Saldaña, 2009). Rigor and validity were ensured by collecting data via written open text responses, thereby avoiding interviewer effects or biases. Open questions were answered prior to the multiple-choice questions regarding RT and MRT to ensure participant responses were not primed. Qualitative data were triangulated with an external researcher experienced in qualitative research, who independently coded the data, and met with the leading author to reach consensus with the coding and ensure rigor of the findings.

8.6 Results

8.6.1 Quantitative data

A total of 78 (84.7%) respondents reported using VRT in their work, most commonly *several times per week* (45.3%), followed by *daily* (26.7%), *once per week* (20%), *monthly* (6.7%), and *rarely* (1.3%). Music (53.2%), pictures (49.5%) and objects (36.9%) were the most used prompts to facilitate RT, followed by technology (25.2%) and scents (15.3%), while 4.5% of respondents reported using no prompts.

Sixty-two participants reported using MRT (reminiscence involving the discussion, listening, or making of music) in their work, 82% of those who reported using VRT. Participants reported using MRT '*most times'* (32%), '*sometimes*' (22.7%) and '*all the time'* (20%) with reminiscence. A minority (17.3%) of participants reported '*never*' using music in RT. The types of music used in MRT included live (24.5%), recorded (45.9%) and as a topic of discussion (35.1%). MRT was most commonly used during reminiscence discussions (45.9%) compared to after (28.8%), and before (23.4%).

Of participants using VRT, most delivered the treatment in both group and individual contexts (*n* = 43, 57.3%), with less using VRT exclusively in individual (*n*=28, 32.3%) or group (*n* = 4, 5.3%) sessions. Similarly, of participants using MRT, most delivered the treatment across both group and individual contexts (*n*=36, 61%), with less using MRT exclusively in individual (*n*= 16, 27.1%) or group (*n*= 7, 11.9%) sessions.

Comparisons were made between VRT and MRT in relation to the frequency of use for each reminiscence approach (simple, life review, life review therapy; see Table 10).

Table 10.

Mean and SD of reported frequency ratings for the three types of reminiscence therapy for VRT and MRT on a 5-point scale (never to always) over the last year.

	Reminiscence approach					
	Simple reminiscence		**Life review**		**Life review therapy**	
Reminiscence type	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
VRT	3.76	1.03	2.08	0.74	3.02	0.97
MRT	3.35	1.11	1.90	1.06	2.45	1.14

A two-way 2x3 repeated measures ANOVA was used to determine if significant differences in frequency were identified between the approaches of VRT and MRT. This test was performed with a sample of 51 participants who answered all questions related to

frequency of use. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the two-way interaction (χ^2 (2) = 8.31, p = .016) and main effect of type of RT, χ^2 (2) = 6.03, p = .049. Using a Greenhouse-Geisser correction for the degrees of freedom, there was no significant interaction between the approach and type of reminiscence, F (1.73, 86.50) = 2.041, p = .142, ns. However, main effects were observed for both type and approach. A significant main effect of the type of reminiscence was found (F (1.79, 89.61) = 75.69, p = <.0005. partial eta squared = .602). Based on a Bonferroni corrected LSD post hoc test, *simple reminiscence* was the most frequently used approach across both VRT and MRT, followed by *life review therapy*, and then by *life review* (each p < .001). There was also a significant main effect for reminiscence type; F (1, 50)= 10.843, p = .002. partial eta squared = .178. power = .898). Across the three reminiscence approaches, MRT was used significantly less often than VRT.

Comparisons were also made between VRT and MRT for 50 participants who reported on the frequency of use for the eight underlying purposes identified by Webster and colleagues (Webster, 2003; Webster et al., 2010)(see Table 11).

Table 11.

Mean frequency for the purposes of VRT and MRT on a 5-point scale (never to always) for the last year.

	VRT		**MRT**	
Purpose of RT	**Mean**	**SD**	**Mean**	**SD**
To complain	1.98	0.892	1.86	1.178
Boredom reduction	3.42	1.178	3.52	1.216
Social engagement	3.92	0.877	3.44	1.232
Death preparation	2.98	1.152	2.76	1.098
Identity validation	4.04	1.087	3.60	1.125
Connect to those lost	3.10	1.129	3.08	1.192
Problem solving	3.32	1.133	2.74	1.226

Teach others	3.32	1.115	3.14	1.294

N = 50.

A 2x8 repeated measures ANOVA was used to determine if differences in the frequency of purposes for VRT and MRT existed. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the two-way interaction, χ^2 (2) = 50.59, p = .004, but not for the main effects.

The repeated measures ANOVA demonstrated a small significant interaction using a Greenhouse-Geisser correction between the RT type and its purpose (VRT vs MRT; *F* (5.247, 257) =2.716, *p* = .019, effect size = .053). There was also a significant main effect of purpose (*Wilks Lambda F* (7, 43*)* = 22.88, *p* = <.0005; Partial eta squared = .788), demonstrating a very large effect. LSD contrast post hoc tests using the Bonferroni correction revealed that VRT and MRT was used significantly less 'to complain' than other purposes (each *p* <.001). Table 12 summarises the differences of significance between the 8 purposes of RT.

Table 12.

Mean, standard deviation and pairwise comparisons for frequency of underlying purposes of overall RT (VRT and MRT) use over the last 12 months.

Purpose	**Mean**	**SD**
a. To complain	$1.92^{bcdefgh}$	1.16
b. Boredom reduction	3.47^{a}	1.21
c. Social engagement	3.68^{adfg}	1.21
d. Death preparation	2.87^{ac}	1.09
e. Identity validation	3.82^{adfgh}	1.11
f. Connect to those lost	3.09^{ace}	1.18
g. Problem solving	3.03^{ace}	1.21
h. Teach others	3.23^{ace}	1.28

Note: Superscript letters indicate a significant difference between same lettered purposes at p < .05.

Identity validation, social engagement, and boredom reduction were the most commonly reported purpose of all reminiscence activities, which did not differ significantly from each other. Social engagement and identity validation were reported as the most frequent purposes compared to all other purposes, except for boredom reduction, which was not significantly different from any purpose except to complain.

MRT had a similar pattern of use to VRT for the mean purposes of complaining, boredom reduction, and to remain connected to those who have died (see Table 11). MRT was used less than VRT for the purposes of social engagement, death preparation, identity validation, problem solving, and teaching others. MRT was most frequently used for the purposes of boredom reduction, social interaction, and identity validation.

8.6.2 Qualitative data

Participant descriptions of experiences in which they had used VRT and MRT with older people were coded using content analysis coding (Saldaña, 2009), and subsequent pattern coding into *situations of use*, *topics of discussion*, and *outcomes* (see Table 13). Codes were sorted into related major themes and triangulated by two researchers (RE and HS). Within the data, both VRT and MRT were described when used individually, and with older adults.

8.6.2.1 Situations of use

*Situations of us*e was defined as the context in which the intervention was used and described by participants, involving details relating to the format of the intervention, such as type (e.g., type of verbal or musical interaction), purpose, prompts, frequency, timing, or delivery. Five major themes for the *situations of use* for VRT and MRT were observed.

1. Both VRT and MRT had ameliorative and preventative functions, with distinct patterns of use in response to immediate client needs.

Participants reported using VRT and MRT with older people who had clear needs (e.g., as a direct treatment of distress) as well as those who were well in order to maintain their wellbeing (e.g., to prevent health issues). For example, "Music reminiscence is often used with residents who experience pain or agitation", contrasted with:

> We sometimes get our clients to bring in items from their past… We then have a group discussion about the item and what it means to them in a group… it is usually a very effective session and provides really lovely conversation and engagement

in which group VRT was used as a social experience, which is known to prevent ill health outcomes (Holt-Lunstad et al., 2010). A range of ameliorative and preventative functions were found within participant responses, related to the immediate needs of clients.

Participants reported distinct patterns of use related to the immediate needs of clients, such as the need for distraction (e.g., articulated as from "pain", "agitation", "stress", "anxiety" or "confusion"), emotional or psychological processing (during "grief", "lamenting", "regrets", "depression", and "sadness"), and for social connection (e.g., those who are "shy", "withdrawn", "non-verbal" or experiencing "loneliness"). For example, one participant:

> Used reminiscence with an older person with dementia who was upset. I picked up a photo of her grandsons when they were children from her bedside table and asked her to tell me about them as I knew she always gushed when she spoke of her family. She recalled humorous stories of them as cheeky little boys and her mood improved.

This was consistent across both VRT and MRT.

2. The use of VRT and MRT was often spontaneous, and was integrated into routines of daily care.

While some respondents described VRT and MRT as planned and intentional interventions, typically participants indicated that VRT and MRT were used spontaneously in addition to other activities or daily routines, such as while assisting older adults with activities of daily living (ADLs). For example: “Talking to patients when feeding them about their previous occupation, children if any and hobbies.” Participants also used MRT at these times, for example:

> I put together a playlist of these songs and during hygiene time (predominantly showering which was a time of high stress and anxiety) we played the music and this allowed for relaxation and positivity. It also ‘kept the story going’ as we added to the playlist over time.

This suggests that VRT and MRT are used as an integrative strategy to support interpersonal and personal care, and can be used in a spontaneous way.

3. MRT use was based on musical heritage (musical preferences, history and background).

Musical heritage, including individual musical preferences, personal history and musical background was informed by the older person or family, and used to select music for use in RT, for example:

> I used Spotify on my phone and had selected a number of songs by artists her son informed me she used to like. We listened to songs by The Beatles, The Easybeats and Queen. The music prompted the resident to recall details of concerts she had attended

4. MRT was used as a compensatory strategy when clients were unable to verbally respond.

MRT was often used in situations with older people when they were not able to engage in verbal discussions in RT (e.g., those who were "unable to speak", "non-responsive", and "non-verbal"), for example one participant described:

> An older person with dementia, not able to speak appeared to respond to time I spent with her: assisting with meals, sitting and talking to her or reading to her. When I sit face to face with her and sing she joins me and sings along word-for-word.

MRT was therefore reported as a compensatory and accessible strategy, where music was used as the process of reminiscence.

5. The sequence and methodology of how MRT and VRT were implemented varied greatly.

For VRT, the participants used both structured (photobooks and structured thematic discussion) and the far more common unstructured methods including informal conversations, described as "chats", and asking prompting and open questions. For example, "I often chat with residents about their younger years and the antics they got up to..." While structured therapy and positive reframing of experiences were also evident, for example, one participant:

> Chose reminiscence alongside existential psychotherapy… One of the methods of using reminiscence was looking through old photos and talking about the people in the photos and the time in her life. Also making memory boxes for her to leave for her 3 grandsons.

The music methods varied (active music making, music listening, live music or recorded or streamed music) and the order and initiator for MRT varied according to two main principles:

a) Either a client or staff – initiated process. For example, this client-led MRT: "Recently, a person I was working with initiated discussion following singing

the tune, "wish me luck as you wave me goodbye" compared to staff-initiated MRT “I suggested creating a personal playlist of songs the resident liked most”.

b) VRT led to music, or music led to VRT: Participants most commonly reported situations in which music facilitated recall of personal experiences, for example, one person who found using music “…videos provided a backdrop for a wide-ranging discussion of his life.”

8.6.2.2 Topics of discussion

Topics of discussion related to the content, theme, or topic of reminiscence, music or song reported or described by the participants. The topic could be driven by the participant, or older person. Three major themes were identified in participants’ descriptions of experiences with MRT and VRT:

1. Relationships

Participants reported that relationships to others were a key concept in the recounted personal narrative by older people, both as a way of acknowledging those of importance, those who have died, and to define ones’ identity by the relationships or role (e.g., as a “*mother*”). One participant commented on work she had done with an older woman with dementia looking at photos, recounting the client:

> appeared to be mourning the loss of the people in the photos - either through death or relationships becoming distant. I redirected the focus of the conversation to the quality of the relationship her and her late husband had, as this was a topic I knew she was happy discussing and gave her comfort.

This theme was also observed in the description of a distressed client who refused to leave her room and was constantly waiting for her children to visit. The participant said:

> I sat down with her and asked her about her children and her as a mother. What were they like as children? How did she like mothering? I could tell that mothering was a

very important part of her life and I reflected that she must have done a wonderful job in her role as a mother to have such successful and loving children…she became very comfortable talking.

2. Places

Participants reported places as a common theme during the reminiscence experience for older adults. Participants reported that older adults reflected on places of origin and culture as connected to identity and to describe ones' life. One participant said that she:

> Worked with a man in his 70s who was born in Romania. He… was interested in the folk music of his birthplace. I offered different videos found through a YouTube search for Hungarian folk music…. Sometimes he would disagree with how the music was labelled - "*this isn't Hungarian folk, it's Russian folk!"* … These videos prompted reminiscence about the folk dancing practices of the town where he grew up.

Place was also used to recount periods of transition such as immigration. One participant recounted: "…She talked about her life as a mother in England. … then she moved to Australia with her children and continued working here." Another recounted the following:

> One lady experiences great general pain, through talking, she shared her long history of working on farms, of experiencing apprehension when the boys in her family went to war, of how the women managed the animals, drought, stock and produce prices, town resources and love of the land, she often asks of the area she lived in, and has family who occasionally visit and share pictures and stories of the town and how much it's changes and who is still there and other generational news.

3. Identity

Participants reported that older people discussed identity constructs in both VRT and MRT. The use of VRT and MRT involved discussing, acknowledging, or enhancing identity

constructs such as personality, personhood, strengths, achievement, and previous roles or work. For example, one participant reflected that VRT *"*Help[s] people to recall times in their lives when they felt joy, pride, achievement, positive experiences helps them to focus on more positive experiences in their lives and provides opportunities to highlight personal strengths.*"* These themes were also present in the MRT experience data. Codes within the MRT experiences also related to life events or periods, such as parenthood or wartime. For example, a participant who reflected on the use of MRT said *"*I used this with a woman to reflect on her role during the war (it was a war song) and the resilience she had shown to navigate this difficult time and contribute to the war effort" highlighting the participant's identity as a "helper" to contribute or as "resilient". MRT was useful for exploring identity without the need for verbal discussions. Identity was also related to the outcome of VRT and MRT and is therefore discussed further below.

8.6.2.3 Outcomes

Outcomes refer to the participants' perceptions of results of VRT and MRT. Outcomes could be positive or negative, experienced by staff or clients, and quantified in any way. Participant responses demonstrated four themes related to the outcomes of using VRT and MRT with older adults:

1. Enhanced social connections.

During VRT use, participants emphasized the shared and collaborative nature of the experience, and the quality of the interaction. VRT also assisted to develop relationships and build further conversation. This enhanced social connection was one of the most prevalent codes in the participant responses. One participant reflected:

> Going through a photo album, talking about who was in the pictures, the fashion, descriptions of where and when the photos were taken. This then assisted with later

conversations as it was a reference to return to. The emotions shared, both joy and sadness, was a special time to share.

Further responses indicated the importance of a willingness to be present and to connect, for example, “I felt time was needed just to sit there with the patient and get them focusing on something else….” Similar themes were identified in MRT, with the addition of extending to the social benefits with family, for example this MRT lead to enhanced social connections with her children, “It was a journey of wonderful memories and conversation with her children and a part of her life she had not shared with them”.

2. Improved affect and mood.

Participants reported a range of positive affective changes from VRT interventions, commented on themes of emotional reactions, specific positive affect (e.g., happiness, joy, comfort), and improved mood. For example, “The patient enjoyed this as he was able to connect personal moments about his life to someone willing to listen which made him really happy.” This was also a common outcome for MRT. Participant experiences centred around happiness, joy, and relaxation, for example:

> We use it often we know that the ability to recall and reflect helps older adults remember who they used to be and it also makes them feel good. They get an endorphin flow in the moment. It can calm a stressed resident.

3. Better care practices.

A variety of benefits were reported in relation to staff behaviour from RT. Staff reported reductions in medications administered, agitation, behaviours of concern, and that VRT interventions influenced social programs offered, resulted in improved staff handover and communication, and helped to establish treatment goals and make lasting change. One participant described the outcome following VRT the older person was “talking away excited for us to continue to see her. When I spoke to the care manager 2 weeks later, she stated that

she had seen a real change." While another participant used VRT to show "what they remember life being like before their hearing declined in order to establish rehab goals". Another participant noticed the outcome of "…diversional therapy with reminensing [sic] was we didn't need to give drugs"

For participants, the inclusion of music facilitated additional changes to care practices, including increased acceptance and success of care, staff learning, changes to social programs, staff handover, learning and communication, and building resources (e.g., playlists or legacy items). For example, a staff member reflected that in MRT, they were able to use music as common ground to improve care practices as a "conversation topic which helped me to build rapport with this patient. This facilitated my care with them as I believe they were more comfortable to concede health details with me."

4. Connect to identity.

Participants reported that older people often discussed concepts related to their identity. In discussing these topics, participants perceived that the older people were able to reconnect with their past and present identity or sense of self. This was evident across both VRT and MRT, for example, it helped them feel… "connected to their past as this gives them a sense of identity" and "the ability to recall and reflect helps older adults remember who they used to be and it also makes them feel good."

8.6.2.4 Negative outcomes

Two participants reported negative or unforeseen outcomes of RT. During VRT, an older person "became mournful". However, this participant also "redirected the focus of the conversation to the quality of the relationship her and her late husband had, as this was a topic I knew she was happy discussing and gave her comfort.*"* Another participant commented that when using VRT with older people with dementia that "At times it was

difficult to see an outcome due to cognitive impairment, but often it bought a lot of joy to residents".

Two negative or unforeseen outcomes were described when using MRT. A participant reported some agitation and unhelpful reminiscence resulting from MRT, as the client "sometimes circles back to his dissatisfaction at being in aged care (non-voluntary - has court appointed guardian). Can also cause some agitation as he then gets frustrated that he can't play anymore." Another participant also described an unintended consequence of using MRT, commenting:

I remember one session we did this and a gentleman that was non-verbal had tears rolling down his face, we assumed he had been remembering something, when we told his family they told us the song we played was played at his wedding.

The participant felt that this was appropriate and further commented "The music prompted a very powerful memory for him and it was very moving." While not a negative outcome, another participant reported having trouble and lack of confidence in establishing musical preferences, for example, "A list of songs was put together, but I did not feel confident that the music chosen was exactly right for the resident."

Table 13.

Overview of the major themes within the qualitative data coded by two independent researchers.

Pattern codes	Major themes
Situations of use	Both VRT and MRT had ameliorative and preventative functions, with distinct patterns of use in response to immediate client needs. The use of VRT and MRT was often spontaneous, and was integrated into routines of daily care. The sequence and methodology of how MRT and VRT were implemented varied greatly. MRT use was based on musical heritage (musical preferences, history and background). MRT was used as a compensatory strategy when clients were unable to verbally respond.
Topics of discussion	People. Places. Identity.

Outcomes	Enhances social connections. Improved affect and mood. Better care practices. Connected with identity.
Negative outcomes	VRT – client became mournful, and 1 participant found it difficult to see the outcome. MRT – reminded client of dissatisfaction with life, 1 participant did not feel confident in using MRT.

8.7 Discussion

This descriptive mixed-methods study aimed to clarify how aged care workers and volunteers used and viewed VRT and MRT strategies. The study investigated the extent to which these strategies were used by these individuals, the types of RT used, and the methods of implementation. The findings of this study indicated that VRT and MRT were widely used to ameliorate negative emotions and to promote wellbeing. The majority (84%) of participants used VRT, of which a significant proportion (82%) also employed MRT. It is possible then that MRT is viewed as an additional component of RT by the workforce, rather than a separate intervention entirely. This study provides the first step in understanding the frequency of the use of MRT with older people, with only 17% of the sample participants never using music. Given the benefits associated with the inclusion of music in RT (El Haj et al., 2011, 2012; Haslam et al., 2014; Potts et al., 2020; Rawtaer et al., 2015) music (in any form) should be embedded within RT in research to reflect treatment as usual.

Despite the high number of participants using MRT, MRT was used significantly less often than VRT across all RT types. Given numerous studies that demonstrate that music enhances the outcomes of reminiscence, this is surprising. It may be that limitations in staff training or access to music are barriers that reduce the uptake of using music in RT, particularly given the reported spontaneity of its use.

Simple RT was used significantly more than *life review,* and *life review therapy* over the last 12 months for both VRT and MRT. *Life review therapy* was used to a lesser extent. Past research suggested that *life review* and *life review therapy were* the most effective VRT

methods for improving wellbeing outcomes for older people, and *simple* RT was the most effective for those with dementia (Bohlmeijer et al., 2007; Pinquart & Forstmeier, 2012). While few overt references to the type of RT were noted within the qualitative data, a distinct pattern of using VRT and MRT emerged related to the particular needs of the clients. A schema was proposed using the participant responses to describe the clients' needs, including for distraction (from anxiousness, pain, agitation), emotional or psychological processing (during grief, regrets, lamenting), and for social connection (for those experiencing loneliness, withdrawal etc). These can be related to the purposes of *simple* and *life review therapy* indicating consistency between the qualitative and quantitative data, and that the older person's needs have driven how the interventions were applied. Likewise, overwhelmingly these interventions were reported to be spontaneous and integrated as part of daily care, for example, in addition to feeding or hygiene routines, perhaps explaining why *simple* RT was the most used type.

Researchers have suggested that older people reminisce for eight reasons (Webster, 2003; Webster et al., 2010). These eight purposes can be delineated into factors associated with positive (e.g. social engagement, identity, problem solving, teaching others, death preparation) and negative (e.g. bitterness revival, boredom reduction, intimacy maintenance) health outcomes (Cappeliez et al., 2005). The most reported purposes for utilizing all RT were social engagement, identity validation and boredom reduction. When looking at reported mean use, these were also the most common purposes for MRT. To complain was consistently reported as the least common purpose of both VRT and MRT. These quantitative results suggest that aged care workers and volunteers use these interventions to improve health outcomes in older people. This conclusion was also drawn from qualitative analysis: VRT and MRT contribute towards factors of wellbeing, such as identity, and positive affective experiences. The present study therefore takes a first step to address a gap in

existing literature for the underlying purposes of VRT and MRT from the perspective of the staff who implemented it.

Both VRT and MRT were perceived as a social experience that was part of everyday care, often accompanying other activities. The care workforce emphasized the quality of the interaction for themselves, with notions of *willingness* to be present and of *sharing over time*, purposefully building on reminiscence storytelling. Clear changes to staff behaviour and care practices as a result of using these interventions were also evident within the experiences detailed by the participants. Overall, the participants perceived both VRT and MRT as successful interventions. These are perhaps highly valuable and easily implemented interventions that could address the interpersonal needs of the client in aged care settings, that may overcome issues such as the depersonalization of older individuals in institutions (Gudex et al., 2010). This is further supported by the common themes identified within participant responses for both interventions relating to sense of self, people or roles, and places to describe ones' life and self.

The way in which the interventions were delivered varied. Music was most frequently used *during* RT, compared to *before* or *after*, and in practice, music is flexible in its delivery from live music, recorded music, or as a topic of conversation. Within coded participant responses, the overwhelming majority of participants emphasized its '*prompting*' role in RT. Both delivery formats (verbal and music) were also used in both group and individual contexts, rather than in individual only, or group only. These results indicate that VRT and MRT are used clinically across both individual and group contexts in treatment as usual paradigms, and therefore validates both approaches for further research. What remains to be explored is the type (e.g., live vs recorded) and the size of the dose of music required in RT, and how much VRT and MRT is needed to achieve clinical significance on wellbeing outcomes.

One key difference between the interventions was that MRT was used as a compensatory strategy to provide interpersonal care or interaction to those who may not have the capacity to engage in verbal discussions, such as those who are non-verbal or with memory impairments. Music engenders an experience that does not require verbal articulation, and therefore can be the focus in the MRT experiences, and can function at multiple and intrinsic hidden levels that is still shared socially (e.g., as an internal emotional and reminiscence experience) (Engelbrecht, Bhar, et al., 2021).

This study explored the methods and staff views of VRT and MRT in clinical practice. Despite the contribution of the findings, several limitations were evident. For example, the sample was treated as homogenous, as all participants worked in the care of older people. In actuality, the sample varied by different occupational groups (e.g., nurses, psychologists, music therapists etc), and work settings (e.g., residential aged care, hospitals etc). Given the size and heterogeneity of the sample, further analysis of the demographic variables (e.g., occupations, work settings, or years of experience) were not feasible. Those working with older adults in care settings are time poor (Giné-Garriga et al., 2020) and there were difficulties engaging this population in research. Further research that looks specifically at staff behaviour between settings or occupations would provide greater insight into different patterns of use.

Furthermore, in 2016 approximately 34% of aged care workers in Australia were migrants, and possibly from culturally and linguistically diverse (CALD) backgrounds (Mavromaras et al., 2017). In the present study, only 4% of participants reported to speak a language other than English at home. Those from CALD backgrounds may have chosen not to participate given the language requirements of the study, and therefore the sample might not be representative of the population of workers from CALD backgrounds.

Despite these limitations, this study is the first to explore the views and practices of aged care workers and volunteers in Australia in regards to VRT and MRT. These findings begin to establish how these interventions are used in '*treatment as usual'* paradigms, and will help to drive future research decisions based on clinical use. The data also provides indicators for the clinical situations in which MRT may be useful as an intervention over and above VRT (e.g., as a compensatory strategy). It should also be acknowledged that VRT and MRT can lead to rare negative outcomes, or bringing up past traumas that require processing and psychological support, and therefore should be used with caution and be implemented only by suitably trained staff capable of processing these emotions and experiences. Using a mixed-method approach allowed for both richness and depth in the data, and has allowed for a detailed exploration of the extent to which VRT and MRT are used by the care workforce, the methodology of the interventions, and staff perceptions on their use.

8.8 Conclusion

Reminiscence therapy and music-assisted reminiscence therapy are interventions that can improve the wellbeing of older people and the care practices of staff who care for them. This study described how these interventions were being used in clinical practice by care staff, with both VRT and MRT frequently used, particularly *simple* reminiscence (e.g., thematic discussions) that is spontaneous and integrated in daily care (e.g., during other activities). These findings can inform the development of future research protocols investigating the use of these interventions as treatment as usual, and to inform the practices of those working with older adults to improve the care standards.

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responsibility for the integrity and validity of the data collected and analysed by this coauthor.

Chapter 9. Feasibility and acceptability

9.1 Chapter guide

This chapter presents paper 3 which reports the findings of a pilot study investigating the feasibility, acceptability and outcomes of music-assisted reminiscence therapy with older adults. This paper was formatted and submitted to *Music Therapy Perspectives* for review on the 10th of December, 2021.

9.2 Paper 3. Music-assisted reminiscence therapy with older adults: feasibility, acceptability, and outcomes.

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Keywords: pilot; reminiscence therapy; music; older adults; wellbeing; mood

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9.3 Abstract

Reminiscence therapy (RT) is often used in music therapy; however, it remains unclear how music can be integrated within this therapy. This pilot study aimed to contrast the user experience and acceptability of RT with and without music. Eight older adults experiencing symptoms of anxiety and/or depression were randomly allocated to a single session of either verbal RT (VRT) or music-assisted reminiscence therapy (MRT). Pre and post measures of affect (Positive and Negative Affect Scale) and memory (Memory Experience Questionnaire, Short-Form) were administered to compare VRT and MRT, followed by a brief semi-structured interview to understand the participants' experiences and level of satisfaction. Interviews were qualitatively analysed using an inductive coding approach. Two MRT protocols were also delivered to examine different ways of embedding music into RT, and compared using qualitative interview data. Participants reported that VRT and MRT were equally acceptable and well tolerated. All participants completed the assigned VRT or MRT session. Participants were able to identify a song to listen to in both MRT protocols and found both acceptable. A pre-post pattern of improvement was observed for affect following VRT, and particularly MRT, suggesting both as promising interventions. The high treatment fidelity achieved in this study indicates that the interventions can be successfully implemented with this population. MRT resulted in higher scores on memory experience characteristics such as vividness, coherence and accessibility, and therefore may provide changes above and beyond VRT for older people experiencing psychological distress, suggesting large-scale clinical trials are warranted.

9.4 Introduction

Older adults aged 65 years and over face unique health and wellbeing challenges compared to younger populations, such as significant changes to living arrangements, working and social roles, and physical health needs (World Health Organization [WHO], 2015). Globally, approximately 7% and 3.8% of older adults experience depression and anxiety respectively (WHO, 2017). It is estimated that up to 15% of older adults, and over half (52%) of those living in residential aged care in Australia are experiencing psychological distress (Australian Institute of Health and Welfare [AIHW], 2013, 2015; WHO, 2018), defined as unpleasant feelings or symptoms of stress, anxiety, or depression (American Psychological Association, 2013). With a global aging population expected to double the proportion of older adults by 2050, over half of which have multiple and chronic physical health conditions (WHO, 2015), interventions that can improve the wellbeing and health outcomes for this population are a key area for research and intervention development.

Reminiscence therapy (RT) is an intervention that uses purposeful recollection or reframing of personal narratives and experiences to improve wellbeing (Webster et al., 2010), and has been found to improve psychological wellbeing in older adults (Bohlmeijer et al., 2007; Chin, 2007; Pinquart & Forstmeier, 2012; Watt & Cappeliez, 2000; Westerhof et al., 2010, 2018). Webster et al., (2010) and Westerhof et al., (2010) delineate reminiscence therapy into three types based on differing purposes and outcomes. These types are *simple* reminiscence (focused on shared story telling or thematic discussions around particular experiences, topics, or times), *life review* (focused on the meaning in life and a coherent identity), and *life review therapy* (focused on reframing negative experiences and using existing coping strategies for problem-solving) (Westerhof et al., 2010). Instrumental reminiscence is a specific application of *life review therapy* that focuses on past problem solving successes (Meléndez et al., 2015; Watt & Cappeliez, 2000; Webster, 2003).

Instrumental reminiscence involves the recollection of a mastery experience in which the individual has previously coped with a stressful event or problem, and the application or adaption of these successful strategies to current issues or problems (Meléndez et al., 2015). Instrumental reminiscence has been found to improve wellbeing in older adults by allowing for adaptive coping strategies and resilience in order to manage stressors and change (Meléndez et al., 2015).

Music can be used with RT, including in instrumental RT, to augment the recall of memories, experiences, lessons, successes, and personal traits or strengths. Music-assisted Reminiscence therapy (MRT) involves the use of music in any from (e.g., recorded, live music-making, or as a topic of discussion) to enhance the experience and outcomes of RT (Engelbrecht et al., 2021). Listening to preferred music can improve mood, induce pleasure, and activate the dopaminergic reward system in the brain (Bennett & Maas, 1988; Coffman, 2002; Laukka, 2007; Zatorre & Salimpoor, 2013). Music can also change the vividness, accessibility, and impact of recalled autobiographical memories (Baumgartner, 1992; El Haj et al., 2011, 2012). Studies have compared the outcomes of RT when music is included in the delivery of the intervention, compared to reminiscence without music (see Ashida, 2000; Haslam et al., 2014; Istvandity, 2017; Mohammadi et al., 2011; Rawtaer et al., 2015; Takahashi & Matsushita, 2006). MRT has been found to significantly improve aspects of wellbeing for older people (Istvandity, 2017), such as mood, depression, anxiety, stress, social interaction and group identity, blood pressure, and saliva cortisol levels to a greater extent than RT without music (Ashida, 2000; Haslam et al., 2014; Mohammadi et al., 2011; Rawtaer et al., 2015; Takahashi & Matsushita, 2006).

Despite these findings, little attention has been given to how music can be purposefully applied in RT, or the extent to which MRT is feasible and acceptable to clients. Isvandity (2017) conducted a systematic review of literature exploring the outcomes of MRT

and found that studies did not clearly describe how music was integrated in RT. Furthermore, research has focused on the prompting functions of music in RT, that is, to open conversations and improve memory recall (El Haj et al., 2011, 2012; Engelbrecht et al., 2021). It is unknown what benefits music may add to RT during discussions. While randomised controlled trials (RCTs) are considered gold standard in exploring the efficacy of intervention studies, one key element of high-quality research is pilot feasibility trials. Pilot studies allow for testing of user experiences, and refining of intervention applications (Bowen et al., 2009; Robb, 2013). Therefore, before MRT can be tested in larger scale RCT studies to determine efficacy, piloting is needed to clarify how acceptable, feasible, and effective elements of the implementation methods are.

The purpose of this pilot study was to consider two different ways in which music could be added to RT, specifically in life review therapy involving instrumental reminiscence, to constitute MRT. It assessed the feasibility and acceptability of MRT protocols compared to verbally-delivered RT for older adults experiencing psychological distress. The aims of this study were to describe the development of two MRT protocols and assessed their feasibility and acceptability when used with older adults experiencing psychological distress. The study also explored trends in the outcomes associated with MRT, in contrast to RT without music.

9.5 Method

9.5.1 Participants

The sample comprised eight English-speaking older adults (5 women, 3 men, age ranged from 69 to 86, mean age = 75.9; *SD* = 7.29), recruited through advertisements placed in community organisations, newspapers, and online bulletins (see Table 14). Individuals were screened for eligibility to participate through a brief telephone interview. Participants were eligible if they were aged 65 years and over, denied having cognitive impairment or a

diagnosis of dementia, and scored 16 or higher on the Kessler psychological distress scale (K10; Australian Bureau of Statistics, 2012; Kessler et al., 2003). The study was approved by the Swinburne Human Research Ethics Committee (2019/071).

9.5.2 Conditions

All sessions were implemented by RE to maintain consistency between the treatment conditions. This researcher was a provisional psychologist trained in RT, and a music therapist registered with the Australian Music Therapy Association, with extensive experience in working with older adults. The sessions ran for 25-35 minutes.

9.5.2.1 Verbal Reminiscence Therapy (VRT)

The Reminiscence of Mastery Experience protocol (ROME) (James and Bhar, 2016) was used in this condition. All questions were verbally delivered and did not involve any other prompts or tools, such as music. An interviewer met with participants for a single face to face session and asked questions about childhood and adulthood (e.g., “what was your family like?”), and instrumental reminiscence prompts to reflect on a past success (e.g., “Think back over your life and try to

Table 14.

Participant demographic information and randomly assigned treatment allocation.

ID	Condition	Age	Gender	K10	Relationship status	Country of birth	Highest level of education
22	RT	78	Female	21	Married	Australia	Undergraduate university degree
36	RT	86	Female	19	Widowed	India	Postgraduate university degree
47	RT	69	Female	34	Married	Sri Lanka	Undergraduate university degree
69	RT	85	Male	16	Married	Australia	TAFE diploma or certificate
35	MRT 1	78	Female	24	Separated	Australia	Postgraduate university degree
56	MRT 1	68	Male	21	Divorced	Australia	TAFE diploma or certificate
31	MRT 2	70	Female	28	Single	South Africa	Year 10 or equivalent
51	MRT 2	70	Male	29	Widowed	Australia	Undergraduate university degree

Note. K10 scoring: scores 0-15, low or no distress, 16-24 indicate mild distress, 25-29 indicate moderate distress, 30-50 indicate severe distress (Australian Bureau of Statistics, 2012).

remember the times when you managed to solve a problem, which required some effort or ingenuity on your part. Can you describe the problem you faced"?) (James & Bhar, 2016, p4). The interviewer asked participants to reflect on how the person came up with a solution, and the skills or lessons they have learned as a result of solving their problem (James & Bhar, 2016). This protocol has previously been associated with significant improvements in pessimism, mastery, and depressed mood in a single session for undergraduate psychology students (James & Bhar, 2016), but has not yet been applied to older adult populations.

9.5.2.2 Music-assisted reminiscence therapy (MRT)

Two MRT protocols were trialled (see Table 15): General music preferences (MRT protocol 1) and music preferences specific to problem-solving success (MRT protocol 2). Both protocols utilised the ROME protocol as described above, but also embedded recorded music identified by the participants via the questions contained in the assigned protocol. Music was played through an online streaming service and Bluetooth speaker placed on the table in the soundproofed interview room. Participants were asked if the volume was suitable and were able to alter the volume as required. In both protocols, a song was played after discussion of the problem-solving success, and during reflections of lessons learned or the outcomes of solving the problem. Verbal processing of the music and the remaining ROME protocol was completed after the music was presented to respond to and reflect on the issues or experiences raised by the participants. This design was selected to test the enhancing functions of music in RT, rather than the prompting function of music (e.g., to summon memories). All questions in the protocols were posed to the participants. If several songs were identified, participants were asked to choose a single song to be presented.

In MRT protocol 1, three prompting questions were delivered to identify music related to personal preferences, positive affective experiences (e.g., happiness etc), or related

to a happy time of life. This approach was selected to gain the most emotional and psychological benefit from including music in the treatment. In MRT protocol 2, more flexible and targeted prompts were used to identify songs related to the mastery memory being discussed. The question designed to probe the emotions experienced from the mastery experience were changed from MRT1 in MRT2 to be more flexible, by asking a generalised prompt such as a song that captures the emotions of overcoming this problem, allowing the participants to report on their own emotional experiences. The question designed to probe the time connection to the mastery memory in MRT2 was changed to explore the time of when the problem was solved. Finally, MRT2 also included a new prompt designed to explore identity or a self-connection of the person in relation to the mastery memory (e.g., skills learnt, or personal strengths identified through the experience). All questions in the protocols were posed to the participants. If several songs were identified, participants were asked to choose a single song to be presented.

Table 15.

Evolution of the music-based questions for the Music-assisted reminiscence of mastery experience protocol.

Purpose of question	**MRT Protocol 1**	**MRT protocol 2**
Personal preferences	What is your favorite song?	-
Emotional connection to memory	Is there a song that makes you feel happy, empowered or strong?	Can you think of a song that captures the emotions of overcoming this problem?
Time connection to memory	Is there a piece of music that reminds you of the happiest time in your life? Or the time when you have solved this problem?	Can you think of a song that reminds you of that time of your life?

Self-connection to memory	-	Can you think of a song that represents yourself or the skills that you've learnt?

Note. Participants who identified multiple songs during the session were asked to choose a single song to listen to.

9.5.3 Measures

9.5.3.1 Kessler psychological distress scale (K10)

The K10 is a 10-item self-report measure that was used in this study to screen for study eligibility. The K10 asks participants to rate the extent to which they have been feeling aspects of psychological distress (e.g., "*How often have you felt tired out for no good reason*") on a scale of 1 (*not at all*) to 5 (*all the time*) over the last 30 days (Kessler et al., 2003). The K10 has been validated for use with older adults and over the telephone, and is scored from 10 -50, with a higher scoring indicated higher levels of distress (Andrews & Slade, 2001; Australian Bureau of Statistics, 2012). In accordance with the Australia Bureau of Statistics (ABS), a minimum score cut off of 16 was used to select eligible participants who were experiencing mild psychological distress or higher (ABS, 2012). During screening procedures, the participants scored between 16 – 34 out of 50 on the K10, with an average score of 23.8, indicating that overall participants were experiencing mild psychological distress. Two participants were rated as experiencing moderate distress (scores of 28 and 29), and one reported to be experiencing severe distress (score of 34) at the time of assessment (see Table 14).

9.5.3.2 Completion rates

Participant completion rates were used to monitor acceptability and feasibility of the interventions. The number of interested participants, eligible participants, and participants who completed the study were recorded.

9.5.3.3 Treatment adherence and competency Form

To monitor how the protocols were implemented, all sessions were audio recorded. Following the study, a researcher designed treatment adherence and competency form was completed for each session by a member of the research team (SB) who did not perform the intervention. The form was purpose built and was used by the rater to indicate on a 5 point scale (1 = *not at all*; 5 = *extremely*): 1) The extent to which the interviewer delivered the questions as intended (adherence); and 2) The extent to which the interviewer was able to draw out information that the question was designed to elicit and develop rapport with the participant (competency). Competency ratings included interviewer skills such as listening, encouraging, paraphrasing, reflecting meaning, summarising and interrupting.

9.5.3.4 Memory Experience Questionnaire – Short Form (MEQ-SF)

To assess the characteristics of the memories shared in the VRT and MRT conditions, 7 subscales of the Memory Experience Questionnaire: Short-Form (MEQ-SF, Luchetti & Sutin, 2016) were administered to participants following their session. This 31-item self-report measure rates the qualities of a memory on a five-point scale from 'strongly disagree' to 'strongly agree'. The items are divided into the subscales of vividness (e.g., "my memory for this event is very vivid"), coherence (e.g., "the order of events in the memory is clear"), accessibility (e.g., "the memory was easy to recall"), sensory details (e.g., "my memory for this event does not involve a lot of sensory information such as sounds, sights, smells, tastes etc"), visual perspective (e.g., "In my memory I see this experience through my own eyes"), emotional intensity (e.g., "The memory of this event evokes powerful emotions") and valence (e.g., "The overall tone of the memory is positive"). Three MEQ-SF subscales (time perspective, sharing, and distancing) were deemed irrelevant and not used for this project, therefore 22 items were presented to participants. Each subscale has between 2 – 4 items, with multiple items reverse scored. Scores on this measure are treated as continuous, with higher scores on all subscales indicate a higher level of the corresponding memory

characteristic. For this study, participants were asked to answer the MEQ-SF questions in relation to the problem-solving memory (e.g., “tell me about a time where you have solved a problem?”).

9.5.3.5 Positive and negative affect scale (PANAS)

To measure changes in affective state following VRT and MRT, the PANAS (Watson et al., 1988) was administered to participants before and after the session. The PANAS is a 20-item self-report measure that asks participants to rate the extent to which they feel 20 different positive and negative emotions on a five-point scale from ‘Not at all’ to ‘Extremely’ over a period of 30 days. The instructions were altered to ask participants to reflect on their emotional states ‘right now’. The items were equally divided into two separate scales of the Positive Affect Scale (PAS) and Negative Affect Scale (NAS). The PAS contains items such as: interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active. Mean scores for the PAS for a normative sample is 33.3 (range from 10-50) with high scores indicating higher levels of positive affect (Watson et al., 1988). The NAS contains items rating the extent of feeling distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid. Mean scores for the NAS for a normative sample is 17.4 (range from 10 – 50), with lower scores indicating lower levels of negative affect (Watson et al., 1988). Individuals are rated on a continuum of high to low on each of these dimensions (Watson et al., 1988).

9.5.3.6 Brief semi-structured interview

Following completion of the post-test measures, participants answered 8 open-ended questions to assess their experiences in reminiscence with and without music, including what they liked and/or disliked, their level of satisfaction, and any benefits, challenges or difficulties they experienced during the session. Interviews were recorded, transcribed and manually analysed using an inductive content analysis approach (Saldaña, 2009). This

approach allowed for the themes and codes to emerge from the data. Coding of participant responses was conducted using Microsoft Excel with manual '*in vivo'* coding of the participants language and terms used, and pattern coding to group similar terms and language together for the user experiences (Saldaña, 2009).

9.6 Procedure

VRT and MRT protocols were initially tested with four healthy adults (aged 18 – 43) prior to commencement of recruitment. Study participants were recruited and data were collected between August 2019 and March 2020. Upon commencement of the study and following the telephone screening, eligible study participants arrived at the Swinburne laboratory, signed consent and completed pre-test questionnaires. Electroencephalogram (EEG) data were also recorded as part of a separate study and are reported elsewhere (Engelbrecht et al., 2021). Data on completion rates were recorded in an excel spreadsheet.

Participants were randomly allocated using masked block randomisation to one of two treatment conditions: VRT or MRT. Participants in the MRT condition were assigned toone of two MRT conditions based on the order in which they completed the study. Block randomisation is used in clinical research when equal groups in treatment conditions are required, and to reduce bias and confounding of participant characteristics between groups (Efird, 2011). Block randomisation works by assigning participants in randomly generated blocked groups of equal number to ensure that each treatment arm is the same size, however, this method can be problematic if the block size is known, as the allocation of participants can become predictable (Efird, 2011). Using masked, randomly assigned and varying block sizes overcomes this issue.

Block randomisation was completed through the use of a block randomisation website which allows for randomised and hidden group sizes. This website generated a list of treatment allocations that was printed by a research volunteer, and each individual allocation

was placed in a sealed envelope, labelled with a sequential order number (e. g., 1, 2 ,3), and provided to the researcher. The allocation was then revealed by the researcher opening the envelope immediately after the pre-test measures. Participants then engaged in the single session of the assigned intervention. Following the brief session, participants completed the post-test measures (MEQ-SF and PANAS), a brief interview, and were reimbursed $30 for their time and travel costs. Following the completion of the study, treatment adherence ratings were completed.

9.6 Results

9.6.1 Quantitative results

This pilot feasibility study comprised a small sample; hence we used descriptive statistics to identify quantitative trends. Quantitative data for the two MRT protocols were combined and compared against VRT due to the small sample size resulting from the COVID-19 Pandemic.

9.6.1.1 Feasibility

9.6.1.1.1 Completion rates. Of those who registered their interest and met study criteria, 90% went on to complete the study. One participant chose to withdraw after the screening interview due to health complications. All participants who commenced the session completed it in its entirety, resulting in a zero percent drop-out rate.

9.6.1.1.2 Treatment fidelity. Adherence monitoring was used to ensure that each session followed the planned protocols for both VRT and MRT conditions. The treatment adherence and competency for the questions related specifically to music were scored at 5 ("*extremely*") out of a 5 scale for all participants in the MRT condition, indicating these questions were delivered as intended, and competently. For the ROME questions, the majority (86%) of all ROME questions were rated as "*extremely"* adherent and competent (score of 5), with a few exceptions (13%), indicating that the protocol was administered as

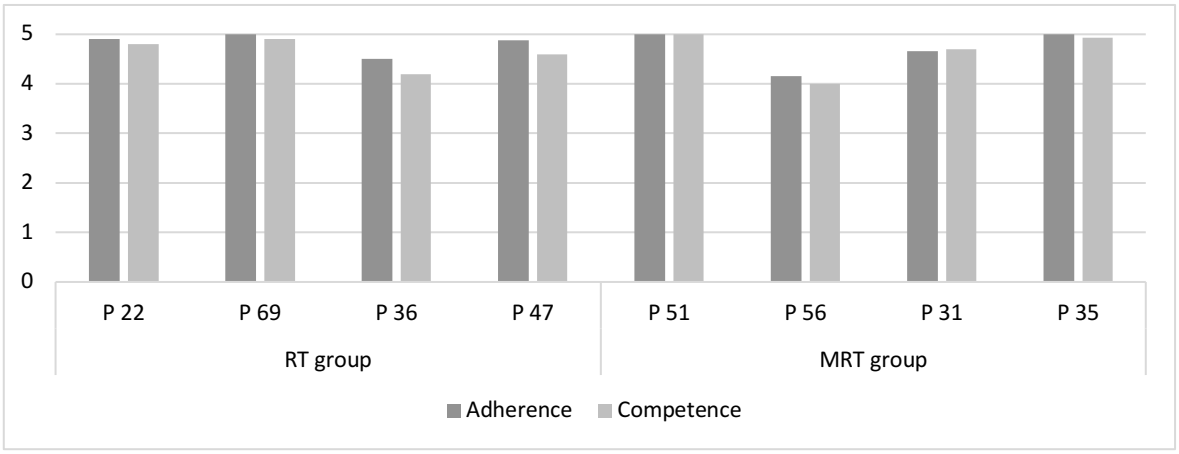
intended (see Figure 3). Of the exceptions, 28% were instances in which participants disclosed information that indicated the question was not relevant (e.g., they previously disclosed they were never married, or had children), and these questions were therefore excluded from the procedure.

9.6.1.2 Outcomes: Psychological data

9.6.1.2.1 PANAS. Data obtained from the PANAS were mixed, with minor shifts in positive and negative affect scale scores between the pre and post testing. Seven participants demonstrated minor improvements to their affective state following the single session, on either or both subscales of the PANAS. Six participants demonstrated slight improvements to their level of positive affect, and four participants experienced less negative affect at the post-testing (see Table 16). The sole exception to this pattern was participant 47, who showed less positive and more negative affect following the session. Participant 47 shared her traumatic experience of escaping an abusive marriage during the reminiscence session, which may have accounted for the worsening of affect. Mean scores for participants in the MRT conditions improved from pre to post test; no change in such scores were found for participant in the VRT condition (see Figure 4).

Figure 3.

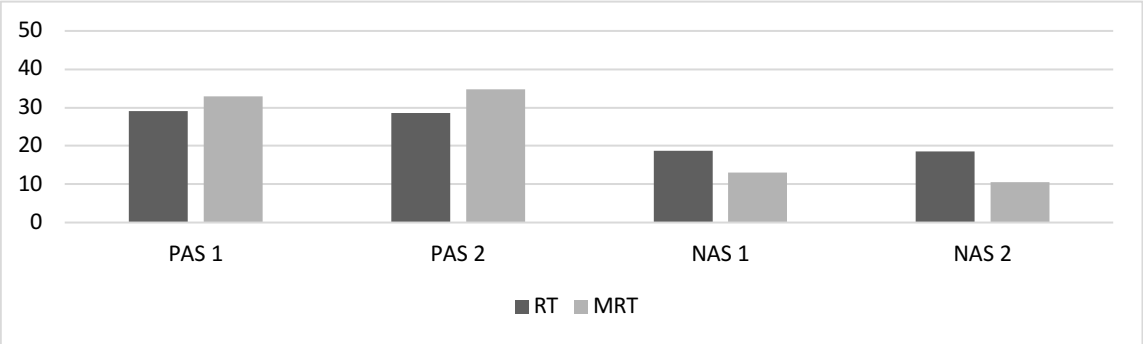
Mean adherence and competency ratings for each participant for the 10 ROME protocol questions.



Note. Scoring: 1 = Not at all, 2= A little, 3 = Somewhat, 4 = Very, 5 = Extremely.

Figure 4.

Mean PAS and NAS scores for those in the RT and MRT conditions.



Note. Positive Affect Scale (PAS) and Negative Affect Scale (NAS) were completed immediately before (1) and after (2) the interventions.

Table 16.

Participants pre and post Positive affect scale (PAS) and Negative affect scale (NAS) scores.

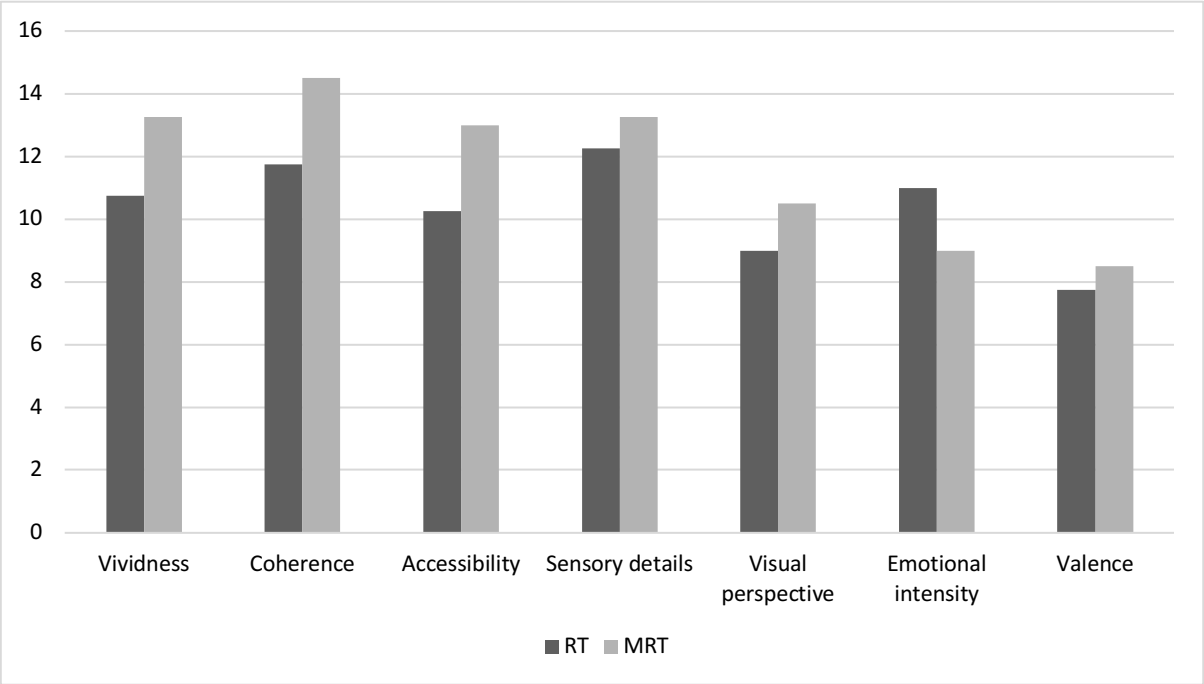
Subject ID	Treatment condition	PAS 1	PAS 2	Difference	NAS 1	NAS 2	Difference
22	RT	32	28	-4	14	11	-3
36	RT	16	20	4	17	18	1
47	RT	40	34	-6	34	35	1
69	RT	28	32	4	10	10	0
35	MRT 1	34	32	-2	15	12	-3
56	MRT 1	30	32	2	10	10	0
31	MRT 2	36	40	4	12	10	-2
51	MRT 2	32	35	3	15	10	-5
Mean scores	RT	29	28.5	-0.5	18.75	18.5	-0.25
	MRT	33	34.75	1.75	13	10.5	-2.5

Note. PAS and NAS scores range from 10 – 50.

9.6.1.2.2 MEQ-SF. Participants in the MRT conditions tended to rate their memory experiences as more vivid, more coherent, and more accessible than those in the VRT condition (see Figure 5). Those in the VRT condition tended to report more emotional intensity. Scores between the MRT and VRT groups were similar for the valence, sensory details, and visual perspective subscales, with those in the MRT conditions reporting slightly higher scores.

Figure 5.

Mean memory experience characteristics for participants following a single session of RT and MRT.



9.6.2 Qualitative results

9.6.2.1 Acceptability

All participants completed a brief semi-structured interview to gain insight into their experiences. Three major qualitative themes were identified in the participants' responses. First, participants were satisfied with their experience, indicating the users felt the interventions (VRT, MRT1 and MRT2) were acceptable and enjoyable. Seven participants

commented on their satisfaction with the interventions, with 6 indicating they were satisfied with the experience of the single session of VRT or MRT, for example, "overall I am satisfied" (participant 51) and "very satisfied" (participant 31) and "well, I'd come back again!" (participant 69). Participant 47 noted following VRT "I feel good that I came out lucky and successful in my venture…So it was good to look back on it and feel very successful about it [laughter]." Three participants commented that there was nothing they disliked about the experience, for example, participant 69 commented "there was no 'dislike' about it - I feel it was essential if the body is going to survive." Conversely, one participant was unsure, stating "I don't know yet, unless I know the results" (participant 36).

Second, participants reported that they noticed benefits from the single session of VRT and MRT. Participant 47 directly referenced the outcomes of reflecting on past successes, stating:

> You feel stronger when you feel you have achieved something and that gives you more confidence to do what you have to in the future…I think it makes the body feel better when you have released, even in answering these questions and explaining to you its probably better for my body.

Participants also noted it was beneficial to have the time to dive into issues or the social contact that they might not normally have the opportunity for, for example participant 47 felt:

> It was good that I could speak to you about it because you asked me and you gave me time. Whereas if I start on the topic with someone else… then sometimes I cut it short, ….I don't want to take up their time

and participant 69 commented, "I was very interested because I tell you what – I don't have the opportunity to talk to people like you or the fields that you're in." Similarly, participant 51 felt he doesn't "get the 'there you go' conversations…the more I run it

past [other people] I pick up the answer…so that's the feedback I'm after." Additional perceived benefits were relaxation and positive feelings such as "feeling calmer" (participant 31) and "overall I am going to go away with a positive feeling" (participant 51) and "I feel a lot better going out the door than I did coming in" (participant 69). Only one participant said they noticed no benefit or enjoyment. Participant 36 reported a negative outcome after discussing her grief after losing her husband and was unable to come up with another problem she had faced. Participant 36 stated "I actually felt depressed when I spoke about my husband, but that's the only thing I noticed."

Third, most participants reported some difficulty identifying a mastery related memory. Four participants had difficulty identifying 'problem-solving success'. Participant 35, said she "felt bad about finding something that I had 'conquered' as it were, to see it in your terms…I hadn't ever seen it as that, I just sort of muddled in and did what I could." Others expressed difficulties in thinking clearly. Similarly, participant 22 reported:

> It was difficult in a way because…I would hesitate in thinking that, or in having expressed too much…I guess I don't look back on problems all that much and then try and analyse them, so I guess it was difficult to bring together a true picture…I hadn't thought, uh about what effect it had on me, which you seemed to want to know.

9.6.2.1.1 Evolution and acceptability of the MRT protocols. When comparing the MRT protocols, several observations and comments were noted from the participants and researchers. Protocol 1 (MRT 1) was used with participant 35 and 56, and protocol 2 (MRT 2) was used with participants 51 and 31. In MRT 1, three questions were delivered to identify music related to personal preferences, positive affective experiences (e.g., happiness etc), or related to a happy time of life. In MRT 2 three questions were also delivered, designed to

identify music related to the problem-solving success through an emotional, time, or self-connection to the RT memory. During the study, the implementing researcher (INITIALS removed for review) noted that the MRT 1 questions were not directly related to the psychological components of RT, or to the experience of mastery or problem-solving success. While including preferred music and music connected to a happy period of life would possibly improve therapeutic rapport and create a positive experience, it is not directly related to the RT experience. In MRT protocol 2, more targeted prompts were used to identify songs related to the mastery memory being discussed. The question designed to probe the time of the memory in MRT 2 was changed to explore the time of when the problem was solved, compared to the general happy time of life question used in MRT 1. Furthermore, MRT 2 also included a new prompt designed to explore a musical reflection of identity or a self-connection of the person in relation to the mastery memory (e.g., skills learnt, or personal strengths identified through the experience). This identity question in MRT2 replaced the general music preference question used in MRT 1. While the MRT 2 protocol helped participants to identify a song specifically related to the RT memory, one participant commented that the chosen song did not elicit the same emotional warmth compared to his preferred music. Participant 51 in noted that:

> I felt where I struggled a bit was in relation to the song to the music. There's probably other songs, like if you'd played the song "Fire and Water" then I probably would have felt better because it's a song I really like. But I couldn't sort of see any correlation between that and the stuff we were discussing… I'm not sure whether I got that part of it right.

Changes were also made to the question relating to the emotional experiences of the mastery memory in RT between MRT 1 and MRT 2. In the original MRT 1 protocol, participants reported that finding a song related to specific emotions such as empowerment,

strength or happiness was difficult to answer. This question also did not allow for flexibility in the emotions, and made assumptions about the emotions that the individual might have felt. MRT 2 was then designed to address this issue to allow more flexibility in the emotions captured and reflected by the music. The question designed to probe the emotions experienced from the mastery experience were changed from MRT 1 in MRT 2 to be more flexible, by asking a generalised prompt such as a song that captures the emotions of overcoming this problem, allowing the participants to report on their own emotional experiences.

9.7 Discussion

This pilot study examined two ways of integrating recorded music to enhance instrumental RT, and to test user experience and acceptability of VRT and MRT with older adults experiencing psychological distress. The MRT treatment protocol was trialled with two different iterations: general music preferences (MRT 1) and specific music preferences related to the RT (MRT 2). Within both iterations of the MRT protocol, participants were able to identify a song. Consistent with the approach taken for MRT 1, previous research suggests music is a strong communicator of identity (Engelbrecht et al., 2021), and listening to personally preferred music provides emotional enhancement and pleasure (Bennett & Maas, 1988; Coffman, 2002; Laukka, 2007; Zatorre & Salimpoor, 2013). However, personally meaningful music that is directly related to the RT experience might enhance the therapeutic outcomes, as in MRT protocol 2. Conversely, one participant noted in MRT 2 that he did not have a strong personal connection to the song selected to relate to the mastery experience memory, compared to a personally preferred song. It is possible the music did not function as intended in this instance. In connecting music directly to the mastery memory, there needs to be a balance between the emotional reward of music listening to preferred music and music related to the RT.

This paper explored the feasibility and acceptability of using MRT and VRT to treat older adults experiencing psychological distress. Overall, the participants reported that VRT and MRT were acceptable and well tolerated interventions, and 100% of participants completed the session. The participants felt the RT (both VRT and MRT) provided a unique experience going beyond typical social interaction and providing more specialty and meaningful connections with someone willing to sit with the experience and give time to listen, perhaps addressing a need for older people.

The high treatment fidelity achieved in this study indicates that these interventions can be successfully implemented with this population. While all participants reported enjoyment in the session, several identified challenges in relating to the terminology or conceptualisation used in the ROME protocol, e.g., "*a problem solving success*". Participants found reviewing their past experiences with this lens difficult. While therapy itself should pose a degree of challenge to reframe experiences in a new way, the feedback from the users indicates that flexibility may be needed when implementing the ROME protocol. Additional questions may be needed to draw out success-related memories for the older adult populations, who may not conceptualise their life events as 'problems'. In the future, different iterations of this question could be proposed, for example "tell me about a time where you achieved success based on your hard work or ingenuity" or "looking back on your life, what successes or achievements are you most proud of?" Furthermore, it is important to note that the treatment adherence rater was a member of the research team, and therefore ratings may contain a level of bias.

This pilot study also tested for trends in affective change and to evaluate the characteristics of memory experiences in VRT and MRT. Trends in the data suggested some affective changes for most participants after the single session indicating that instrumental RT (i.e., both VRT and MRT) may improve aspects of wellbeing, consistent with previous

literature (Bohlmeijer et al., 2007; Chin, 2007; Meléndez et al., 2015; Pinquart & Forstmeier, 2012; Watt & Cappeliez, 2000; Westerhof et al., 2018). When comparing VRT and MRT, it appears that minor changes to affect were stronger for those in the MRT conditions. This is consistent with previous literature that demonstrated therapeutic effects of RT were enhanced by including music (Istvandity, 2017). The small changes in affective scores could be the result of measurement error, self-report biases, topics chosen for discussion (e.g., for participant 47 and 36) or actual changes following the single session of the interventions. Participant 47 was an outlier in her level of psychological distress (severe) compared to other participants and she chose to discuss her traumatic past of escaping an abusive marriage as her problem-solving success. It is therefore possible that the topic chosen by the participant caused her change in PAS scores between pre and post.

For the MEQ-SF, consistent with past research (Baumgartner, 1992; El Haj et al., 2011, 2012), larger differences between VRT and MRT were evident, with data suggesting those in the MRT conditions had a stronger memory experience on some factors such as vividness, accessibility, and impact of recalled autobiographical memories. These data, while promising, are not conclusive and it is difficult to determine the degree of clinical or statistical significance. Given the differences of memory experience characteristics evident between the participants of VRT and MRT, this clearly warrants further investigation in large scale trials to quantify the differences in memories experiences between VRT and MRT.

This study provides preliminary evidence for the feasibility and acceptability for using music in RT. There were several limitations in the study. First, the study sample was small. Larger samples, would allow for a more robust analysis of memory experiences and outcomes for VRT and MRT for older adults experiencing psychological distress. Second, all participants in the study were English-speaking, mostly highly educated and limited to one setting (i.e., metropolitan Melbourne, Australia). Future research inclusive of different

ethnicities and communities would expand our understanding of how these interventions can be applied with different populations and to address different needs. Third, the study did not use a control condition, hence could not compare the outcomes of VRT and MRT to a no-intervention condition. Fourth, the study used a single session of reminiscence, and a single piece of music. The low dose of intervention may explain the small changes demonstrated by the participants. Future research may examine the effects of more sessions of RT and MRT. Finally, the effects of RT and MRT in this study were examined immediately following the intervention, and hence we cannot track the longer-term effects of the interventions. Future longitudinal research would be beneficial to examine the longer-term durability of such effects.

Music can be used flexibly in RT, and as such, it is also worth considering when and how the music-enhancement occurs. The tested protocols used music following the instrumental RT questions as a means of enhancing the discussed experience, and not to prompt memories or open discussions. The results suggested that music added following the memory and during self-reflection is an acceptable method of MRT. In practice, music can be embedded within the RT experience at multiple points to open and prompt discussions in addition to enhancing the experience. The findings of this study can inform clinical practice by illustrating probing questions that can be used to identify music related to RT. Further research investigating how music can be integrated to both prompt (e.g., trigger memories) and enhance RT would add to the understanding of what role music can play in this therapy modality, and help to guide evidence-based practice for clinicians and music therapists. Music therapists are well positioned to use these interventions when working with older adults and in aged care, and therefore would benefit from access to training and implementing these interventions to provide evidence-based services to meet the needs of their clients.

9.8 Conclusion

MRT and RT were found to be well tolerated, acceptable, and feasible interventions to use with older adults who are experiencing psychological distress. Using music that is personally preferred and related to the autobiographical memory were both successful methods to connect music to the RT experience. Outcome measures of affect and memory experience suggested differences in outcomes between VRT and MRT, and future large-scale trials are warranted to test the efficacy and long-term clinical significance of these interventions to improve the wellbeing of older adults.

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Chapter 10. Neurological mechanisms

10.1 Chapter guide

This chapter presents the fourth and final paper, which uses a single-subject design to report on the neural connectivity and coherence for older adults in a single session of verbal reminiscence therapy, or music-assisted reminiscence therapy. This paper has been submitted for publication in Frontiers in Human Neuroscience.

10.2 Paper 4. Cognitive processes in reminiscence therapy with and without music: Four single cases comparing the neural effects for older people with psychological distress.

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10.3 Abstract

Music is often used to enhance reminiscence therapy, which can improve later-life psychological distress. The neurological mechanism for such enhancement is unknown. This paper aimed to explore the neural activity of four older adults while engaging in reminiscence when accompanied versus not accompanied by music. The study used a single-subject design approach. Participants were eligible for the study if they were 65 years and over and experiencing psychological distress. They were randomly assigned to a condition (reminiscence with music vs verbal reminiscence). Participants in both conditions were asked to reminisce about childhood, relationships, work, and a problem-solving success. Participants in the reminiscence with music condition were also asked to select and listen to a related or preferred piece of recorded music during the session. EEG recordings of resting states (e.g. eyes closed) were taken before and after the session, together with different epochs recorded during the session (e.g., during the start of reminiscence, the problem solving success, and music played). Analysis involved calculating the alpha, beta and theta wave topography to identify areas of peak wave activity, and standardised LORETA (sLORETA) calculations to map regions and sources of EEG activity during these epochs. Rolling average EEG epochs for electrodes grouped into lobe areas were analysed using two-way mixed Analyses of Variance. Findings suggested that reminiscence with music was associated with increased bilateral activation in EEG compared to reminiscence without music, particularly in the frontal and central areas. Areas associated with emotional regulation were activated in both conditions, but especially during reminiscence with music. Differences were detected in individual wave band data during the start of reminiscence when discussing childhood, compared to when discussing a problem solving success, suggesting that different cognitive processes were associated with different types of memory

recollection. Further research is needed to support if such neurological changes between reminiscence with and without music are consistent in large-scale research.

10.4 Introduction

Reminiscence therapy (RT) is an intervention that uses purposeful and directed recollection of past experiences to improve wellbeing (Webster et al., 2010). Different types of RT exist, including the thematic discussion and recollection of memories or experiences (*simple reminiscence*), the discussion of memories relating to identity and the meaning of one's life (*life review*), and the discussion of experiences related to successes and achievements (*Life review therapy;* Webster et al., 2010; Wong & Watt, 1991). RT has been found to be effective in improving mood, cognitive function, loneliness, quality of life, mental health, happiness and wellbeing for older adults (Bohlmeijer et al., 2007; Brooker & Duce, 2000; Chaing et al., 2010; Gudex et al., 2010). A meta-analysis demonstrated small to moderate improvements of RT on depressive symptoms, mental health, wellbeing, mastery, and cognitive performance, with the largest improvements resulting from the application of *life review therapy* to older people with depression (Pinquart & Forstmeier, 2012).

Music is often employed to enhance RT in music-assisted reminiscence therapy (MRT; Engelbrecht et al., 2021). Initial studies of the outcomes of MRT have suggested that the inclusion of music significantly enhances late life wellbeing above and beyond verbal RT (VRT) without music (Istvandity, 2017). Music has the capacity to engage bilateral (both left and right) and widespread neurological areas (Koelsch, 2010; Särkämö et al., 2013), however, the specific neurological mechanism for how music enhances RT remains unknown. Neuroimaging studies can address this question by mapping and comparing the neurological activity during and following VRT and MRT interventions.

Electroencephalogram (EEG) and neuroimaging studies can provide information about the neurological mechanisms by which VRT and MRT improve emotional regulation,

mood, and wellbeing. The brain produces electrical impulses or waves during all states of arousal and rest, varying in amplitude depending on the level of neurological activity, alertness, emotions and cognitions (Gruzelier, 1996). These brain waves are delineated into bands associated with the frequency of the electrical impulse patterns per second, including: Delta (< 4 Hz), Theta (4-8 Hz), Alpha (8-12 Hz), and Beta (13 – 40 Hz) waves (Ray & Cole, 1985; Stern, 2013). Wave patterns are generated from the cortex and internal neurological structures when cells use electrical signals to communicate (Sterman, 1996; Stern, 2013). Theta waves are classed as slow activity, and are associated with meditative states, daydreaming, creativity, intuition, and memory (Stern, 2013). Theta waves typically peak during periods of internal focus. Alpha waves are associated with a relaxed and alert state of mind, and are associated with attention, extraversion, creativity, and shifting between activities, though alpha waves decrease during active mental processing, termed desynchronisation (Stern, 2013). In memory tasks, alpha desynchronisation is positively associated with richer information in memory recording and retrieval (Hanslmayr et al., 2012). Beta is considered as fast wave activity and is associated with high executive functions, problem solving, judgement and decision making, and information processing (Ray & Cole, 1985; Stern, 2013).

Few studies have investigated the neurological activity and changes associated with RT interventions to explain the underlying mechanisms and neurological benefits. A case study of an 88 year old man with Alzheimer's Dementia demonstrated that weekly individual RT led to increased blood flow, particularly to the frontal lobe (Tanaka et al., 2007). Huang and colleagues (2009) recorded EEG before and after an 8-week reminiscence-cooking program for 10 participants with dementia in Taiwan. EEG results showed that participants' average fast wave activity significantly rose, while slow waves (e.g., theta) significantly reduced (Huang et al., 2009). The authors posited that an increase in fast wave and decrease

in slow wave reflected high arousal, high attention, and improved mental state. However, this study did not compare these patterns for individuals undergoing VRT versus MRT. It is also unclear what task participants completed during the EEG recordings. Further research is needed to explore the neurological changes associated with VRT versus MRT.

Research to date has focused on describing the neurological processes associated with general autobiographical recall and memory retrieval, and not on the neural activation of RT, which uses a specific psychological lens to view or change the meaning of memories to achieve wellbeing outcomes (e.g. mastery experiences). It is likely that different RT types may use different cognitive processes and areas of the brain. The hippocampus, prefrontal, frontotemporal and medial temporal lobes are all known to be critical for memory construction, searching, and retrieval (Graham et al., 2003; Holland et al., 2011). Prefrontal activity has been linked to working memory and episodic long-term memory (Ranganath et al., 2003), areas which may be involved in RT. Furthermore, the posteromedial cortex and default mode network play an important role in episodic and autobiographical memory (Shapira-Lichter et al., 2013). Emotion and sense of identity play a key role in recollection in RT, impacting on how memories are coded and stored (Conway, 2005; Rathbone et al., 2015), and which memories are remembered during recollection (Engelbrecht et al., 2021; Knight et al., 2002). A pilot RCT conducted by Bhar, Ciorciari, Lawrence and Yip (2012) compared the neurological activation through EEG recordings for 29 older people during either VRT or a memory task. The results suggested that Brodmann areas 5,18 and 31 were activated during VRT, with VRT characterized by brain areas associated with positive emotions and physical security (Bhar et al., 2012). The specific neurological processes that underlie each of the different RT types with and without music requires further investigation.

Mental illnesses change the patterns of brain waves, particularly for the retrieval of autobiographical memories. A pilot EEG study demonstrated that depression was

significantly related to the strength, vividness and importance of negative autobiographical memories (Knyazev et al., 2017). Individuals with depression demonstrated low-frequency EEG synchronisation during negative memory episodes, while those without depression synchronised in positive memory episodes (Knyazev et al., 2017). sLORETA localised the source of this synchronisation to the medial prefrontal cortex, with decreased connectivity in alpha bands in the posterior regions, and increased connectivity within beta bands in frontal regions. Further research demonstrated that individuals with a diagnosis of depression demonstrated frontal asymmetry with increased right frontal processing related to rumination and negative affect, particularly for Alpha wave bands (Davidson, 2004; Fachner et al., 2013). Left frontal activity is associated with positive emotions and memory, while the right frontal areas are associated with negative affect and memory (Ray & Cole, 1985). Collectively, this research indicates the importance of mental health and emotional regulation on the activity of the brain, and EEG studies may provide a way of measuring the effects of treatments for interventions that can improve psychological wellbeing, such as RT and MRT.

Neuroimaging studies using music in therapy have demonstrated significant outcomes. Music and other creative tasks have resulted in increased coherence (e.g. connectivity) between occipital and frontopolar regions (Petsche, 1996), and listening to binaural beat resulted in changed band activity for those with anxiety (da Silva Junior et al., 2019). Fachner and colleagues (2013) conducted an RCT comparing standard care to standard care with music therapy (MT) for 79 adults with a diagnosis of clinical depression and comorbid anxiety. Significant changes were identified in resting EEG following 3 months of psychodynamic music therapy, involving improvisation and discussion of the emotions and images that improvisation elicited. For those in the MT condition, alpha and theta waves increased in the left fronto-central area, and resulted in increased left-sided brain activity (areas associated with positive affective experiences) and lower scores on measures

of anxiety (Fachner et al., 2013). The results suggested the MT intervention induced benefits of neural reorganisation in those areas, a finding which has been supported in other research investigating the use of music in therapy for neurorehabilitation (Rojo et al., 2011). Similarly, Ramirez and colleagues (2018) randomly assigned 40 terminal patients in palliative care to a control (e.g. social company) or MT condition, demonstrating a significant increase in arousal and emotional valence through EEG for the MT participants only. Those in the MT condition also reported a significant decrease in tiredness, anxiety and physical symptoms, as well as increased overall wellbeing (Ramirez et al., 2018). More recently, Byrns and colleagues (2020) applied MT to virtual reality (VR) in a non-randomised pilot using EMOTIV EEG recordings with 19 older adults with dementia, using music listening and VR memory training exercises, involving depicted a classic theatre with a red curtain that closed after each of the eight, 30 second music excerpts played. Results indicated that VR MT decreased negative emotions (e.g. frustration), increased positive emotions (e.g. relaxation and valence) and demonstrated small changes in cognitive functions such as attention and memory when compared to pre-testing (Byrns et al., 2020). While useful in indicating the potential power of music in neurological activation and change, the interventions in these studies did not use a reminiscence therapy approach.

The specific neurological mechanism by which music may enhance RT requires further study. Engelbrecht and colleagues (2021) proposed the SEED theoretical model that suggests music has a multimodal enhancing role when used with RT – namely music helps to summon autobiographical memories, evoke emotions, elicit physiological responses, and define identity and social relatedness through a range of psychological, neurological, emotional, and physiological responses. To date, evidence has largely focused on the psychological and emotional outcomes of MRT. With music listening a highly subjective experience, responses vary for each individual. A case study approach is therefore useful

when investigating how each individual responds to music against their own baseline cognition, and to flexibly apply the intervention tailored to the individual. Single-case studies are also a viable alternative to large-scale RCTs when resources are limited (Lobo et al., 2017). What remains unknown are the neurological outcomes or changes to brain wave activity during VRT and MRT alike, and why music enhances the experience of RT. This information can help to guide effective and individually tailored applications of these interventions, the measurement of related and relevant outcomes, and indicate when these interventions are and are not clinically useful.

This paper presents a pilot study exploring the neurological changes and patterns of activity for four older adults during different phases of a single session of VRT and MRT using a single-subject study design with several cases. The aim of this study was to map the neurological activity associated with reminiscence with and without music, during the start of simple RT, and an instrumental reminiscence question. The hypotheses for this study were: 1) During music presentation, individuals in the MRT condition were expected to demonstrate greater and more widespread activation for alpha, theta and beta compared to during VRT, particularly in the frontal sites for alpha; 2) Differences in activation were hypothesised to be evident between the start of the RT and start of the instrumental reminiscence question (e.g. problem solving question); and 3) Wave pattern analyses were predicted to demonstrate changes for each individual - Alpha EEG was expected to decrease during RT (desynchronisation) while beta and theta were expected to increase between RT and RT problem solving.

10.5 Methods

10.5.1 Participants

Four older adults aged 69-86 (Mean age = 73.75, *SD*=4.92) comprised the final sample (Table 17). Participants were recruited through community and bulletin

advertisements. Individuals were eligible if they spoke English, were aged 65 years or over, had no known cognitive impairment or diagnosis of dementia (as determined by self-report), and were experiencing psychological distress as measured through a score of 16 or higher on the Kessler psychological distress scale (K10; Australian Bureau of Statistics, 2012; Kessler et al., 2003).

Advertisements were placed in community newspapers and organisations, and interested individuals contacted the research team via phone or email to register their interest. Individuals then completed the brief screening telephone interview. Of ten individuals screened, eight were found eligible for the study. All eligible participants attended the Swinburne EEG labs for a single session. Data from 3 participants were not used due to poor quality of EEG data. A further participant was excluded from analysis because of their lability and distractibility during the session.

10.5.2 Measures

10.5.2.1 Kessler psychological distress scale (K10)

The Kessler psychological distress scale (K10) is a brief, self-reported measure that asks participants to rate the extent to which they have been experiencing psychological distress (e.g. "How often have you felt tired out for no good reason?") on a scale of 1 (*not at all*) to 5 (*all the time*) over the last 30 days (Kessler et al., 2003). The K10 has been validated for use with older adults and over the telephone, with scores ranging from 10 – 50 (Andrews & Slade, 2001; Australian Bureau of Statistics, 2012). A higher score indicates higher levels of distress (see Table 17 for scoring).

During telephone screening procedures, the 4 participants scored between 21 – 34 out of 50 on the K10, with an average score of 27 (SD = 5.72), indicating that overall participants were experiencing *moderate* psychological distress (see Table 17).

Table 17.

Participant demographic information.

ID	Condition	Age	Gender	K10*	K10* distress	Relationship status	Country of birth	Education level
22	VRT	78	Female	21	Mild	Married	Australia	Undergraduate university degree
47	VRT	69	Female	34	Severe	Married	Sri Lanka	Undergraduate university degree
35	MRT	78	Female	24	Moderate	Separated	Australia	Postgraduate university degree
51	MRT	70	Male	29	Moderate	Widowed	Australia	Undergraduate university degree

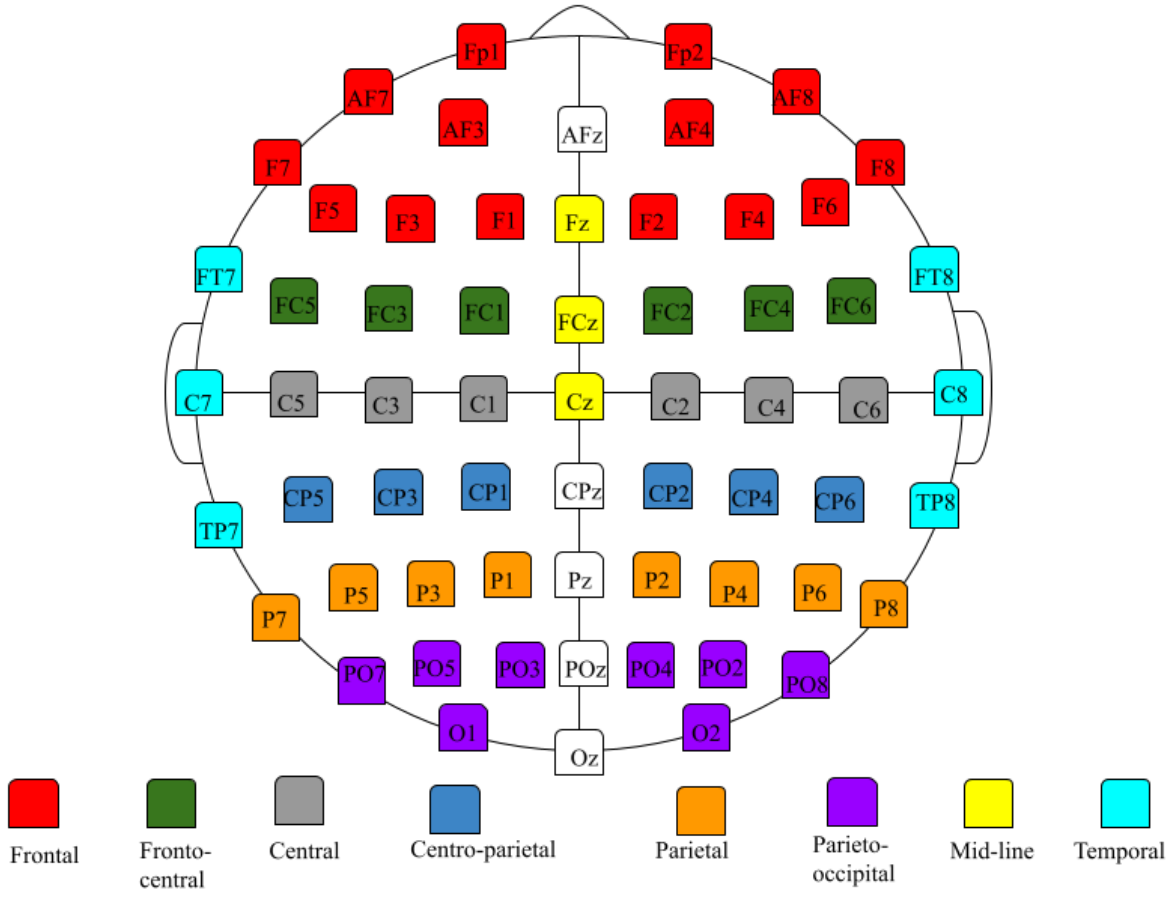
**K10 scoring: 0 – 16 no distress, 16--24 mild distress, 25-29 moderate distress, 30-50 severe distress.*

10.5.2.2 Electroencephalogram (EEG)

To monitor changes in neural activity during and following reminiscence with and without music, data were collected through a 64 channel 10-20 electroencephalogram (EEG), recorded through the portable ANT EEG system and electrode cap at Swinburne University of Technology's EEG lab. For statistical analysis, the 64 electrodes were grouped into the lateral (e.g., left or right) lobe locations, similar to Goodin et al. (2012) (see Figure 6).

Figure 6.

Electrode and left/right lobe map for the 64 EEG electrodes.



10.5.3 Procedure

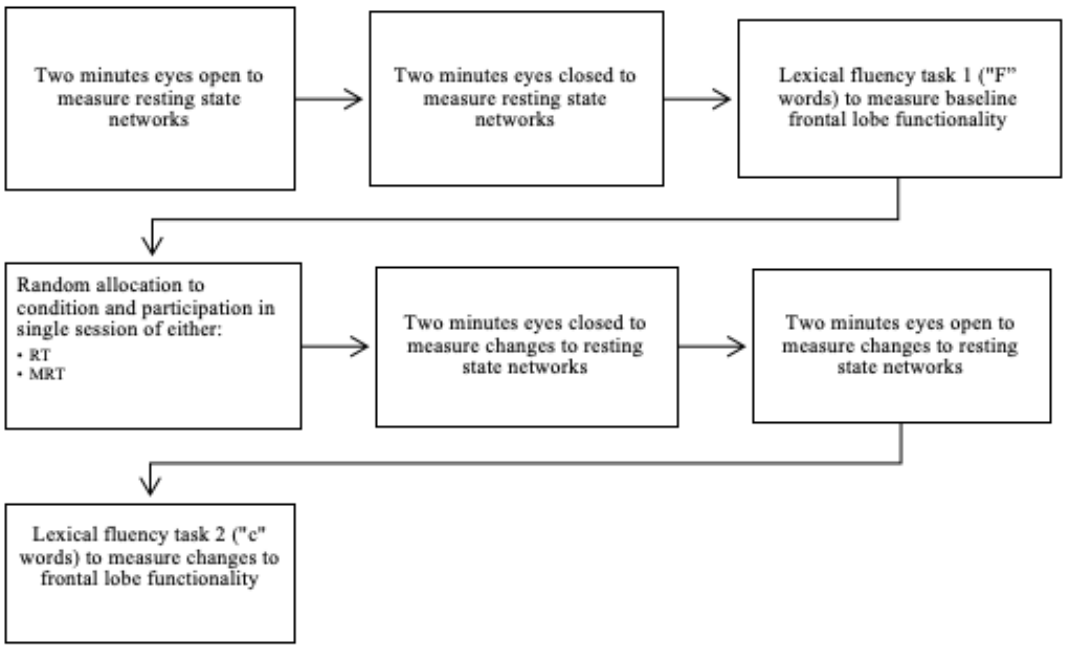
Initial treatment and EEG protocols were tested with 4 healthy adults prior to the commencement of the study. Eligible and screened study participants arrived at the laboratory, signed consent and completed pre-test questionnaires. Then, they were fitted into

the EEG cap using the 10-20 method to correctly position the electrodes. Conductive gel was placed in each electrode and signal checking was completed to ensure good connectivity. Once properly fitted, participants engaged in initial baseline recording of the resting state networks using two minutes of eyes open and eyes closed tasks, followed by a lexical fluency task. Baseline comparisons involved resting state networks (e.g. eyes closed or at rest) are useful analysis methods for creative or music based tasks (Petsche, 1996).

Participants were then randomly allocated using block randomisation to one of two experimental conditions: Verbal reminiscence therapy (VRT), or music-assisted reminiscence therapy (MRT). The researcher was blinded to the allocation sequence, until the allocation was revealed immediately prior to the intervention session. Following the brief session, participants completed the post-test measures of eyes open, eyes closed, and lexical fluency tasks (See Figure 7 for the tasks completed by all participants). Participants were reimbursed $30 for their time and travel costs.

Figure 7.

EEG recording procedure.



10.5.3.1 Verbal reminiscence therapy (VRT)

Participants underwent a single session of reminiscence. They were asked to reminisce about childhood experiences, work roles, relationships, and an experience in which they had successfully solved a problem. The Reminiscence of Mastery Experience protocol (ROME) developed by James and Bhar (2016) was used to guide the session, involving priming questions such as "*what was your family like?"* and "*what type of work did you do?".* The instrumental reminiscence question asked participant to "*Think back over your life and try to remember the times when you managed to solve a problem, which required some effort or ingenuity on your part. Can you describe the problem?"* followed by further exploration of the solutions they used, how they thought of the solution, and how the solution made them feel or learn about themselves (James & Bhar, 2016). When used with undergraduate psychology students, the ROME protocol was associated with significant improvements in pessimism, depressed affect, and mastery (James & Bhar, 2016).

10.5.3.2 Music-assisted reminiscence therapy (MRT)

The ROME protocol was adapted for the MRT condition. Several iterations of the music questions were trialled and are reported elsewhere (see Table 18). Protocol one involved a priming question regarding musical preferences, and then attempted to identify a song related to positive emotions such as happiness or success. Protocol two attempted to identify a song based on the emotions of solving the problem, a time connection to when the memory occurred, or that represented the skills or lessons from that experience.

Table 18.

MRT protocol.

Protocol 1:	What is your favorite song? Is there a piece of music that reminds you of the happiest time in your life?

	Is there a piece of music that reminds you of a time when you've solved a problem or had success?
Protocol 2:	Can you think of a song that captures the emotions of victory or overcoming this problem? Can you think of a song that reminds you of that time of your life? Can you think of a song that represents yourself or the skills that you've learnt?

Note. The above questions, and music played were implemented in the ROME protocol following the 'problem solving' question and when indicated.

10.5.3.3 EEG data recording and statistical analysis

EEG was recorded with a multi-electrode amplifier system (ANT Neuro) onsite at Swinburne University of Technology. The participants sat upright in a comfortable chair whilst EEG setup and recordings were performed. EEG setup and recordings lasted approximately one and a half hours. Artifacts were removed from the EEG using band-pass filtering set at 0.5 Hz–25 Hz, Notch Filter at 50 Hz and ocular correction. Data were corrected for eye and muscle artifact, with baseline corrections. Epochs associated with each of the events listed previously were created with a running average filter.

EEG analysis software, Brain Vision Analyser (Brain Products ver2.22) was used to analyse the EEG data using standard spectral analysis to produce topography maps marking areas of peak surface activation, and the Standardised LORETA algorithm was used to identify sources and regions associated with EEG activity (Pascual-Marqui, 2002) for each of the event average periods. Fast Fourier Transform (FFT) analysis was conducted to look at theta (memory), alpha (attention) and Beta (higher executive functioning) (Ray & Cole, 1985; Stern, 2013). Epochs were analysed for the pre and post resting state networks (eyes open/closed), during key moments of the interventions (e.g., the start of the ROME protocol, the problem solving question, or music played). The activity for each band (theta, alpha, beta)

was extracted and two-way mixed analysis of variance tests were used to compare regions of activation for statistical differences using IBM SPSS (version 27).

The assumption of normality scores was approximately satisfied as assessed by visual inspection of normal Q-Q plots, except for participant 47, who demonstrated consistently positively skewed distributions. Data were not transformed. There were outliers present in the theta, alpha, and beta rolling average data, as assessed by examination of the student residuals for values greater than ±3. Given the filtering and extraction process, the outliers were retained for analysis.

10.6 Results

Findings from each participant are presented in turn, detailing the results of statistical analyses for the EEG rolling average data and the peak activity for alpha, beta and theta brain waves during VRT, problem solving, and music played (if applicable). sLORETA analyses are then presented for RT, problem solving, and music played.

10.6.1 Participant 22 (VRT)

Mixed two-way ANOVA within epochs, between lobes repeated measures analyses were conducted separately for the alpha, theta, and beta EEG data. Alpha EEG data demonstrated a violation of sphericity. Using a Greenhouse Geisser correction (χ^2 =26.98 ε= .675, $p < .001$) there was a significant interaction between alpha power rolling averages for the eyes closed, VRT and VRT problem solving epochs and the 15 lobe categories, F (18.91, 56.67) = 2.269, p = .009, partial eta squared = .431. For theta EEG, a significant interaction existed between epochs and lobe areas (sphericity assumed), F (28, 84) = 4.59, p =<.001, partial eta square = .557. Beta EEG data demonstrated a violation of sphericity. Using a Greenhouse Geisser correction (χ^2 = 11.30, ε = .806, p = .004) there was a significant interaction between beta wave rolling averages for the eyes closed, VRT, and VRT problem

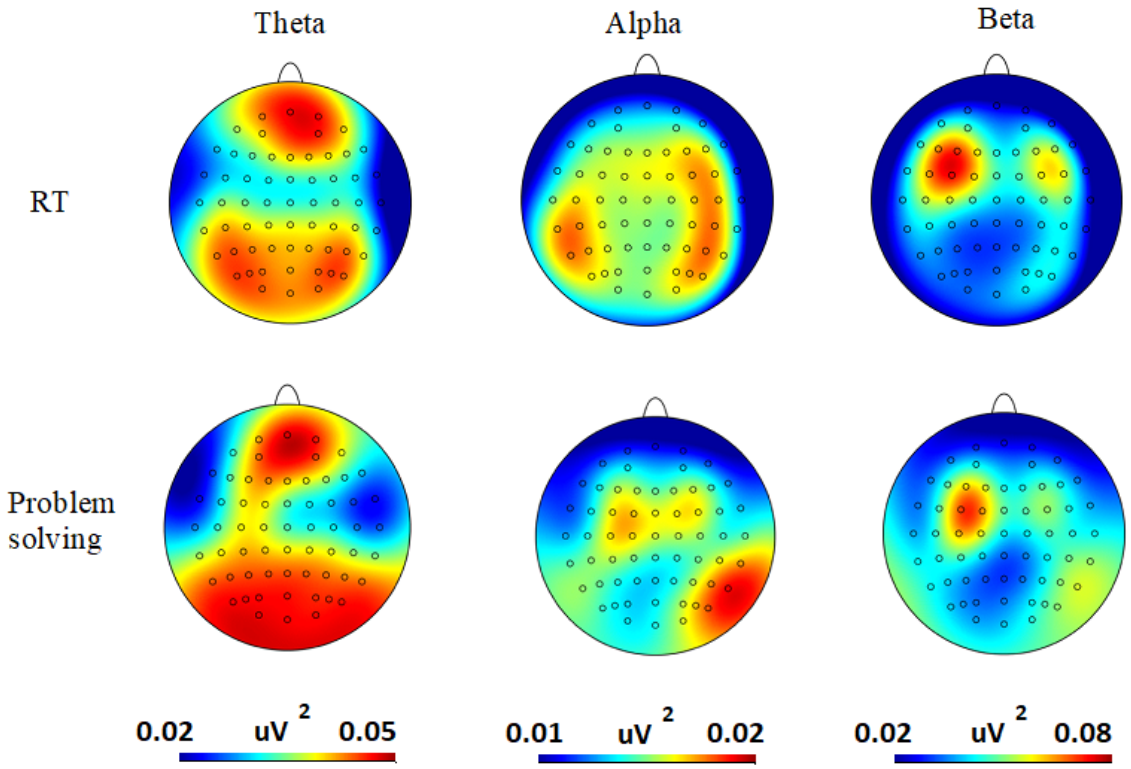
solving epochs and the 15 lobe categories, F (22.56, 67.69) = 3.28, p < .001, partial eta squared = .523.

10.6.1.1 VRT

Examination of the topographical distributions of brain activity (see Figure 8) associated with the start of the ROME protocol indicated that theta EEG demonstrated peak activation in the left and right fronto-central, right centro-parietal, right and left parietal, and right and left parieto-occipital lobes.

Figure 8.

Topographical distributions of Theta, Alpha and Beta EEG activity for participant 22 in the VRT condition (Average EEG Band amplitude Unit: uV).



For the regional analysis, Bonferroni corrected Post hoc LSD tests using the left frontal lobe as a comparison demonstrated significant differences during the initial RT for the Left fronto-central lobe (t = -2.44, p = .019), right fronto-central lobe (t = -2.14, p = .038), left parietal lobe (t= 2.85, p = .007), right parietal lobe (t = 2.24, p = .030), left parieto-occipital lobe (t =

3.513, p = .001), right parieto-occipital lobe (t =3.42, p = .001), and right temporal lobe (t = -4.83, p < .001).

Topographical distributions of alpha EEG peaked in the right and left parietal lobe (see Figure 8). Bonferroni corrected Post hoc LSD tests using the left frontal lobe as a comparison demonstrated significant differences during RT for the right fronto-central lobe (t = 2.108, p = .041), left central lobe (t = 2.147, p = .038), right central lobe (t = 2.168, p = .036), right parietal (t = 2.136, p = 039), right parieto-occipital lobe (t = 2.75, p = .008) and right temporal lobe (t = -2.65, p = .011).

Topographical maps identified that beta EEG were concentrated at the left frontal, left and right fronto-central, and left central lobes (see Figure 8). Bonferroni corrected Post hoc LSD tests using the left frontal lobe as a comparison demonstrated significant differences during RT beta for the right frontal lobe (t = -2.75, p = .009), left fronto-central (t =2.27, p = .028), left centro-parietal lobe (t = -2.60, p = .013), right centro-parietal lobe (t = -2.11, p = .041), left parietal lobe (t = -3.35, p = .002), right parietal lobe (t = -2.87, p = .006), left parieto-occipital lobe (t=-3.55, p= .001), right parieto-occipital lobe (t=-2.12, p = .040), left temporal lobe (t =-2.26, p = .029) and right temporal lobe (t=-4.49, p < .001).

10.6.1.2 VRT problem solving

During the discussion of problem-solving successes, the examination of the brain wave topography (see Figure 8) demonstrated that theta EEG peaked bilaterally across the right and left frontal lobes and left and right parieto-occipital lobes. Regional Bonferroni corrected Post hoc LSD comparisons for during RT problem solving identified significant differences between the left frontal lobe and right frontal central lobe (t= -2.909, p = .006), left parietal lobe (t = 2.28, p = .028), right parietal lobe (t = 2.06, p = .548), left parieto-occipital lobe (t = 3.06, p = .004), right parieto-occipital lobe (t = 2.64, p = .012), left temporal lobe (t = -2.06, p = .045) and right temporal lobe (t=-2.58, p = .013).

Topographical distributions of alpha EEG peaked in the right parietal and parieto-occipital areas (see Figure 8). Activation was also present in the right and left fronto-central, and central lobes. During RT problem solving, significant differences were detected using Bonferroni corrected Post hoc LSD tests for alpha between the left frontal lobe and the central line (t = 2.878, p = .006), left central lobe (t = 2.123, p = .040), left centro-parietal lobe (t = 2.882, p = .006), right centro-parietal lobe (t = 2.389, p = .021), left parietal (t = 2.981, p = .005), right parietal (t = 3.679, p = .001), left parieto-occipital (t = 2.350, p = .024), right parieto-occipital (t = 3.772, p = .001), and right temporal lobes (t = 2.59, p = .013).

Topographical distributions of beta EEG peaked in the central, left and right parieto-occipital lobes (see Figure 8). Further Bonferroni corrected Post hoc LSD comparisons for during RT problem solving identified no significant differences in rolling average beta waves between the left frontal lobe and any other area.

10.6.2 Participant 47 (VRT)

Mixed ANOVA within epochs, between lobes repeated measures analyses were conducted separately for the alpha, theta and beta EEG data. There was no significant interaction between the lobe categories and the theta epochs, F (28, 82) = .950, p = .546. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 24.24$, $p < .001$. Using a Greenhouse-Geisser correction (ε= .691) the main effect of theta epochs demonstrated significant differences in rolling average theta between eyes closed, VRT and RT problem solving, F (1.38, 58.07) = 4973.06, $p < .001$, partial eta squared =.992. Contrasts between epochs demonstrated significant differences between eyes closed and RT (F (1, 42) = 4635, $p < .001$, partial eta squared = .991), eyes closed and Problem Solving (F (1, 42) = 95.25, $p < .001$, partial eta squared = .694), and RT and problem solving (F (1, 42) = 24872. 75, p < .001, partial eta squared = .998).

For alpha EEG, there was no significant interaction between the lobe categories and the alpha epochs, F (28, 82) = .998, p = .482. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 53.69$, $p < .001$. Using a Greenhouse-Geisser correction (ε= .578) the main effect of alpha epochs demonstrated significant differences in rolling average alpha between eyes closed, RT and RT problem solving, F (1.16, 48.52) = 34.49, $p < .001$, partial eta squared =.451. Post-hoc comparisons demonstrated that RT and RT problem solving were significantly different, F (1, 42) = 213. 84, p < .001, partial eta squared = .836.

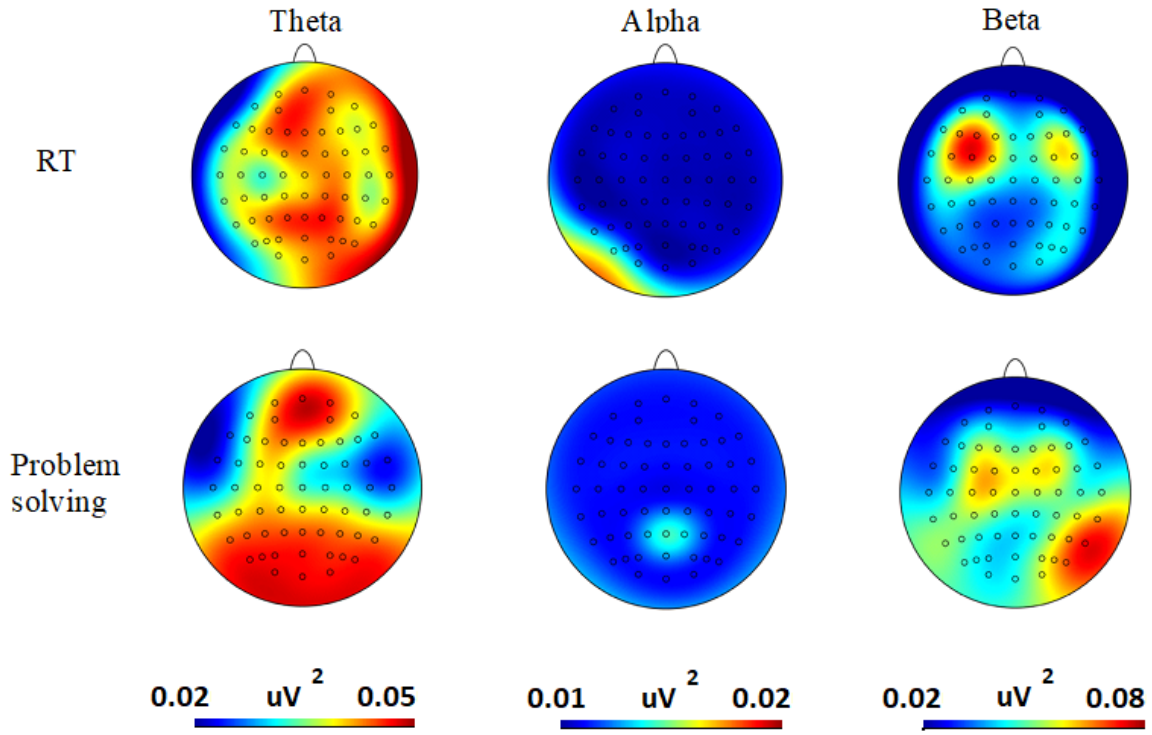
Beta EEG data showed no significant interaction between the lobe categories and the beta epochs, F (28, 82) = .925, p = .578. Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 117.85$, $p < .001$. Using a Greenhouse-Geisser correction (ε= .515) the main effect of beta epochs demonstrated significant differences in rolling average beta between eyes closed, RT and RT problem solving, F (1.03, 483.22) = 10.28, p = .002, partial eta squared =.197. Post hoc comparisons demonstrated significant differences between eyes closed and RT (F (1, 42) = 9.22, p = .004, partial eta squared= .180) and eyes closed and RT problem solving (F (1,42) = 13.67, p = .001, partial eta squared = .246) only.

10.6.2.1 VRT

During the priming questions of the ROME protocol, examination of the topographical distributions of brain activity (See Figure 9) associated with the start of the ROME protocol compared to resting state cognition indicated that theta waves peaked bilaterally across the right and left frontal lobes and left and right parieto-occipital lobes. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in theta rolling averages were located. Using the left frontal lobe as a comparison, no significant differences were identified during RT.

Figure 9.

Topographical distributions of Theta, Alpha and Beta for participant 47 in the VRT condition (Average EEG Band amplitude Unit: uV).



Alpha EEG waves peaked in the left parieto-occipital lobe (see Figure 9). Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in alpha rolling averages were located. Using the left frontal lobe as a comparison, significant differences were identified during RT for the left parieto-occipital lobe only, (t = 3.205, p = .003).

Beta waves peaked in the central, left and right parieto-occipital lobes (see Figure 9). Using the left frontal lobe as a comparison, significant differences were detected for the left parieto-occipital lobe only (t = 2.02, p = .006).

10.6.2.2 VRT problem solving

During the discussion of problem-solving successes, the examination of the brain wave topography demonstrated that for participant 47, theta waves peaked bilaterally across the right and left frontal lobes and left and right parieto-occipital lobes (see Figure 9). During

RT problem solving, significant differences were detected for the left parieto-occipital lobe only ($t = 3.25$, $p = .002$).

Alpha EEG peaked in the right parietal and parieto-occipital areas (see Figure 9). Activation was also present in the right and left fronto-central, and central lobes. During RT problem solving, significant differences in alpha were detected for the right parietal lobe only ($t = 3.37$, $p = .002$).

Beta waves peaked in the central, left and right parieto-occipital lobes (see Figure 9). Using Bonferroni corrected post hoc LSD tests, significant differences for beta were detected for the right parietal only ($t = 3.01$, $p = .004$).

10.6.3 Participant 51 (MRT)

Participant 51 was engaged in MRT protocol 1, involving questions to elicit music from their happiest time of life, a time of problem solving success, or their preferred music. Mixed ANOVA within epochs, between lobes repeated measures analyses were conducted separately for the alpha, theta and beta EEG data. For theta EEG, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 30.08$, $p < .001$. Using a Greenhouse-Geisser correction ($\varepsilon = .701$) there was significant interaction between the lobe categories and the theta epochs, F (39.27, 117.82) = 1.79, $p = 009$, partial eta squared = .374. There was also a significant main effect of theta epochs demonstrating differences in rolling average theta between eyes closed, VRT, VRT problem solving, and music played, F (2.81, 117.82) = 20.31, $p < .001$, partial eta squared =.326.

For alpha EEG, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 116.12$, $p < .001$. Using a Greenhouse-Geisser correction ($\varepsilon = .410$) there was significant interaction between the lobe categories and the alpha epochs, F (22.94, 68.84) = 12.82, $p < 001$, partial eta squared = .810. There was also a significant main effect of alpha epochs demonstrated differences in rolling average

alpha between eyes closed, VRT, VRT problem solving, and music played, F (1.63, 68.84) = 534.96, p < .001, partial eta squared =.927.

For Beta EEG, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 50.56$, $p < .001$. Using a Greenhouse-Geisser correction (ε= .596) There was significant interaction between the lobe categories and the beta epochs, F (25.02, 75.05) = 4.34, p <.001, partial eta squared = .591. The main effect of beta epochs demonstrated significant differences in rolling average beta between eyes closed, VRT, VRT problem solving, and music played, F (1.78, 75.05) = 139.42, p <.001, partial eta squared =.768.

10.6.3.1 VRT

During the introduction of the ROME RT protocol, examination of the topographical distributions of brain activity (See Figure 10) associated with the start of the ROME protocol indicated that Theta EEG peaked in the right frontal lobe, with activation also evident in the right central, left centro-parietal, left parietal, and left parieto-occipital lobes. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in theta rolling averages were located using the left frontal lobe as a comparison. During VRT, significant differences were evident between the left frontal area and left central lobe (t = 2.53, p = .015), right central lobe (t = 2.65, p = .041), left centro-parietal lobe (t = 2.65, p = .011), left parietal lobe (t = 2.66, p = .011), left parieto-occipital lobe (t = 2.75, p = .009)

Alpha EEG peaked in the right temporal lobe, right frontal lobe, left and right central area, left and right parietal lobe, right and left parieto-occipital lobe. During RT, significant differences were evident for all areas (p <.05) except for central and right centro-parietal lobes.

Beta EEG were activated bilaterally across the right and left frontocentral and central areas. Using the left frontal lobe as a comparison, significant differences were detected

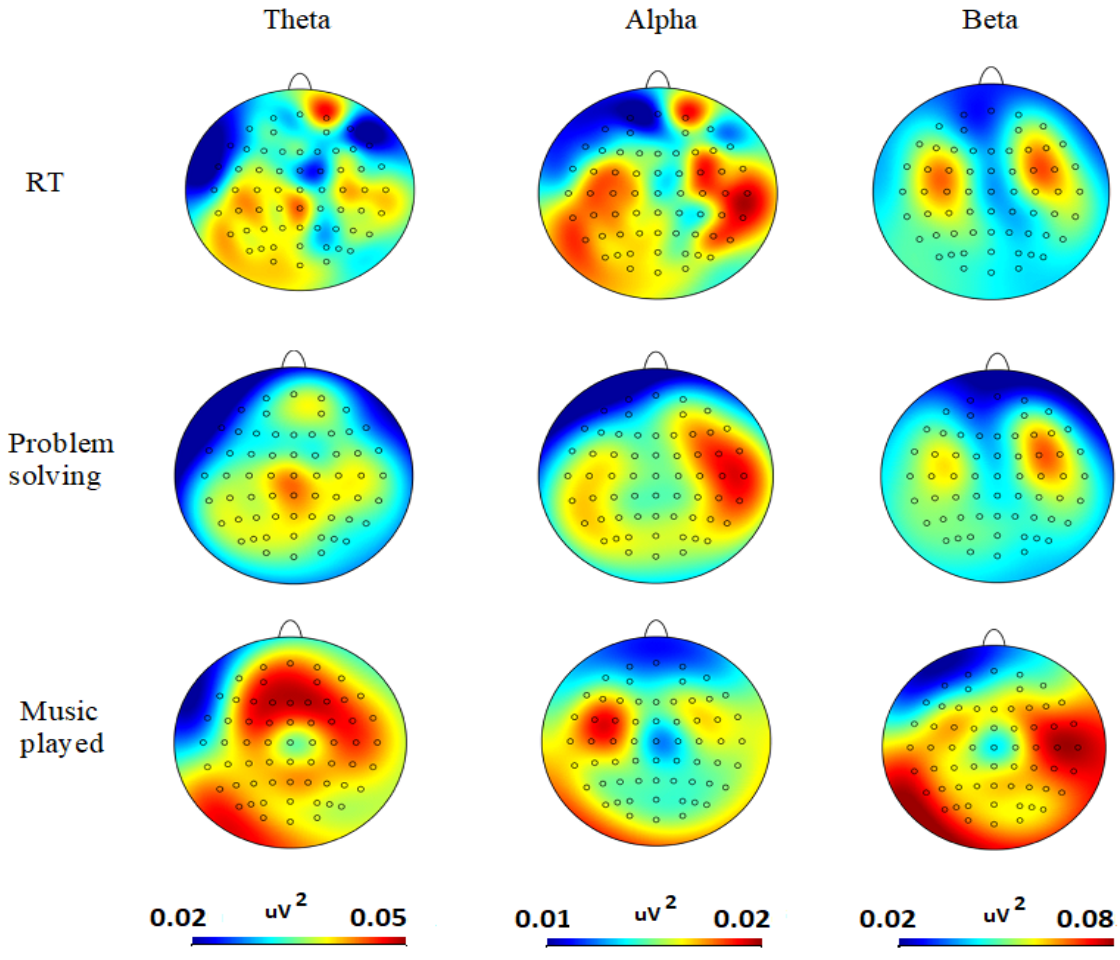
during VRT for left fronto-central (t = 2.94, p = .005), right fronto-central (t= 2.23, p = .031), and left central areas (t= 2.38, p .022).

10.6.3.2 VRT Problem solving

During the discussion of problem-solving successes, the examination of the brain wave topography (see Figure 10) demonstrated that theta EEG peaked in the left and right central and centro-parietal areas, right frontal, and left parieto-occipital lobes. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in theta rolling averages were located using the left frontal lobe as a comparison. During RT

Figure 10.

Topographical distributions of Theta, Alpha and Beta for participant 51 in the MRT condition (Average EEG Band amplitude Unit: uV)



problem solving questions, significant differences were identified for the central area (t = 3.81, p <.001), left central lobe (t= 3.13, p = .003), right central area (t = 2.85, p = .007), right centro-parietal lobe (t = 2.49, p = .016), left parietal lobe (t = 2.71, p = .010), right parietal lobe (t=2.49, p =.017), and left parieto-occipital lobe (t = 2.98, p = .006).

Alpha EEG peaked in the right temporal, fronto-central, central, and parietal areas. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in Alpha rolling averages were located using the left frontal lobe as a comparison. Significant differences were detected for all 15 lobe areas (p < .05) compared to the left frontal lobe.

Beta EEG peaked in the right fronto-central and central areas, with activation also lateralised to the left frontocentral and central lobes. During RT problem solving, significant differences were detected for the left fronto-central (t = 2.18, p = .035) right fronto-central (t = 2.47, p =.018), left central (t= 2.60, p =.013), and right central areas (t= 3.28, p = .002).

10.6.3.3 Music played

When the selected recorded music was played in MRT, the examination of the brain wave topography (see Figure 10) demonstrated that Theta EEG peaked in the left and right frontal, fronto-central and central areas, and left parieto-occipital lobe. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in theta rolling averages were located using the left frontal lobe as a comparison. When music was played, significant differences were only evident between the left frontal lobe and the left temporal lobe (t = -2.27, p = .028).

Alpha EEG peaked in the right temporal, fronto-central, central, and parietal areas, and left parietal-occipital area (see Figure 10). During music played, significant differences were evident between the left frontal lobe for all areas (p <.05) except for the central area.

Beta EEG peaked in the left fronto-central and central, and parieto-occipital areas, with activation also lateralised to the right frontocentral, central, and parieto-occipital lobes. During music played, significant differences were identified between the left frontal lobe and the left fronto-central ($t = 3.74$, $p = .001$) and left central lobes ($t = 2.71$, $p = .010$) only.

10.6.4 Participant 35 (MRT)

Participant 35 was engaged in a single session of MRT using protocol 2, involving questions to elicit music related to the emotions from the memory, the time-period in which the memory occurred, or related to their sense of self. Mixed ANOVA within subject epochs, between lobes repeated measures analyses were conducted separately for the alpha, theta and beta EEG data. For the Theta EEG, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 47.87$, $p < .001$. Using a Greenhouse-Geisser correction ($\varepsilon = .639$) there was significant interaction between the lobe categories and the theta epochs, F (35.79, 107.37) = 2.31, $p < 001$, partial eta squared = .435. There was also a significant main effect of theta epochs demonstrated differences in rolling average theta between eyes closed, VRT, VRT problem solving, and music played, F (2.56, 107.37) = 2.89, $p < .047$, partial eta squared =.064.

For the alpha EEG, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 143.6$, $p < .001$. Using a Greenhouse-Geisser correction ($\varepsilon = .373$) there was significant interaction between the lobe categories and the alpha epochs, F (20.91, 62.72) = 12.66, $p < 001$, partial eta squared = .808. There was also a significant main effect of alpha epochs demonstrated differences in rolling average alpha between eyes closed, VRT, VRT problem solving, and music played, F (1.49, 62.72) = 610.83, $p < .001$, partial eta squared =.936.

For the EEG beta data, Mauchly's test of sphericity indicated that the assumption of sphericity was violated for the main effect, $\chi^2(2) = 114.72$, $p < .001$. Using a Greenhouse-

Geisser correction (ε= .486) there was significant interaction between the lobe categories and the beta epochs, F (32.75, 98.27) = 6.60, p <.001, partial eta squared = .687. The main effect of beta epochs demonstrated significant differences in rolling average beta between eyes closed, VRT, VRT problem solving, and music played, F (2.34, 98.27) = 291.33, p <.001, partial eta squared =.874.

Overall, stronger activation was present during when music was played, compared to VRT and VRT problem solving. Activation was lower during VRT problem solving when compared to VRT for all wave patterns.

10.6.4.1 VRT

During the introduction of the ROME RT protocol, examination of the topographical distributions of brain activity (See Figure 11) associated with the start of the ROME protocol indicated that for participant 35, theta EEG peaked in the right frontal lobe. Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in theta rolling averages were located using the left frontal lobe as a comparison. During RT, significant differences were evident between the left frontal area and left central lobe (t = 3.96, p <.001), right frontal lobe (t = -2.54, p < .001), left fronto-central lobe (t = 7.01, p < ,001), right fronto-central lobe (t = 7.16, p <.001), left central lobe (t = 2.42, p = .020), and right central lobe (t = 5.38, p =<.001).

Alpha EEG peaked in the left fronto-central lobe (see Figure 11). Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in alpha rolling averages were located using the left frontal lobe as a comparison. During RT, significant differences were evident for central areas (t = 3.827, p < .001), left fronto-central (t= 10.12, p <.001), right fronto-central (t = 8.478, p <.001), left central (t = 2.41, p=.020), right central (t = 3.84, p <.001) and right temporal (t = 2.23, p = .031) lobes.

Beta EEG peaked in the right temporal lobe and lateralised across the right and left frontocentral areas (see Figure 11). Bonferroni corrected Post hoc LSD tests were used to demonstrate where these significant differences in beta rolling averages were located. Using the left frontal lobe as a comparison, significant differences were detected during RT for the left fronto-central lobe ($t = 6.85$, $p < .001$), right fronto-central lobe ($t = 6.01$, $p < .001$), right central lobe ($t = 2.99$, $p = .005$), left temporal lobe ($t = 2.88$, $p = .006$) and right temporal lobes ($t = 4.96$, $p < .001$).

10.6.4.2 VRT Problem solving

The topographical distributions of brain activity (See Figure 11) associated with the VRT problem solving task demonstrated peak activation for Theta EEG peaked in the bilateral frontocentral and central areas, and right frontal lobe. During VRT problem solving questions, significant differences for theta were identified for the central area ($t = 3.23$, $p = .002$), left fronto-central lobe ($t = 2.81$, $p = .008$), right fronto-central lobe ($t = 2.67$, $p = .011$), left central lobe ($t = 2.80$, $p = .008$), and right central lobe ($t = 2.11$, $p = .041$).

Alpha EEG activation was bilateral in the left and right fronto-central areas, and right frontal lobe. During VRT problem solving, significant differences were detected for all lobe areas ($p < .05$) except the right frontal lobe, left centro-parietal, left parietal, and left parieto-occipital lobe.

Beta EEG peaked in the right frontocentral and central area. During VRT problem solving, significant differences were detected for all areas ($p < .05$) except the right frontal lobe, left centro-parietal lobe, left parietal lobe, and left and right parieto-occipital lobes.

10.6.4.3 Music played

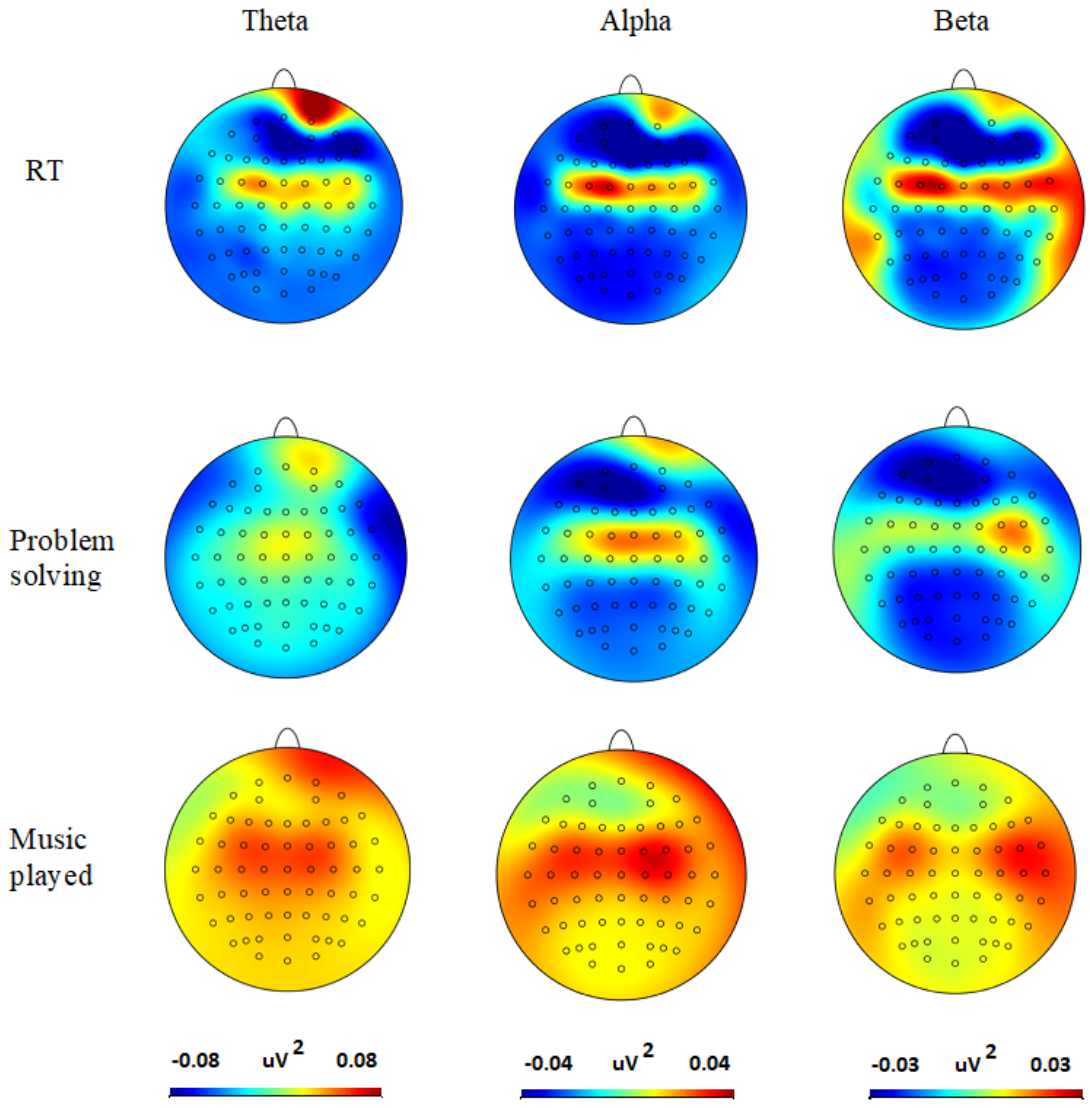
For participant 35, when the selected recorded music was played, the examination of the brain wave topography demonstrated (see Figure 11) that theta EEG peaked in the right frontal lobe, and bilateral activation in the frontocentral and central area. When music was

played, significant differences were evident for theta between the left frontal lobe and the central area (t = 2.59, p = .013), left fronto-central (t =4.00, p <.001), right fronto-central (t = 3.69, p <.001), left central (t = 3.15, p = .003), and right central (t = 2.85, p =.007) areas.

Alpha peaked in the right and left fronto-central and central areas. During music played, significant differences were evident for all areas (p <.05) except for the right frontal lobe, and left parieto-occipital lobe.

Figure 11.

Topographical distributions for Theta, Alpha, and Beta for participant 35 in the MRT condition (Average EEG Band amplitude Unit: uV)



Beta EEG peaked in the right temporal and frontocentral and central lobes. During music played, significant differences were identified in the left frontocentral lobe (t = 5.30, p < .001) right fronto-central lobe (t =6.29, p <.001), left central lobe (t = 2.53, p =.015), right central lobe (t = 3.87, p < .001), left temporal lobe (t = 2.63, p = .012), right temporal lobe (t = 5.98, p <.001).

10.6.5 sLORETA analysis

10.6.5.1 VRT

During the priming questions of the ROME protocol, sLORETA analysis showed participant 22, 47 and 35 demonstrated activation to the Brodmann Area 10 (BA 10) and inferior frontal gyrus (see Figure 12). Participant 51 showed weak activation to Broadman area 40 (BA 40) parietal lobe, and inferior parietal lobule.

10.6.5.2 VRT problem solving

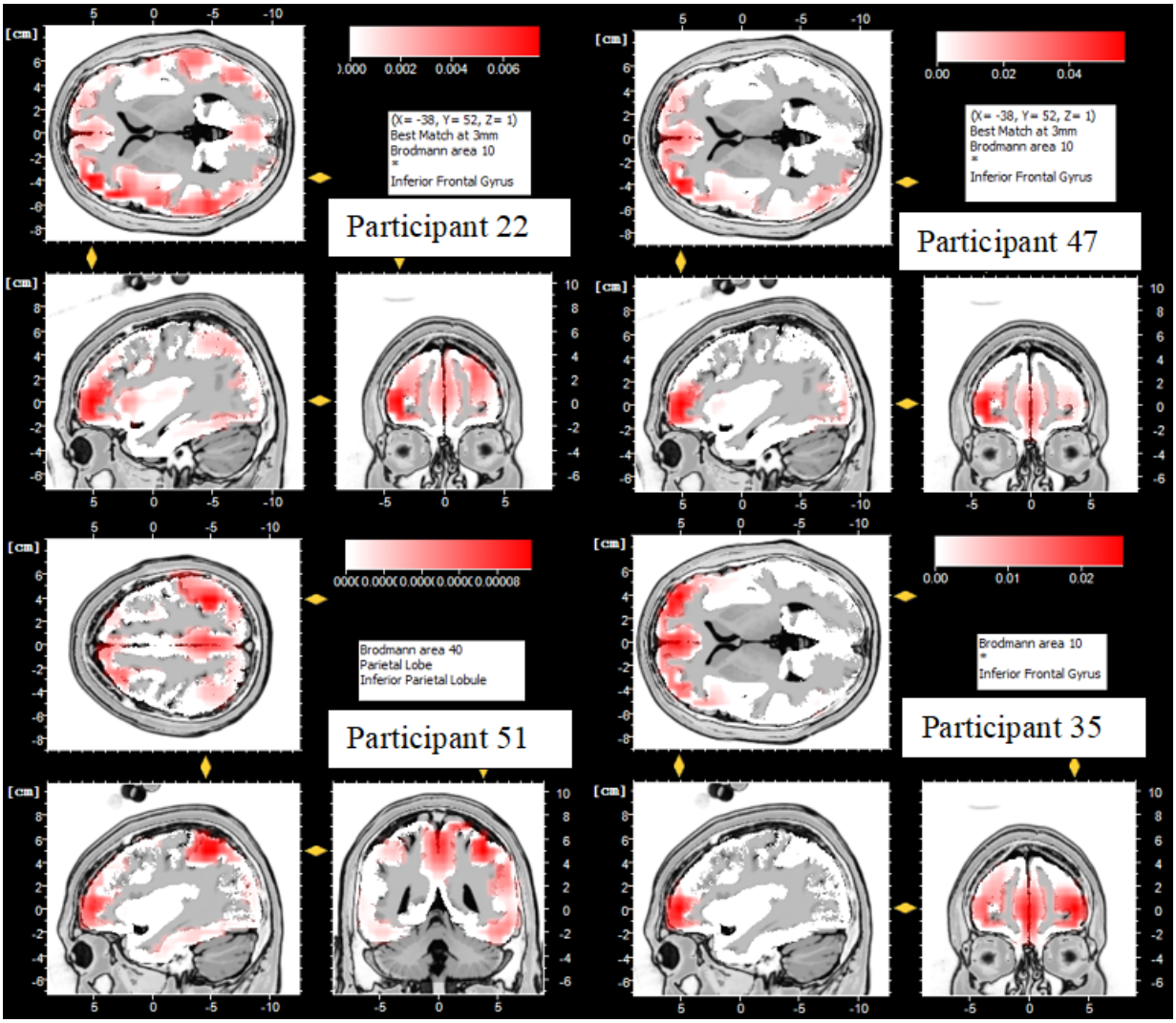
During the discussion of problem-solving successes, the sLORETA results for participant 47, 51 and 35 demonstrated activation in the Brodmann Area 10 (BA 10) and inferior and middle frontal gyrus (see Figure 13). Participant 22 demonstrated weak activation in the Brodmann area 21 (BA 21), temporal lobe and middle temporal gyrus.

10.6.5.3 Music played

sLORETA analysis of when music was played and listened to during RT treatment demonstrated similarities for participant 51 and 35 in the music condition, with activation in the Brodmann area 6 (BA 6), frontal lobe, and medial frontal gyrus (see Figure 14). BA6 was only activated during music.

Figure 12.

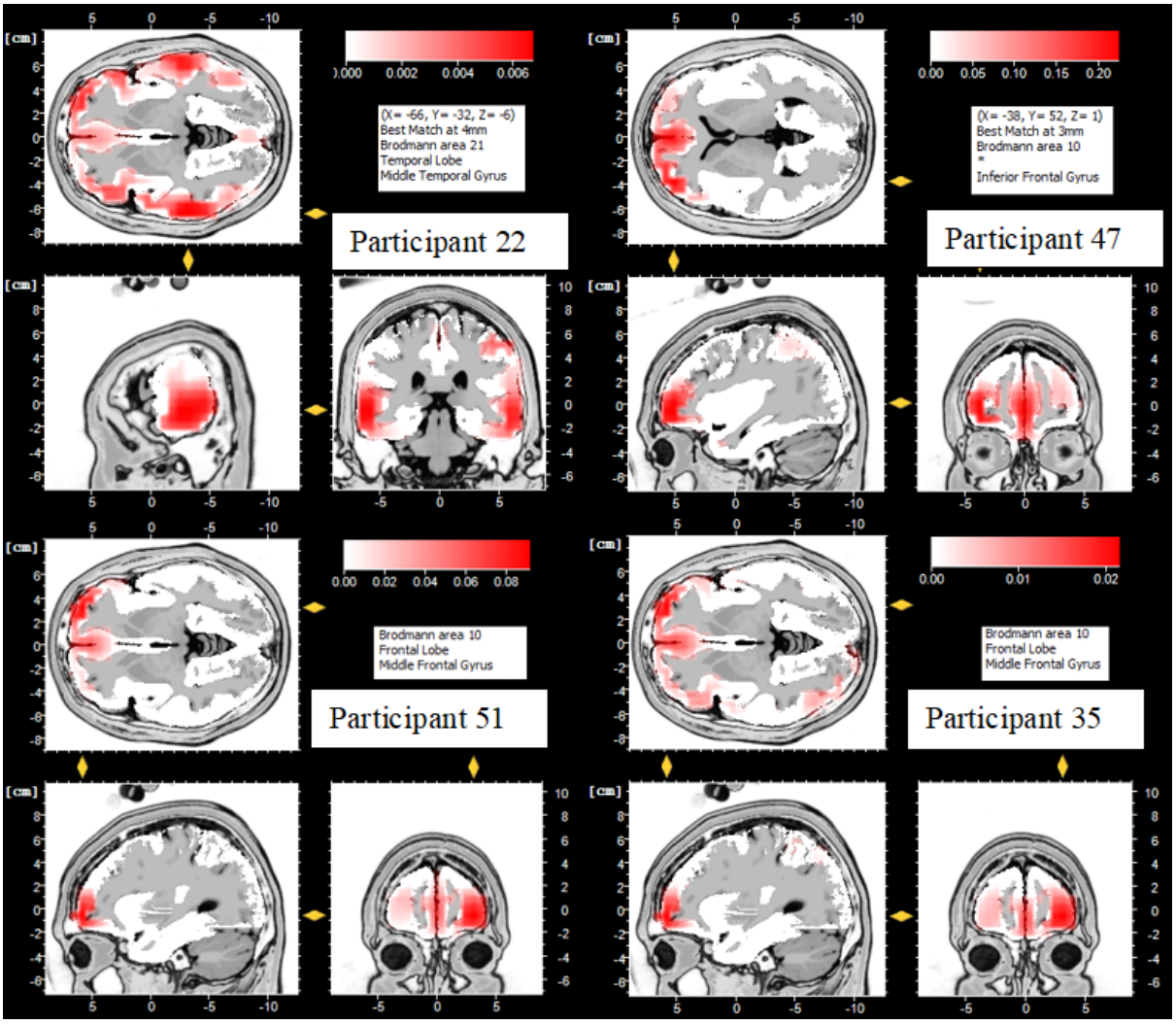
sLORETA analysis of EEG activity during VRT treatment (current density unit: uA/mm2).



NB. This figure shows the three orthogonal brain slices (horizontal, sagittal, coronal) for the 4 different participants during the VRT treatment phase of the session.

Figure 13.

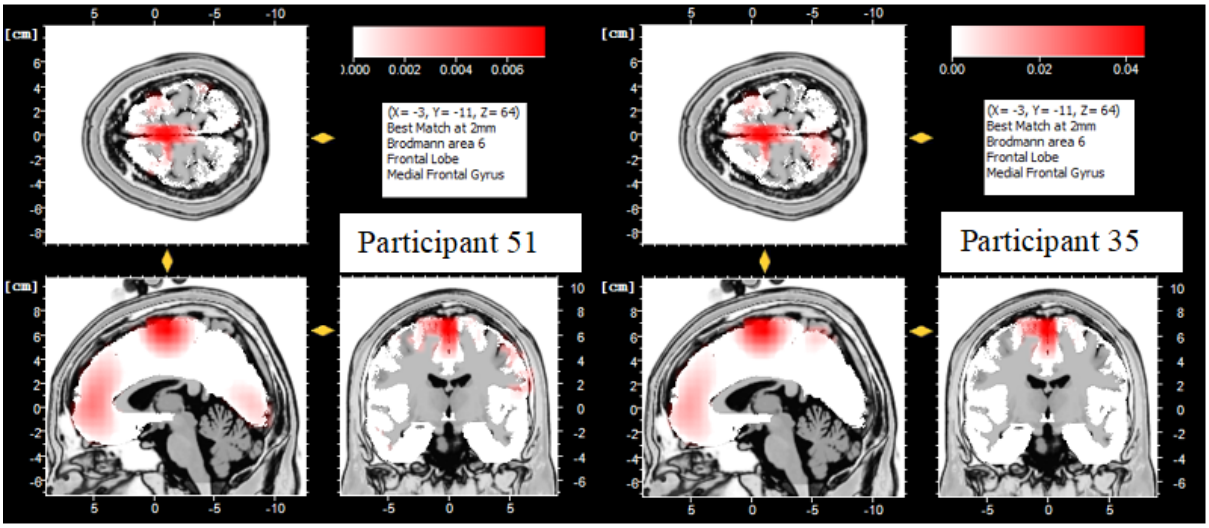
sLORETA analysis of the EEG activity during VRT problem solving questions (current density unit: uA/mm2).



NB. This figure shows the three orthogonal brain slices (horizontal, sagittal, coronal) for the 4 different participants during the VRT problem solving treatment phase of the session.

Figure 14.

sLORETA analysis of EEG activity during music played in RT (current density unit: uA/mm2).



NB. This figure shows the three orthogonal brain slices (horizontal, sagittal, coronal) for the 2 different participants during the MRT phase of the session.

10.7 Discussion

This pilot study investigated the neurological activation for four older individuals with psychological distress during different phases of a single session of RT treatment with or without the addition of music. Several methods were employed to detect changes in neural activity, including topographical analysis of peak wave EEG band activity (e.g., theta, alpha or beta waves), regional statistical analysis comparing the left frontal area to other regions within each wave band, and sLORETA source localisation to estimate the underlying neurological area that caused the identified surface activity recorded through EEG. Of particular focus for this study was identifying the underlying mechanisms for how music

enhances RT, and the neurological activity between the RT and RT problem solving. Results suggest that all three hypotheses were met with individual differences.

As hypothesised, compared to epochs during RT and RT problem solving, participants in the MRT condition were found to experience greater and more widespread activation during the presentation of music as demonstrated by the topographical maps for theta, alpha, and beta band waves. This finding is consistent with previous studies which showed that music causes widespread and bilateral activation of the brain (Koelsch, 2010; Särkämö et al., 2013). Furthermore, sLORETA analyses showed similarities during MRT for individuals, with BA 6, the frontal lobe, and medial frontal gyrus the likely source of the surface activity detected for the two participants in the MRT condition. BA6 is associated with meditative states, regulation of emotional states, attention, and working memory (Guleria et al., 2013). These case studies illustrate the neurological activation that underlies how music may enhance RT, suggesting the role of emotional regulation in creating therapeutic change during MRT. As predicted, the participants in the MRT condition experienced activation in the frontal sites during the presentation of music.

RT resulted in changes to neurological activity compared with baseline cognition (e.g., eyes closed) tasks for all four participants. There was evidence of increased activation in regions associated with working memory and attention, consistent with previous findings (Bhar et al., 2012). In contrast to previous findings, sLORETA analysis indicated both BA 10 and BA 21 were activated during RT and RT problem solving. BA 10 is the largest frontal brain region that has been associated with a range of functions, including risk assessment and decision making (Deppe et al., 2005), reward (Rogers et al., 1999), emotional processing (Bermpohl et al., 2006), episodic long-term memory (Ranganath et al., 2003) and assessing and evaluating working memory (Peng et al., 2018; Zhang et al., 2003). Likewise, the inferior frontal gyrus is an important node in brain networks that control speech, linguistic

processing, memory, and emotion, particularly in regards to answering questions and problem solving (Fincham et al., 2002; Hesling et al., 2005; Ranganath et al., 2003; Wildgruber et al., 2005). Brodmann Area 21 (BA 21) and middle temporal gyrus are areas associated with auditory comprehension tasks, language and semantic processing (Cabeza & Nyberg, 2000; Düzel et al., 2001; Goel et al., 1998; Hesling et al., 2005; Mirz et al., 1999). These case studies demonstrate the underlying neurocognitive mechanisms for individuals during *simple* RT and *life review therapy* for older adults experiencing psychological distress.

Despite the similarity in areas of underlying brain structure activation (e.g., sLORETA), individual wave band data suggested differences in activation between the start of the RT and the RT problem solving question. This perhaps indicates the different cognitive processes identified between *simple* reminiscence (e.g., the thematic discussion of memories e.g., 'childhood') and a *life review therapy* application of RT such as instrumental reminiscence focused on mastery experiences (Webster et al., 2010). A meta-analysis found that different types of RT (e.g., simple, life review therapy etc.) demonstrated outcomes of varying strength on factors of wellbeing (Pinquart & Forstmeier, 2012). This pilot study illustrates the changes that occur in the brain in real time during these interventions that might indicate the underlying mechanisms behind this difference.

Further differences were identified in the wave pattern analysis. It was predicted that alpha EEG would decrease during RT, a phenomenon in which alpha waves decrease indicating desynchronisation, or the brain becoming more efficient (Hanslmayr et al., 2012) with theta and beta increasing between RT and RT problem solving. Desynchronisation was evident in alpha wave bands for all 4 participants between RT and RT problem solving. Theta and Beta waves did not consistently increase between RT and RT problem solving, with varied topographies for each individual. For both participants in the VRT condition, there were similarities in beta wave patterns in the left and to a lesser extent right fronto-central

areas during the start of the ROME protocol and problem-solving question. For Alpha EEG, the two participants in VRT demonstrated no activation in the right frontal areas, areas previously linked to rumination, anxiety and depression (R. Davidson, 2004; Fachner et al., 2013; Ray & Cole, 1985). In the MRT condition, both participants demonstrated initial activation to the right frontal lobe during the start of the RT protocol, which then decreased during the problem-solving discussions and the presentation of music. Research conducted by Davidson (2004) and Fachner et al., (2013) suggests that these changes in alpha are associated with a decrease in negative affect for memory experiences. Both participants in the MRT condition reported sadness related to their early childhood experiences, indicating that the beginning of the RT protocol that involved questions about childhood and family may have induced negative affective experiences, which were then changed through the subsequent intervention and music. This therapeutic experience may demonstrate real time examples of emotional regulation for those with psychological distress through the use of MRT.

These four single-subject case studies offer a unique perspective on the neurological activation during a single session of two different intervention protocols, describing individual differences. Despite the value of these findings, several limitations are present in the sample and research design. This pilot study used a small sample, with each participant as their own control and cannot test for efficacy, and therefore the conclusions that can be drawn from the data is limited. The sample was also mostly highly educated at a university or postgraduate degree level. Education has been linked with differences in neural patterns and activation (Kaszniak et al., 1979) and therefore the results may not apply to different samples. This pilot also only applied recorded music as an enhancing factor following reminiscence, and therefore does not investigate the use of music as a prompt for memories. Prior research has noted that live music has demonstrated greater results than recorded music (Bailey, 1983)

and therefore live music may pose avenues for further enhancement of RT. As this case study sought to test the combined effect of music following RT to be delivered by those without musical training (e.g., nurses, or psychologists) this was considered an appropriate way to pilot these interventions, despite the training of the administering researcher, who was a registered music therapist.

Future research would benefit from exploring the long-term effects of VRT and MRT on the neurological activity and connectivity of older people who are experiencing distress, and from further investigating the use of these interventions with individuals experiencing cognitive impairment to compare the neural effects of these therapeutic modalities. Future RCTs would benefit from using large samples, a control condition as a comparison, a live music condition, and a longitudinal approach to treatment to investigate effects. Further questions remain about the frequency, duration, and dose size required of VRT and MRT to create lasting neurological and clinically significant change for groups such as older adults experiencing psychological distress.

10.7 Conclusion

This pilot study investigated the neural activation for 4 older people experiencing psychological distress during a single session of VRT or MRT. The single-subject studies showed similarities in areas of activation and evidence of emotional regulation during VRT, results that were enhanced by the presentation of recorded music. The results of this study suggested that MRT has a stronger impact on cognitive activation and function, and describes what neurological areas may be involved in the enhancing effects of music in RT. These results can inform future research to indicate what neurological areas may be involved during such interventions, and clinically to indicate when they might be usefully applied (e.g., following instrumental reminiscence), and individually tailored by including related music, with music increasing some cognitive effects of RT. Further research in a clinical trial of the

neurological outcomes and activation of VRT and MRT is warranted to replicate and expand these findings using a large sample, and exploring the long-term outcomes and effects of these interventions to improve the wellbeing of older adults.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

SB contributed to the study design and editing of the paper. JC contributed to the study design, data analysis, supervised the project, and contributed towards writing of the paper. RE designed and implemented the study, analysed the data, and took the lead in writing the paper.

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Chapter 11. Discussion

If you give your life to music,

It opens up the path

Maybe you didn't even choose it

You made the most with what you had

If you give your life to music

And commune with the unseen

Your brain is like a fuse

It melts the distances between.

- *Music life* (Todd, 2021).

11.1 Chapter guide

This chapter provides an overview of the dissertation. Firstly, the topic of the dissertation is summarised, and the research questions are restated. Then, the findings of each paper are summarised, and findings of the dissertation are explored in the context of the existing literature. The strengths and limitations of the project are discussed, followed by recommendations and directions for future research. This chapter then discusses the implications of the findings of the dissertation, and presents a conclusion.

11.2 Overview of the dissertation

Older adults face many emotional and psychological changes such as transitions in work and social roles, living arrangements (i.e., moving into care), deteriorating physical health and functioning, and losses. Older adults are at risk of experiencing poor mental health, such as symptoms of anxiety or depression. RT and music therapy are two interventions that can address psychological distress in older adult populations by providing

opportunities to meet a range of social, psychological, and emotional needs, such as recognising and validating identity and self-worth, social relatedness and autonomy, continuing social roles and previously enjoyed activities, and experiencing joy and pleasure (Atchley & Barusch, 2004; Baumeister & Leary, 1995; Havighurst et al., 1963; Tajfel & Turner, 1979).

RT is an effective treatment for late life depression and anxiety, and for older adults experiencing psychological distress (Bohlmeijer et al., 2007; Chaing et al., 2010; Chin, 2007). Several types of RT are used with older adult populations, and when using the Westerhof et al., (2010) typology of RT, can include *simple* reminiscence, *life review*, and *life review therapy*. *Life review therapy*, a specific type of RT that focuses on past problem solving successes, involves the recollection and adaption of previous coping and mastery experiences (Meléndez et al., 2015). This type of RT works by reconnecting with past identity, and allowing for adaptive coping strategies and resilience in order to manage stressors and change (Meléndez et al., 2015), and therefore is an appropriate intervention for use with those experiencing psychological distress.

Music generally enhances the outcomes of various RT types, however the mechanism for such enhancement was unknown. MRT involves VRT strategies with the addition of recorded music, live music, or discussions about music. Over a series of 4 papers, this dissertation used a mixed-method approach to explore the theory and practice of using MRT with older adults. The aim of this dissertation was to explore how music enhances RT, how it is used, and how it can be delivered to older people. Four studies were conducted to meet these aims, the research questions and related papers are summarised below.

11.3 Research questions

1. How does music enhance RT?
2. How are VRT and MRT used with older people in clinical practice in Australia?

2.1 To what extent is VRT and MRT used by the workforce?

2.2 Which types of RT are used?

2.3 How are these interventions delivered?

2.4 What are the perceptions of the situations, topics and outcomes of VRT and MRT for the workforce?

3. How feasible is it to integrate music with RT for older people with psychological distress?
4. What are the neurological mechanisms by which music may enhance the effects of RT for older adults with psychological distress?

11.4 Summary of key findings

11.4.1 The SEED model

In paper 1 we provided a theoretical model of the functions of music when used to enhance the therapeutic effects of RT for older adults. This model proposed that MRT: 1) summons more vivid and faster autobiographical memories through flexible cues and widespread bilateral brain activation; 2) evokes and mimics emotions by releasing dopamine and activating the limbic and paralimbic neural structures; 3) elicits physiological changes such as heart rate, blood pressure, hormone levels, cytokines for immunity, and reduced perceptions of pain through activating subcortical structures; and 4) defines and communicates information about identity, social networks and self-memories. The paper also discussed how these functions may work together within MRT, indicating that several functions overlap (e.g., our identity impacts the type of memory recalled, and the perception of these memories).

11.4.2 The use of VRT and MRT in care

In paper 2, we surveyed 110 people who work or volunteer with older adults to determine how the aged care workforce view and use VRT and MRT. The survey recorded if

and the extent to which such treatments were employed by these providers, why such treatments were administered, and the content of memories reported by clients when engaging in the treatment. In this study, we found that most (n = 78; 84%) respondents reported regularly using VRT in their work, and of those, most (n = 62; 82%) also used MRT. Simple reminiscence was the most frequently used type of reminiscence for both MRT and VRT. Respondents described VRT and MRT as spontaneous interventions. Memories shared by older people to the staff were reported to be most commonly about family and places. Participants perceived that VRT and MRT lead to positive outcomes such as better care practices, positive affect and mood, and improved social connections with older clients. MRT was used as a compensatory strategy when clients could not engage in VRT (e.g., could not verbally communicate). These findings demonstrated how VRT and MRT are being delivered in Australia's aged care sector, documenting treatment as usual practices to inform future research (e.g., establishing that in treatment as usual, VRT and MRT are used in both group and 1:1, and music is most often delivered with recorded music during RT) and clinical practices of those working or volunteering with older adults.

11.4.3 Pilot-testing music-assisted reminiscence therapy

In paper 3, we investigated the feasibility of using VRT and MRT with 8 older adults experiencing psychological distress (K10 scores of 16 and over), who were randomly allocated to a single session of either VRT or MRT. We collected data before and after administering these interventions to participants, to explore if participant experienced improvement in affect. We also explored treatment acceptability and tolerance of two different iterations of MRT and VRT through a post-test semi-structured interview. The feasibility of the treatment was assessed by treatment completion rates (defined as proportion of participants who completed the treatment) and task completion (e.g., able to identify relevant music, therapist was able to adhere to treatment protocol).

Findings were as follows. Participants in MRT conditions tended to experience improvements in affect as demonstrated by positive shifts (or decreased negative affect) in pre-post scores on measures of affect. Results also suggested that MRT may improve vividness and impact of memories on mood, to a greater extent than VRT. The study however was not sufficiently powered to allow for statistical significance testing and hence, such observations are anecdotal.

Participants reported that VRT and MRT were acceptable and well tolerated. All participants completed the session in its entirety demonstrating that the treatment was feasible. Treatment feasibility was also demonstrated in that participants assigned to both MRT protocols were able to identify music, and that the therapist was able to adhere to the treatment protocol.

11.4.4 The EEG findings of VRT and MRT

In paper 4, we examined the neurological responses of four older adults randomly assigned to VRT or MRT (two participants per condition). The participants were a subset of the sample from paper 3 chosen based on the quality of their EEG recordings and behaviour during the interview. EEG recordings were taken continuously during baseline pre-test measures (e.g., eyes closed), during the session, and after the session for post-test measures. Epochs were time-locked with a marker in the data files. Analysis involved key epochs, such as when reminiscing about problem solving successes, and when music was played in the MRT condition. EEG data were analysed with band wave topography (e.g., alpha) to identify areas of peak wave activity, standardised LORETA (sLORETA) calculations to map source localisation of EEG activity during epochs, and rolling average EEG epochs for electrodes that were grouped into lobe areas were analysed using two-way mixed ANOVAs.

The findings from this paper suggested that MRT can lead to increased and bilateral activation in EEG compared to VRT, particularly in the frontal and central areas. The results

of this study therefore indicated that MRT may have a stronger impact on cognitive activation than VRT and baseline measures, and described what neurological areas may be involved in the enhancing effects of music in RT – the BA6, frontal lobe, and medial frontal gyrus. These findings suggested that music may enhance RT through emotional regulation and triggering meditative states.

Furthermore, evidence for different cognitive processes was detected between the types of reminiscence therapy (e.g., *simple* vs *life review therapy*) in individual wave band data between the start of the RT (e.g., in discussing childhood) and the instrumental reminiscence question, suggesting different underlying neurological mechanisms between these therapy types.

11.5 Dissertation findings and previous research

This dissertation has advanced the field of psychology, music therapy, aged care, and neuroimaging in theory and practice. These key findings are contrasted and integrated with the existing literature below.

11.5.1 Theory on the role and functions of music in MRT

Music is associated with multiple benefits when used in RT. The literature exploring MRT is theory poor, and the focus to date has centred on testing music and RT for a single aspect or outcome (e.g., anxiety) of wellbeing. Two papers from this dissertation explored the theory about the functions of music in MRT, and provided novel contributions from both a holistic and neurological perspective as to how music enhances RT. Overall, these two studies contribute to our understanding of the potential mechanisms for change when applying VRT and MRT interventions to improve wellbeing for older people.

This thesis builds on validated functions of music in other therapies and creative contexts. Previous research has suggested that older people engage in recreational music listening to regulate their mood, to validate identity, and to express social relatedness

(Schäfer et al., 2013). These underlying functions serve core psychological and emotional needs; for mastery and autonomy, for self-worth and identity, and for social connection (Baumeister & Leary, 1995; Havighurst et al., 1963; Tajfel & Turner, 1979). Taking this theory further, Brancatisano and colleagues (2020) proposed a model to explain the broad therapeutic role of music, specifically in the treatment of neurological disorders such as autism spectrum disorders (ASD), dementia, stroke, and Parkinson's diseases. This model discussed the 7 capacities of music to make therapeutic change, and the underlying neurological, emotional, and physical mechanisms for this change. These authors postulated that music can be engaging, emotional, physical, social, personal, persuasive, and can synchronise movement (Brancatisano et al., 2020). The SEED model has broad similarities to these models, such as the functions in the cognitive, emotional, physiological and psychosocial domains, and uniquely applies them to the context of RT. The SEED model (paper 1) integrated research and theory from disciplines such as psychology, music therapy, neuroscience, and medicine, and applied and organised theory and research on the mechanisms by which music is proposed to enhance VRT.

The SEED model proposed that music provides a flexible and changeable summoning cue for memories, as in Mace et al.'s (2017) multi-process theory of recall. According to this theory, memory can be accessed through varied methods ranging from indirect or involuntary, from effortful searching, repetitive cues, or temporal cues (Mace et al., 2017). Music can therefore access memory archives through varied and flexible methods of searching. A chorus or repeating song lyric could be used as a prompt for recall, and songs from particular genres or time periods (e.g., from the 1960s), or the content of their lyrics, can be temporal triggers (e.g., songs that remind one of past events or experiences; Ford et al., 2011; Mace et al., 2017). The SEED model goes further, by proposing that music, in addition to those methods of recall based solely on memory, uses emotional and

psychological (i.e., identity) cues to enhance memory recall (El Haj et al., 2012; Juslin & Västfjäll, 2008; Koelsch, 2010). To our knowledge, the SEED model is the first to apply this theory to the context of music in RT.

The SEED model collected and organised the benefits and functions of MRT in a holistic way, and in doing so, identified the paucity of research on exploring the physiological and neurological responses from music in RT, therefore, further testing of this model is needed to provide greater evidence of why music enhances RT. To address this identified gap, paper 4 explored the neurological reasons why VRT and MRT work as interventions to purportedly improve wellbeing in older adults experiencing psychological distress. These four single-subject cases depicted the neurological activation during a single session of two different intervention protocols.

The findings of paper 4 demonstrated that MRT resulted in greater and more widespread neurological activation for theta, alpha, and beta band waves, consistent with previous research on the use of music therapy in other contexts (Koelsch, 2010; Särkämö et al., 2013). For those in MRT, the Brodmann Area 6 (BA6), the frontal lobe, and medial frontal gyrus were the likely source of the surface activity detected. These results illustrated how music may enhance RT, suggesting emotional regulation and meditative states (Guleria et al., 2013) may be responsible for creating therapeutic change in MRT, and enhancing RT with music over and above VRT, providing preliminary support for two factors from the SEED model (e.g., summon autobiographical memories and evoke emotions and pleasure).

Previous meta-analysis research found that the different types of RT (e.g., *simple*) demonstrated outcomes of varying strength on factors of wellbeing (Pinquart & Forstmeier, 2012). Results from paper 4 suggested that band wave data varied between the *simple* (e.g., the beginning of RT) and *instrumental* RT (e.g., RT problem solving), with the authors

theorising that different cognitive processes were involved for these RT tasks, explaining the differences in wave band data identified. This pattern was consistent for VRT and MRT. For alpha waves, desynchronisation was evident for all 4 participants between RT and RT problem solving, in line with previous findings on other cognitive tasks (Hanslmayr et al., 2012). Furthermore, the participants in VRT demonstrated no activation in the right frontal area, areas linked to rumination, anxiety and depression (Davidson, 2004; Fachner et al., 2013; Ray & Cole, 1985).Those in MRT, who both reported sadness related to childhood, demonstrated initial activation to the right frontal lobe (e.g., areas associated with negative affect in memory) during the *simple* RT, which then dissipated during the MRT intervention. This EEG data is the first real time examples of emotional regulation through MRT for those with psychological distress.

The EEG study (paper 4) presented a unique methodology to this research field, as presently no neuroimaging studies have compared VRT and MRT. To date, neuroimaging research has explored RT alone (Bhar et al., 2012; Huang et al., 2009), or autobiographical recall with and without music (Byrns et al., 2020; Davidson, 2004; Fachner & Stegemann, 2013; Knyazev et al., 2017), and not in a corrective or therapeutic RT context, in which new meaning or insight is achieved through discussing memories. In comparison to other music therapy research, this pilot only made use of recorded music to enhance reminiscence discussions. Previous studies have used live music in other therapy contexts, which has demonstrated stronger results than recorded music (Bailey, 1983).

11.5.2 Practice: How are these interventions being used, and how can they be used?

We do not know how VRT or MRT are being used in practice. This dissertation sought to provide clarity on how these strategies are being utilised and what implementation strategies are acceptable and feasible from the perspective of the healthcare worker and the older adult with psychological distress. Despite several trials on the effectiveness of VRT,

prior to this dissertation, none have assessed the feasibility and acceptability for integrating music in such interventions. This research also attempted to examine the experiences of participants undergoing MRT.

In paper 2 VRT and MRT were reported to be widely and frequently used by those who chose to participate and who worked in aged care. In contrast, previous work by Kris et al., (2017) surveyed 43 nurses in aged care homes in a single state in USA, in which less than half frequently engaged in reminiscence with their clients. It is possible that the difference in sampling (e.g., nurses vs health workers and volunteers) explains the disparity. While MRT was overall reported to be used frequently, it was used significantly less compared to VRT for each RT type. This is surprising given a wide range of benefits has been associated with the inclusion of music in RT in previous research (El Haj et al., 2011, 2012; Haslam et al., 2014; Potts et al., 2020; Rawtaer et al., 2015). It is possible that lack of training or access to music are major barriers for those in the workforce that impede using MRT more regularly.

There is very little clarity or consistency in the delivery methods, duration, and frequency of how VRT and MRT are used in practice or research (Macleod et al., 2021). Within the research, VRT weekly group programs range in duration from between 6 – 12 weeks (Chaing et al., 2010; Li et al., 2020; Lök et al., 2019; Stinson, 2009), to individual sessions daily, weekly, or even as single session designs (James & Bhar, 2016). Results of paper 2 in the dissertation demonstrated that music was used flexibly (live, or recorded music, or as a topic of discussion) *during* RT, and both VRT and MRT were delivered in one-to-one and group sessions. These findings addressed a gap in the literature detailing the treatment as usual practices of VRT and MRT from the perspective of the practitioners who implemented these interventions.

Across the studies, both VRT and MRT were perceived as successful and well tolerated interventions. These interventions were valued by both the practitioner and older

adults. Both samples reported VRT and MRT provided opportunities to reconnect with past selves, achieve and maintain deeper social connections, and positive affective experiences. This research also makes an important contribution towards our understanding of the types of RT used within aged care in Australia. Previous research by Bohlmeijer et al., (2007) and Pinquart & Forstmeier (2012) demonstrated that *life review* and *life review therapy* were the most effective RT methods for improving wellbeing for older people, and *simple reminiscence* was the most effective for those with dementia. The results of the dissertation demonstrated that *simple reminiscence* was the most used method across work settings, followed by *life review therapy*. Overwhelmingly these interventions were reported to be spontaneous and integrated as part of daily care, for example, in addition to daily care routines hygiene routines, perhaps explaining why *simple reminiscence* was the most used type.

Furthermore, Paper 3 used a single session design to pilot test VRT and two different MRT protocols; general preferred music (MRT1) and music related to the RT memory (MRT2). Both methods were successful in identifying a song for use in MRT, however, participants reported that the music selected needs to recognise and cater to personal preference (i.e., to have a strong emotional connection to the song) and relevance to the memory (i.e., to have a strong connection to the memory itself). This was the first study to explore how music can be connected to the memory recalled during the RT.

Most participants experienced minor affective change after a single session of VRT, consistent with previous literature on longer-term RT programs (Bohlmeijer et al., 2007; Chin, 2007; Meléndez et al., 2015; Pinquart & Forstmeier, 2012; Watt & Cappeliez, 2000; Westerhof et al., 2018). Previous literature has also demonstrated that the therapeutic effects of RT are enhanced by music (Baumgartner, 1992; El Haj et al., 2011, 2012; Istvandity, 2017). It appears that minor changes to affect were stronger for those in the MRT condition

compared to VRT in this pilot trial, although the difference was not tested for significance. Likewise, participants in the MRT condition appeared to have stronger memory experiences on some factors than those in the VRT condition, such as vividness, accessibility, and impact of recalled autobiographical memories. These findings, while promising, were limited to visual inspection of the data and are not statistically significant. It is therefore possible that the small changes in affective and memory experience scores are the result of measurement error, self-report biases, the memories chosen for discussion, the small dose of intervention (i.e., single session), or actual therapeutic effects.

Webster (2003) and Webster and colleagues (2010) proposed that older people reminisce for eight reasons; including for social engagement, identity, problem solving, teaching others, death preparation, bitterness revival, boredom reduction, and intimacy maintenance. These reasons are associated with either positive (e.g., social engagement) and negative health outcomes (e.g., bitterness revival; Cappeliez et al., 2005). Previous research has shown the most commonly reported reasons for nurses in USA to use VRT was to help residents to relax, to reflect on the meaning of life, and to feel more oriented (Kris et al., 2017). In paper 2, the most reported purposes for utilising VRT were social engagement, identity validation and boredom reduction, while to complain was consistently reported as the least used purpose underlying the interventions. One key difference between VRT and MRT was the use of MRT as a compensatory strategy for those who may not be able to engage in verbal conversations.

Many challenges face this workforce, including carer fatigue, being time poor in stressful environs, burnout, and high staff turnover (Mavromaras et al., 2017). RT with older adults has also demonstrated positive effects on participating care staff, with research suggesting improvements in self-rated measures of personal accomplishment, emotional exhaustion, de-personalisation of residents, mental health, and attitude towards contact with

older people (Gudex et al., 2010). For staff, music making has also shown significant reductions in long-term carer burnout, mood and mood disturbances (Bittman et al., 2003). Participants from paper 2 also noted benefits from the VRT and MRT experiences.

Older adult participants reported enjoying VRT. Despite this finding, the participants identified difficulty complying with the instructions to identify a specific memory. Participants found that reviewing their past experiences with a "problem solving success" lens difficult to achieve. This key feedback from users substantiates the need for flexibility when implementing this protocol, such as additional questions to draw out success-related memories and thinking, who perhaps have not conceptualised their life events as "problems to be solved".

When comparing the findings of this paper to the SEED model, there are several areas of overlap, with participants in this exploratory study recognising the cognitive, social, emotional, and psychological benefits of VRT and MRT. While some participants described health benefits (e.g., symptom management or reduced medication use), what remains unacknowledged is the physiological outcomes of VRT and MRT. It is likely that this represents an area of research that is more difficult to test and identify in the field, and therefore remains unexplored. Furthermore, the findings of this descriptive research were used to inform the research decisions for the subsequent papers (paper 3 and 4), and were used to inform what constitutes as standard practice for VRT and MRT, for example, validating individual sessions as usual practice for VRT and MRT.

11.6 Strengths and limitations of this PhD research project

11.6.1 Strengths

The research undertaken for this dissertation had several strengths. First, this dissertation used a mixed method research approach, which combines qualitative and quantitative data collection and analysis (Johnson et al., 2007; Carr, 1994). Mixed method

approaches allow for exploration of more in-depth research questions and captures individual experiences (Östlund et al., 2011). The combination also overcomes several limitations of the individual methods, for example, adding qualitative data provides much needed context to provide a deeper understanding of the findings via the experience of the individuals (Carr, 1994; Johnson & Onwuegbuzie, 2004).

Second, the research in this dissertation used multiple data collection and triangulation methods as a way of seeking a more in-depth and nuanced understanding of the research findings, and providing validity to the mixed-method data (Carter et al., 2014; Mertens & Hesse-Biber, 2012). This dissertation employed multiple triangulation methods such as from a range of sources (i.e., older adults, and the staff who care for them), multiple methods of data collection (i.e., interviews, surveys, and EEG), theory (i.e., across music therapy and psychology), and investigator triangulation (i.e., two researchers independently coded data). These strategies add rigor, diversity, and a balanced perspective to the findings (Carter et al., 2014; Denzin, 1973; UN Aids, 2010).

Finally, all research methodology was trialled prior to data collection. Methods such as surveys, EEG, and intervention protocols were trialled with volunteers (e.g., in focus groups or with healthy adult volunteers). This ensured that any collection methodological issues were identified (e.g., EEG data recording issues) and resolved, and the researcher was skilled in the necessary methods prior to the commencement of the research.

11.6.2 Limitations

This dissertation used two samples across 3 papers. Both samples were small and had limited power to detect significant findings. For paper 2, direct healthcare workers and volunteers (N= 110) who worked with older adults completed the survey. The sample had some limitations in representing the population of those working with older adults. Given the small size of the sample, it was treated as homogenous for statistical analysis of how the

interventions were used and viewed, however, participants reported working across work settings (e.g., aged care, and/or hospitals) and occupations. Likewise, this sample may not be truly representative of attitudes of the care force Australia wide due to the poor spread of respondents across the states and territories. The majority (59%) of respondents worked in the state of Victoria in Australia with no respondents recorded for the Northern Territory or Western Australia. A large proportion also reported to work within allied health roles (44%) indicating the sample was heavily weighted towards this section of the workforce population. Furthermore, less than 4% respondents identified as culturally or linguistically diverse (CALD).

Similarly, paper 3 used a small sample of 8 older adults who were experiencing psychological distress. This small sample did not achieve the power required to complete statistical testing. Furthermore, this study did not use a control condition. A subset of this sample (*N*=4) were used in the EEG analysis for paper 4, which used a single-subject research design, with each individual acting as their own control condition, thereby overcoming the limitations of the small sample. However, the generalisability of these findings remains limited by the sample size. Furthermore, both samples were obtained from English-speaking and highly educated individuals, and therefore the results presented in the dissertation may not be generalisable to other populations or those who are CALD.

11.7 Future directions for research

Findings from the research indicated four areas for further exploration. First, the poor quality of existing evidence of RT, and particularly MRT interventions requires addressing. In the course of preparing the research for this dissertation the lack of high-quality and rigorous research became abundantly apparent. This was particularly the case for research exploring the physiological and neurological outcomes of VRT and MRT. Future pilot and large-scale research are encouraged to make use of randomisation, clear and replicable

methodology and reporting, and the rigorous evaluation of different or multiple outcomes to test these interventions. Specifically, further exploration of the emotional regulation and meditative states triggered by MRT is warranted. It would be beneficial to establish a clearer and consistent understanding of the changes to alpha, theta, and beta topographies with a larger sample, and across different samples, such as those with dementia. Furthermore, further research is needed to test several factors of the SEED model, such as the neurological and physiological mechanisms of why music enhances RT, and looking at how these mechanisms may work together.

Second, given the high prevalence of immigrants in Australia, future research exploring both VRT and MRT interventions would benefit from investigating the differences in CALD populations and other variables of interest (e.g., work settings). Ethnicity is a factor that has been related to increased risk of psychological distress for older people (Bierman & Lee, 2018; R. T. Morin & Midlarsky, 2016). Future research with larger samples would benefit from further exploring these variables and the patterns of use with other communities and for CALD staff and patients alike.

Third, the care workforce noted several personal benefits of employing VRT and MRT strategies in their own practice. While the outcomes for staff and volunteers were not explicitly explored in this project, the impact these interventions can have in the care workforce is an additional outcome that would benefit from further research and recognition. Research that can quantify these benefits could provide a solid rationale for care organisations to encourage the use of these interventions within aged care and with older populations.

Fourth, music in MRT is valued as a flexible intervention in which the methodology and application can be changed to meet the needs of the individual. While the results of this dissertation were promising, future research would benefit from validating these protocols

with a larger sample, determining the size of the dose needed to make therapeutic change (e.g., how many MRT sessions, or songs in a session), and continue to validate ways of connecting music to different RT interventions. Of particular interest in future studies is to explore both the memory experience characteristics (e.g., vividness) between VRT and MRT as a way of explaining how and why music may enhance RT, and how music can map onto different RT types (e.g., *simple* MRT vs *life review therapy* MRT).

11.8 Implications

The research contributes to the knowledge in two important ways. First, the dissertation contributed theory to describe and articulate how music enhances RT. Our research explored the functions of MRT though a narrative literature review that proposed an original model. This model was the first to organise the existing theory and research exploring the varying functions of music in RT. Furthermore, the neuroimaging research reported on the underlying neurological mechanisms by which music may enhance RT, such as emotional regulation and inducing meditative states. This was the first known study to compare VRT and MRT in this way.

Second, our research reported on how VRT and MRT were currently being used in practice, and tested the feasibility and acceptability of two methods of integrating music into RT. Current research has contained vaguely reported or entirely missing methodology for how such interventions are being implemented. This results therefore contributes a description of '*treatment as usual'* practices for VRT and MRT in aged care in Australia, and provides two feasible ways of including music in RT protocols.

The findings of this dissertation have real-world applications. The results of this dissertation showed that VRT and MRT are acceptable and feasible interventions for use with older adults experiencing distress, and can improve the care practices of staff. Applying this to the field, the results can be used to inform those working with older populations when and

how these interventions should be used. For example, VRT can be implemented during daily care routines to improve care outcomes, and MRT is particularly useful as a compensatory strategy for those unable to verbally communicate. MRT may be a superior intervention over VRT due to its capacity to trigger emotional regulation and meditative states, and therefore, should be included in RT treatment in practice. Finally, this research contributed a replicable protocol for MRT, involving probing questions that can help clinicians in the field to assist older adults to identify music for therapeutic use in MRT.

11. 9 Conclusion

As the population ages, addressing the wellbeing needs of older adult populations will need creative and evidence-based treatments to meet growing need. This dissertation provides initial evidence to suggest that VRT and MRT are widely used, successful, and well-tolerated interventions with older people experiencing psychological distress. We provided theory to describe the multiple ways in which music enhances RT, described the treatment as usual protocols of VRT and MRT, and explored the acceptability, feasibility, and individual neurological changes associated with using these interventions. VRT, and especially MRT offer opportunities to recognise the whole person, their rich history, successes, and strengths in the context of meaningful social connection, and therefore can support the wellbeing of older people as they navigate mental health challenges. As sung by Kiki Dee (Boshell, 1973), "When something gets in my way I go round it, don't let life get me down….I've got the music in me!" this lyric captures the essence of this dissertation, and music's capacity to enhance the wellbeing of older people, and RT.

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Appendix A: Authorship forms

Swinburne Research

Authorship Indication Form

For HDR students

NOTE

This Authorship Indication form is a statement detailing the percentage of the contribution of each author in each submitted/published 'paper'. This form must be signed by each co-author and the Principal Supervisor. This form must be added to the publication of your final thesis as an appendix. Please fill outa separate form for each published paper to be included in your thesis.

DECLARATION

We hereby declare our contribution to the publication of the 'paper' entitled:

Planting the SEED: A model to describe the functions of music in reminiscence therapy with older adults

First Author

Name_Romy Engelbrecht_____Signature:_____

Percentage of contribution: 80 % Date: 18// 02 / 2022

Brief description of contribution to the 'paper' and your central responsibilities/role on project:

Study conceptualisation, researching and identifying relevant literature, organising and creatingthe original model, manuscript preparation.

Second Author

Name:_Professor Sunil Bhar_____Signature:_____

Percentage of contribution: 15 % Date: 20 /02 /2022

Brief description of your contribution to the 'paper':

Provided supervision, assisted with developing the model, contributed to and reviewed themanuscript.

Third Author

Name: Professor Joseph Ciorciari Signature: 

Percentage of contribution: 5 % Date: 18 / 02 / 2022

Brief description of your contribution to the 'paper':

Provided supervision, contributed to and reviewed the final manuscript.

Fourth Author

Name:_Signature:____

Percentage of contribution:__% Date: _ _ / _ _ / _ _ _ _

Brief description of your contribution to the ‘paper’:

Principal Supervisor:

Name:_Sunil Bhar_____Signature:_____

Date: 20 /02 /2022

In the case of more than four authors please attach another sheet with the names, signatures and contribution of the authors.

Authorship Indication Form

Swinburne Research

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For HDR students

NOTE

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DECLARATION

We hereby declare our contribution to the publication of the 'paper' entitled:

Cognitive processes in reminiscence therapy with and without music: Four case studies comparing the neural effects for older people with psychological distress.

First Author

Name: Romy Engelbrecht Signature:

Percentage of contribution: 80 % Date: 18// 02 / 2022

Brief description of contribution to the 'paper' and your central responsibilities/role on project:

Conceptualised and designed the study, obtaining ethics approval, recruitment of participants,collection and analysis of data, preparing the final manuscript.

Second Author

Name: Joseph Ciorciari Signature:

Percentage of contribution: 15 % Date: 18 / 02 / 2022

Brief description of your contribution to the 'paper':

Provided supervision, contributed to the design and data analysis, and contributed to and reviewedthe final manuscript.

Third Author

Name: Sunil Bhar Signature:

Percentage of contribution: 5 % Date: 20 /02 /2022

Brief description of your contribution to the 'paper':

Provided supervision, contributed to and reviewed the final manuscript.

Fourth Author

Name:_Signature:____

Percentage of contribution:__% Date: _ _ / _ _ / _ _ _ _

Brief description of your contribution to the 'paper':

Principal Supervisor:

Name:___Sunil Bhar_____Signature:_____

Date: 20 /02 /2022

In the case of more than four authors please attach another sheet with the names, signatures and contribution of the authors.

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DECLARATION

We hereby declare our contribution to the publication of the 'paper' entitled:
Testing music-assisted reminiscence therapy: The feasibility, acceptability and outcomes of reminiscence therapy with and without music for older people with psychological distress

First Author

Name_Romy Engelbrecht_____Signature:_____

Percentage of contribution: _80_% Date: _18// 02 / 2022_

Brief description of contribution to the 'paper' and your central responsibilities/role on project:

Designed and conceptualised the study, obtained ethics approval, data collection and analysis,and prepared the manuscript.

Second Author

Name:_Sunil Bhar_____Signature:____

Percentage of contribution: _15_% Date: 20 /02 /2022

Brief description of your contribution to the 'paper':

Provided supervision, assisted in designing the study, data collection, and contributed to andreviewed the final manuscript.

Third Author

Name:_Joseph Ciorciari_____Signature: ___

Percentage of contribution: __5_% Date: 18 /02_ /2022_

Brief description of your contribution to the 'paper':

Provided supervision, contributed to and reviewed the final manuscript.

Fourth Author

Name:_Signature:____

Percentage of contribution:__% Date: _ _ / _ _ / _ _ _ _

Brief description of your contribution to the 'paper':

Principal Supervisor:

Name:___Sunil Bhar_____Signature: 

Date: 20 /02 /2022

In the case of more than four authors please attach another sheet with the names, signatures and contribution of the authors.

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DECLARATION

We hereby declare our contribution to the publication of the 'paper' entitled:

Reminiscence therapy and music with older adults: A Mixed-method investigation of the current views and practices of Australian aged care workers and volunteers

First Author

Name: Romy Engelbrecht Signature: 

Percentage of contribution: 80 % Date: 18/02/2022

Brief description of contribution to the 'paper' and your central responsibilities/role on project:

Conceptualisation and design of the study, obtaining ethics approval, data collection and analysis, preparing the manuscript.

Second Author

Name: Sunil Bhar Signature:

Percentage of contribution: 4 % Date: 20 /02 /2022

Brief description of your contribution to the 'paper':

Provided supervisoin, contributed to the design, and contributed to and reviewed the final manuscript.

Third Author

Name: Helen Shoemark Signature: 

Percentage of contribution: 4 % Date: 18 / 02 / 2022

Brief description of your contribution to the 'paper':

Provided supervision, contributed towards the coding and analysis of qualitative data,and contributed to and reviewed the final manuscript

Fourth Author

Name: Bradley Elphinstone Signature: 

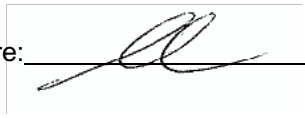
Percentage of contribution: 4 %

Date: 18/02/2022

Brief description of your contribution to the 'paper':

Provided supervision, contributed to the statistical data analysis and contributed to and reviewed the final manuscript.

Principal Supervisor:

Name: Sunil Bhar Signature: 

Date: 20 /02 /2022

In the case of more than four authors please attach another sheet with the names, signatures and contribution of the authors ***Additional authors:***

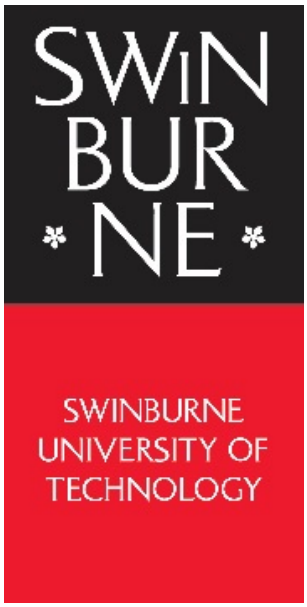
Author 5: Joseph Ciorciari

Signed:
Dated: 22/02/2022
Contribution:
Provided supervision, and contributed to and reviewed the final manuscript.

Author 6:
Christine Critchley (Deceased)
Contribution:
Provided supervision, and contributed to the statistical analysis of the data.

Appendix B: Focus group PLS, consent form & Survey

Welcome to the research study!



Project title: Music and reminiscence with older adults: Current views and practices

Principal investigator: Associate Professor Sunil Bhar, Swinburne University of Technology.
Co-Investigator: Associate Professor Joseph Cioriari, Swinburne University of Technology.
Student investigator: Romy Engelbrecht, Swinburne University of Technology.

Introduction

The following information is provided so that you can decide if you would like to participate. Participation in this study is voluntary, meaning you can choose to not be a part of the study, or withdraw at any time.

You can participate in this study if you are 18 years old or over, currently work with older people (65 years and over) in a professional or volunteer capacity (including personal carer, nurse, doctor, lifestyle or allied health worker, volunteer, trainee or student), and can read and speak English.

What is the study about?

We are interested in how staff and volunteers who interact with older people (65 years and over) may use or view reminiscence and music in reminiscence activities.

What does the study involve?

If you choose to participate in this study, you will be asked to complete an online survey. The questions on the survey will ask you some basic information about you (e.g., gender, age, and what you do for work) and your type of work (e.g. community, aged care, or hospital).

You will then be asked some questions about how you use reminiscence in your work, including how often you might use reminiscence, how you define reminiscence, how and how often music might be involved in reminiscence activities, and what barriers might stop you from using reminiscence and music in your work. The questionnaire should take no more than 15 minutes to complete.

You will then be asked questions about your experience in answering the questions and completing the survey. These questions should take between 15 to 30 minutes to complete.

Upon completion of the questionnaire, you will have the opportunity to go into a draw to win one of two $250 gift cards. All data will be treated with confidentiality, and the personal information you provide in this separate questionnaire will be in no way linked to your questionnaire responses.

What are the potential risks and benefits of the study?

Risks

We do not believe that there will be physical, economic, or emotional risks associated with participation

Potential benefits

Participation in the study may allow you to reflect on your current use and views of using reminiscence and music in your work, and what potential barriers may stop you from using these methods.

Participants may also learn about the different types of reminiscence that can be used.

How will the information be used?

Results from this survey will be used for the purpose of partly completing a Doctor of Philosophy (Clinical Psychology) research program for the student investigator, Romy Engelbrecht, under the supervision of A/Prof Sunil Bhar. Findings of this study will be published and presented in journals, community events and conferences.

FURTHER INFORMATION

If you would like further information about the project, please do not hesitate to contact:
Associate Professor Sunil Bhar
Faculty of Health, Arts and Design
H99, PO Box 218
Hawthorn 3122
(03) 9214 8371
sbhar@swin.edu.au

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer, Swinburne Research (H68),

Swinburne University of Technology, PO Box 218, HAWTHORN VIC 3122.
Tel (03) 9214 3845 or resethics@swin.edu.au

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

Participant consent form

Project title: Music and reminiscence with older adults: Current views and practices

Principle investigator: Associate Professor Sunil Bhar, Swinburne University of Technology.

Co-Investigators: Associate Professor Joseph Cioriari, Swinburne University of Technology.

Student investigator: Romy Engelbrecht, Swinburne University of Technology.

1. I consent to participate in the project named above. I have been provided a copy of the project consent information statement to which this consent form relates and any questions I have asked have been answered to my satisfaction.
2. In relation to this project, please circle your response to the following:

• I agree to be interviewed by the researcher about reminiscence and using the online survey	**Yes**	**No**
• I agree to allow the interview to be digitally recorded	**Yes**	**No**

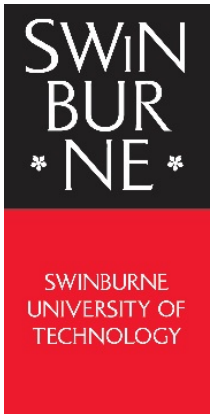
3. I acknowledge that:
    a. My participation is voluntary and that I am free to withdraw from the project at any time without explanation;
    b. The Swinburne project is for the purpose of research and not for profit;
    c. Any identifiable information about me which is gathered in the course of and as the result of my participating in this project will be (i) collected and retained for the purpose of this project and (ii) accessed and analysed by the researcher(s) for the purpose of conducting this project;
    d. My anonymity is preserved and I will not be identified in publications or otherwise without my express written consent.

By signing this document I agree to participate in this project.

Name of Participant: ……..

Signature & Date: ……

Welcome to the research study



Project title: Music and reminiscence with older adults: Current views and practices

Principal investigator: Professor Sunil Bhar, Swinburne University of Technology.

Co-Investigator: Associate Professor Joseph Cioriari, Swinburne University of Technology.

Student investigator: Romy Engelbrecht, Swinburne University of Technology.

Introduction

The following information is provided so that you can decide if you would like to participate. Participation in this study is voluntary; you can choose whether you would like to participate or not.

You are eligible to participate in this study if you are 18 years old or over, currently help older people (65 years and over) in a professional or volunteer capacity, and can read and speak English.

What is the study about?

We are interested in how staff and volunteers who interact with older people use or view reminiscence and music activities.

What does the study involve?

The study involves completing a survey. You will be asked questions about you (e.g. age and gender) and what the type of work you do. You will be asked questions about your experience of using reminiscence and music activities (such as frequency and type of such activities, barriers to such activities, and your opinions about such activities). The survey should take no more than 15 minutes to complete.

Upon completion of the questionnaire, you will have the chance to go into the draw to win one of two $250 gift cards.

All data will be confidential. Any identifying information (such as your name and contact information) for the prize draw will not be linked to your survey responses.

What are the potential risks and benefits of the study?

Risks: We do not believe that there will be physical, economic, or emotional risks associated with participation

Potential benefits: Participation in the study may allow you to reflect on your current use and views of using reminiscence and music in your interactions with older people. You may also learn about the different types of reminiscence and music activities that can be used with older adults.

How will the information be used?

Survey results will be used for the purpose of partly completing a Doctor of Philosophy (Clinical Psychology) research program for the student investigator, Romy Engelbrecht, under the supervision of A/Prof Sunil Bhar. Findings of this study will be published and presented in scientific journals, conferences, and community events.

FURTHER INFORMATION

If you would like further information about the project, please do not hesitate to contact:
Professor Sunil Bhar, Faculty of Health, Arts and Design
H99, PO Box 218, Hawthorn 3122. (03) 9214 8371; sbhar@swin.edu.au

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the conduct of this

project, you can contact:

Research Ethics Officer, Swinburne Research (H68),

Swinburne University of Technology, PO Box 218, HAWTHORN VIC 3122.

(03) 9214 3845 or resethics@swin.edu.au

CONSENT: Please tick one.

☐ I consent, begin the study.

☐ I do not consent; I do not wish to participate.

Q2. What is your age?

- ☐ Age: _____
- ☐ Prefer not to say

Q3. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to say

Q4. What is your country of birth?

_____

Q5. What language do you speak at home? Please list all that apply.

- ☐ Language: _____
- ☐ Prefer not to say

Q6. What is your occupation or job?

- ☐ Personal Care attendant (PCA) or similar
- ☐ Nurse (EN or RN)
- ☐ Medical doctor
- ☐ Allied health, please specify:_____
- ☐ Lifestyle
- ☐ Volunteer
- ☐ Other, please specify:

  _____

Q7. In what settings do you work? Please select all that apply.

- ☐ Residential aged care (e.g. I work with people living in a residential facility)
- ☐ Community aged care (e.g. I work with people living in private dwellings such as their own homes or in independent living units)
- ☐ Hospitals (e.g. I work with people in hospitals)
- ☐ Palliative care (e.g. I work with people who are dying)

☐ Other, please specify:

_____

Q8. How many years of experience do you have working with older people?

☐ Years: _____

☐ Prefer not to say

Q9. In what Australian state do you work?

☐ Australian Capital Territory (ACT)
☐ New South Wales (NSW)
☐ Northern Territory (NT)
☐ Queensland (QLD)
☐ South Australia (SA)
☐ Tasmania (TAS)
☐ Victoria (VIC)
☐ Western Australia (WA)

Q8. What does "reminiscence" mean to you? *Please give as much information on how you may define reminiscence as possible.*

_____

_____

_____

_____

_____

Q9. Do you currently use reminiscence in your work with older people (65 years and over)?

☐ Yes

☐ No. If no, please skip to **question 26.**

Q10. Why do you engage in reminiscence with older people? *Please list as many as needed to reflect all your experiences and reasons*

_____

_____

_____

_____

Q11. Are there any barriers or challenges that stop you from using reminiscence in your work? *If so, please list.*

_____

_____

_____

_____

Q12. Please describe a time where you have used reminiscence with an older person? *Please use as much detail and information as possible about why you chose to use reminiscence, what you talked about, how the older person responded, and any outcomes.*

_____

_____

_____

_____

_____

_____

_____

_____

For the purpose of this survey, think of "reminiscence" as talking with an older person sharing their memories of events or life-stories.

Q13. How often do you use reminiscence in your work?

- ☐ Daily
- ☐ Several times per week
- ☐ Once a week
- ☐ Once a month
- ☐ Rarely

Q14. When you use reminiscence, do you use it:

- ☐ Individually
- ☐ With groups (two or more older people)
- ☐ Both

Q15. How often in the past year have you used the following types of reminiscence with older adults in your work or volunteer role? *Please rate each type of reminiscence in frequency of use, from "Not at all" to "Always".*

Types of reminiscence	Not at all	Some-times	About half the time	Mostly	Always
1. Talking about fun or shared memories (such as holidays, birthdays, and other moments in time).	☐	☐	☐	☐	☐
2. Creating a comprehensive chronology (time line) of life (e.g. discussing their life from birth till now).	☐	☐	☐	☐	☐
3. Talking about past successful experiences (such as discussing a time they have solved a problem) that demonstrate self-creativity, persistence or resourcefulness.	☐	☐	☐	☐	☐

Q16. What tools or prompts do you use to help older people reminisce? *Please select all that apply.*

- ☐ Images or pictures
- ☐ iPads or other mobile technology
- ☐ Music
- ☐ Scents
- ☐ Objects
- ☐ Other, please specify
  _____
- ☐ None

Q17. What purpose does reminiscing serve in your activities with older people? *Please rate each purpose by frequency, from "not at all" to "always"*

Purpose of reminiscence	Not at all	Some-times	About half the time	Mostly	Always
1. For the older person to complain or think about difficult memories or life experiences	☐	☐	☐	☐	☐
2. For the older person to reduce boredom or experience stimulation	☐	☐	☐	☐	☐
3. For the older person to communicate personal information and social engagement	☐	☐	☐	☐	☐
4. For the older person to reflect on their life as it comes to an end and to prepare for their own death	☐	☐	☐	☐	☐
5. For the older person to express and find their identity and sense of self	☐	☐	☐	☐	☐
6. For the older person to remain connected to people that are no longer in their lives	☐	☐	☐	☐	☐
7. For the older person to identify former strengths and problem solving abilities or skills	☐	☐	☐	☐	☐
8. For the older person to share memories to instruct, teach or share life lessons.	☐	☐	☐	☐	☐

Q18. How often do you use MUSIC in reminiscence activities or discussions with older people?

- ☐ All the time
- ☐ Most times
- ☐ Sometimes
- ☐ Occasionally
- ☐ Never. If you answer never, please skip to **question 26.**

The following questions are about how you use MUSIC in reminiscence activities, including in discussion, listening to recorded music, talking about the lyrics of songs, or actively making music and singing.

Q19 How often in the past year have you used MUSIC in the following types of reminiscence with older adults in your work or volunteer role? *Please rate each type of reminiscence in frequency of use, from "Not at all" to "Always".*

Types of reminiscence with music	Not at all	Some-times	About half the time	Mostly	Always
1. Talking about fun or shared memories (such as holidays, birthdays, and other moments in time).	☐	☐	☐	☐	☐
2. Creating a comprehensive chronology (time line) of life (e.g. discussing their life from birth till now).	☐	☐	☐	☐	☐
3. Talking about past successful experiences (such as discussing a time they have solved a problem) that demonstrate self-creativity, persistence or resourcefulness.	☐	☐	☐	☐	☐

Q20 What type of MUSIC do you use in reminiscence activities or discussions with older people? *Please select all that apply.*

- ☐ Live music (e.g. you play instruments and/or sing)
- ☐ Recorded music (e.g. stream music, CDs or other recorded material)
- ☐ Talking about music

Q21 When do you use MUSIC in reminiscence activities or discussions with older people?

Please select all that apply

- ☐ Before discussion
- ☐ During discussion
- ☐ After discussion

Q22 When you use MUSIC in reminiscence, do you use it:

- ☐ Individually
- ☐ With group (two or more older people)
- ☐ Both

Q23 What purpose does your MUSIC serve in your reminiscence activities or discussions with older people? *Please rate each option by frequency from "not at all" to "always"*

	Not at all	Some-times	About half the time	Mostly	Always
1. For the older person to complain or think about difficult memories or life experiences	☐	☐	☐	☐	☐
2. For the older person to reduce boredom or experience stimulation	☐	☐	☐	☐	☐
3. For the older person to communicate personal information and social engagement	☐	☐	☐	☐	☐

4. For the older person to reflect on their life as it comes to an end and to prepare for their own death	☐	☐	☐	☐	☐
5. For the older person to express and find their identity and sense of self	☐	☐	☐	☐	☐
6. For the older person to remain connected to people that are no longer in their lives	☐	☐	☐	☐	☐
7. For the older person to identify former strengths and problem solving abilities or skills	☐	☐	☐	☐	☐
8. For the older person to share memories to instruct, teach or share life lessons.	☐	☐	☐	☐	☐

Q23. Are there any barriers or challenges that stop you from using <u>MUSIC</u> in reminiscence activities in your work? *If so, please list.*

_____

_____

_____

_____

_____

_____

_____

_____

Q24. What information, if any, helps you to decide whether or not to use <u>MUSIC</u> in reminiscence with older people?

_____

_____

_____

_____

_____

_____

_____

_____

Q25. Please describe a time where you have used <u>music together with reminiscence</u> with an older person? *Please use as much detail and information as possible about why you chose to use music with reminiscence, what you talked about, how the older person responded, and any outcomes.*

_____

_____

_____

_____

_____

_____

_____

_____

Q26. Would you like to go into the draw to win one of two prepaid gift cards worth $250, or receive information on the findings of this study?

☐ Yes. If yes, please complete the following pages.
☐ No

Thank you so much for completing the survey. Please return the survey to one of the research team, or to the envelope marked "Music and reminiscence study" in the staff office.

Appendix C: Plain language statement and consent form for study 3 & 4

Project title: Music and the wellbeing of older adults: A feasibility and efficacy RCT investigating the roles and value of music in reminiscence therapy.

Chief investigator: Professor Sunil Bhar

Co-Investigators: A/Professor Joseph Cioriari
Professor Christine Critchley

Student investigator: Romy Engelbrecht

Introduction

The following information is provided so that you can decide if you would like to participate. Participation in this study is voluntary, meaning you can choose to not be a part of the study, or withdraw at any time.

You can participate in this study if you are 65 years old or over, are experiencing distress, stress, depression or anxiety, have no cognitive impairment or formal diagnosis of dementia, and can speak English.

What is the study about?

We are interested in how and why music can be used in reminiscence therapy to improve the wellbeing of older people who are experiencing stress, anxiety or depression. We hope the findings of this study may help us to improve wellbeing programs in such individuals.

What does the study involve?

If you choose to participate in this study, we will invite you to answer some questions over the phone about your levels of stress, anxiety or depression. Your level of psychological distress will be quantified to determine if you are eligible to participate. If you are eligible, you will be invited to participate in a single session in your place of residence or at the Swinburne University of Technology Hawthorn campus.

You will be asked to complete questionnaires that will ask you about your cognitive functioning, levels of distress, and the emotions that you currently feel. They will also ask you about your experiences in the task.

During the brief session, you may be asked to either remember particular things about your childhood and a time where you have successfully solved a problem, or choose and listen to a piece of music that you enjoy. The entire session will be audio recorded.

The interview will take between 45-60 minutes to complete. You will be paid $20 for your time. If you feel tired at any point, you may take a break, stop or postpone the session.

Will all data provided be confidential?
Any information you give us will remain confidential. We will never identify you by name in any publication or conference presentation.

We will need to record the interviews. The recordings will be stored in secure hard drives at Swinburne University. We need these recordings in order to analyse your responses. Recordings will be destroyed 7 years after study findings are published.

What are the potential risks and benefits of the study?
Risks

Participation in this study may result in experiencing minor discomfort in recalling previous memories or answering questions about your emotions.

You can choose to withdraw from participating in the program at any time with no negative consequences.

We will try to ensure that the questionnaires and interviews are conducted at a level that is comfortable for you. If your participation raises uncomfortable memories or feelings and you would like to speak to a counsellor, you can call Lifeline on 131114.

Potential benefits

Participation in the study may allow you to reflect on a time in your life where you have solved a problem, or listen to pleasant music. The findings of this study may help improve the wellbeing programs for older people who are experiencing distress.

How will the information be used?

Results from this survey will be used for the purpose of partly completing a Doctor of Philosophy (Clinical Psychology) research program for the student investigator, Romy Engelbrecht, under the supervision of Prof Sunil Bhar. Findings of this study will be published and presented in journals, community events and conferences.

FURTHER INFORMATION

If you would like further information about the project, please do not hesitate to contact:

Professor Sunil Bhar
Faculty of Health, Arts and Design
H99, PO Box 218
Hawthorn 3122
(03) 9214 8371
sbhar@swin.edu.au

Romy Engelbrecht
0451 534 360
rengelbrecht@swin.edu.au

This project has been approved by or on behalf of Swinburne's Human Research Ethics Committee (SUHREC) in line with the National Statement on Ethical Conduct in Human Research. If you have any concerns or complaints about the conduct of this project, you can contact:

Research Ethics Officer, Swinburne Research (H68),
Swinburne University of Technology, PO Box 218, HAWTHORN VIC 3122.
Tel (03) 9214 3845 or resethics@swin.edu.au

Participant consent form

Project title: Music and the wellbeing of older adults: A feasibility and efficacy RCT investigating the roles and value of music in reminiscence therapy.

Chief investigator: Professor Sunil Bhar

Co-Investigators: Associate Professor Joseph Cioriari

Professor Christine Critchley

Student investigator: Romy Engelbrecht

1. I consent to participate in the project named above. I have been provided information about the study and any questions I have asked have been answered to my satisfaction.
2. I acknowledge that:
    a. My participation is voluntary and that I am free to withdraw from the project at any time without explanation;
    b. The Swinburne project is for the purpose of research and not for profit;
    c. Any identifiable information about me which is gathered in the course of and as the result of my participating in this project will be (i) collected and retained for the purpose of this project and (ii) accessed and analysed by the researcher(s) for the purpose of conducting this project;
    d. My anonymity is preserved and I will not be identified in publications or otherwise without my express written consent.

By signing this document I agree to participate in this project.

Name of Participant:……..

Signature & Date: ……

Would you like to be contacted for further research opportunities? *If so, please write your name and contact details below.*

Name: …….

Mailing address: …….

Email: …….

Phone number: …….

Would you like to receive a summary of findings for this project? *If so, please provide an email or postal address.*

As above:

Mailing address: …….

Email: …….

Appendix D: EEG examples of alpha wave eyes open and closed

Figure 1.

Participant 35 ***eyes open*** *Alpha EEG: Estimated marginal means and 95% confidence intervals between eyes open 1 vs 2 for the 14 lobe categories.*

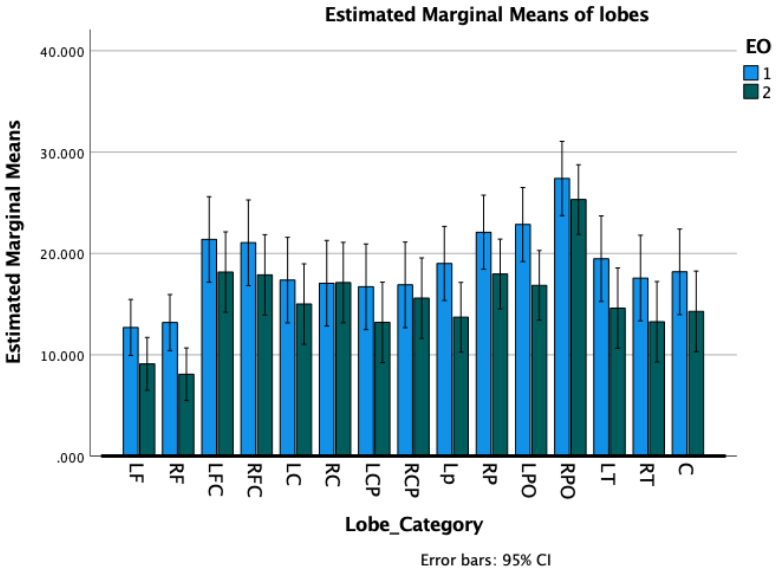


Figure 2.

Participant 35 ***eyes closed*** *Alpha EEG: Estimated marginal means and 95% confidence intervals between eyes closed 1 vs 2 for the 14 lobe categories.*

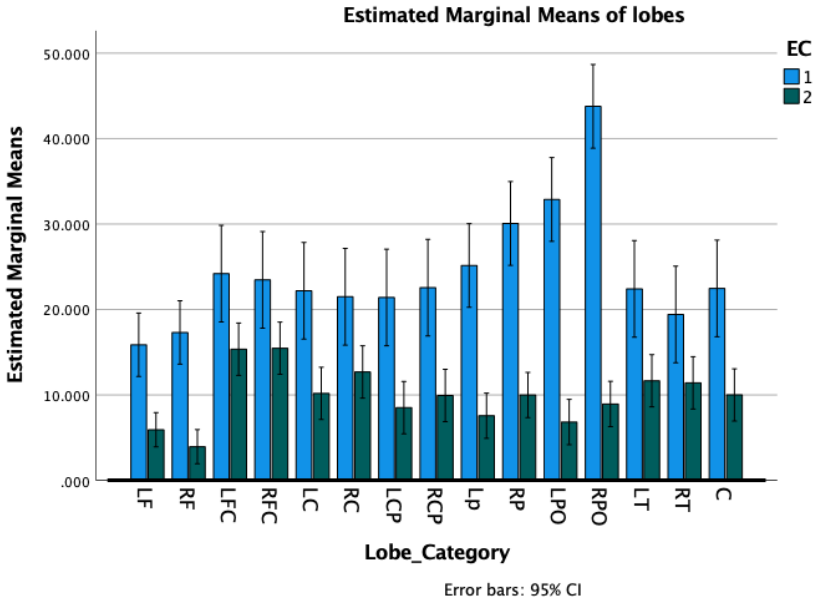


Figure 3.

Participant 47 ***eyes open*** *Alpha EEG: Estimated marginal means and 95% confidence intervals between eyes open 1 vs 2 for the 14 lobe categories.*

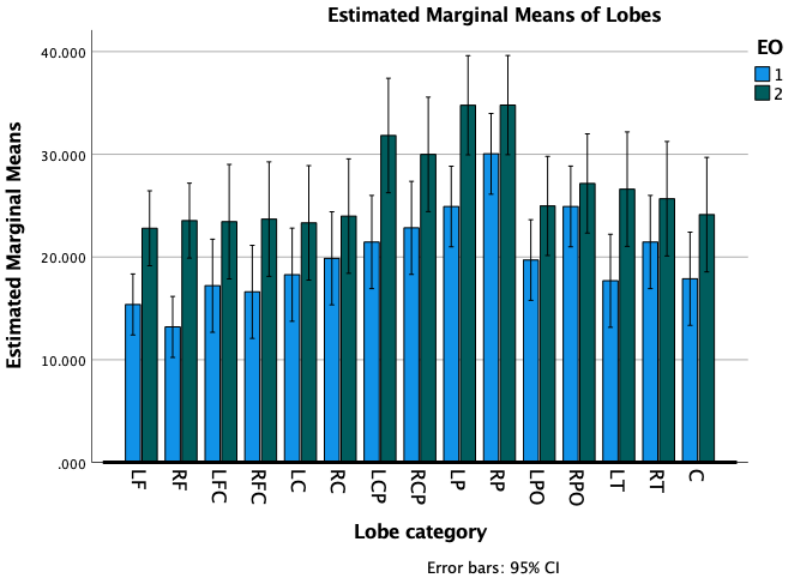
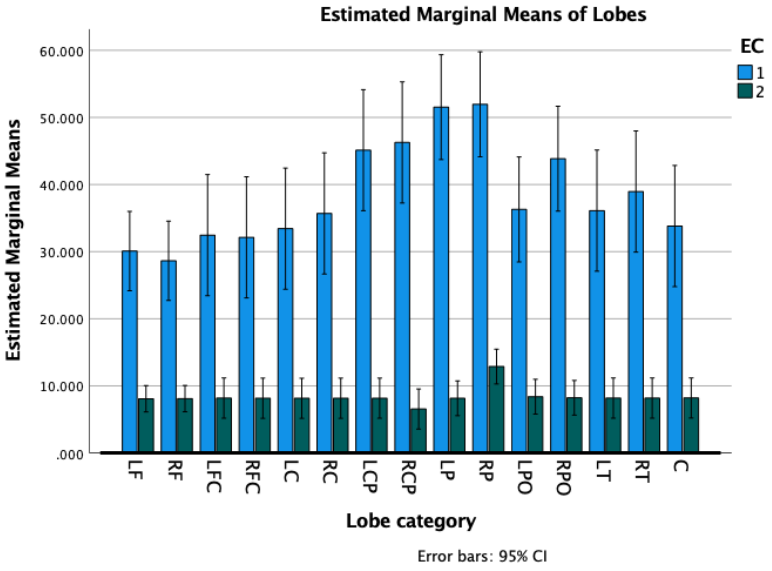


Figure 4.

Participant 47 ***eyes closed*** *Alpha EEG: Estimated marginal means and 95% confidence intervals between eyes closed 1 vs 2 for the 14 lobe categories.*



Note. The above graphs demonstrate that the differences between eyes open 1(pre test) and 2(post test) were within the 95% confidence interval error margins, therefore, this was not analysed further, and eyes closed was selected as the baseline measure.

Appendix E: Ethics approvals

SHR Project 2018/258 - Ethics clearance

Astrid Nordmann

Mon 27/08/2018 11:58 AM

To: Sunil Bhar <sbhar@swin.edu.au>

Cc: RES Ethics <resethics@swin.edu.au>; Joseph Ciorciari <jciorciari@swin.edu.au>; Romy Engelbrecht <rengelbrecht@swin.edu.au>; Sally Fried <sfried@swin.edu.au>

To: A/Prof Sunil Bhar, FHAD

Dear Sunil,

SHR Project 2018/258 - Music and reminiscence with older adults: Current views and practices.
A/Prof Sunil Bhar, A/Prof Joseph Ciorciari, Romy Engelbrecht (Student) – FHADApproved
duraHon: 27-08-2018 to 13-09-2019 [adjusted]

I refer to the ethical review of the above project by a Subcommittee (SHESC1) of Swinburne's Human Research Ethics Committee (SUHREC). Your responses to the review as emailed by Romy Engelbrecht on26 August 2018 were put to the Subcommittee delegate for consideration.

I am pleased to advise that, as submitted to date, ethics clearance has been given for the above projectto proceed in line with standard on-going ethics clearance conditions outlined below.

- The approved duration is **27 August 2018** to **13 September 2019** unless an extension is subsequently approved.

- All human research activity undertaken under Swinburne auspices must conform to Swinburne and external regulatory standards, including the *National Statement on Ethical Conduct in Human Research* and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions, including research and consent procedures or instruments approved. Any change in chief investigator/supervisor, and addittion or removal of other personnel/students from the project, requires timely notificaHon and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethical acceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring and variations/additions, self-audits and progress reports can be found on the Research Intranet pages.

- A duly authorised external or internal audit of the project may be undertaken at any time.

Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the Swinburne project number. A copy of this email should be retained as part of project record-keeping.

Best wishes for the project.Yours

sincerely,
Astrid Nordmann
(for Sally Fried, SHESC1 Secretary)

Dr Astrid Nordmann | Research Ethics Coordinator
Swinburne Research| Swinburne University of TechnologyPh +61 3 9214 3845| anordmann@swin.edu.au
Level 1, Swinburne Place South
24 Wakefield St, Hawthorn VIC 3122, Australia
www.swinburne.edu.au

SHR Project 2019/071 - Ethics clearance

Astrid Nordmann <anordmann@swin.edu.au>

Tue 16/04/2019 11:49 AM

To: Sunil Bhar <sbhar@swin.edu.au>

Cc: RES Ethics <resethics@swin.edu.au>; Romy Engelbrecht <rengelbrecht@swin.edu.au>; Joseph Ciorciari <jciorciari@swin.edu.au>

To: Prof. Sunil Bhar, FHAD

Dear Sunil,

SHR Project 2019/071 – Music and the wellbeing of older adults: A pilot randomisedcontrolled trial investigating the function of music in reminiscence therapy
Prof Sunil Bhar, A/Prof. Joe Ciorciari, Mr Romy Engelbrecht (Student) – FHADApproved duration: 16-04-2019 to 16-04-2021 [adjusted]

I refer to the ethical review of the above project protocol by Swinburne's Human Research Ethics Committee (SUHREC). Your response to the review, as emailed on 25 March and 15April 2019, accords with the Committee review.

I am pleased to advise that, as submitted to date, the project may proceed in line with standardon-going ethics clearance conditions outlined below.

- The approved duration is **16 April 2019** to **16 April 2021** unless an extension request is subsequently approved.

  All human research activity undertaken under Swinburne auspices must conform to Swinburneand external regulatory standards, including the *National Statement on Ethical Conduct in Human Research (2007 – updated 2018)* and with respect to secure data use, retention and disposal.

- The named Swinburne Chief Investigator/Supervisor remains responsible for any personnel appointed to or associated with the project being made aware of ethics clearance conditions,including research and consent procedures or instruments approved. Any change in chief investigator/supervisor, and addition or removal of other personnel/students from the project,requires timely notification and SUHREC endorsement.

- The above project has been approved as submitted for ethical review by or on behalf of SUHREC. Amendments to approved procedures or instruments ordinarily require prior ethical appraisal/clearance. SUHREC must be notified immediately or as soon as possible thereafter of (a) any serious or unexpected adverse effects on participants and any redress measures; (b) proposed changes in protocols; and (c) unforeseen events which might affect continued ethicalacceptability of the project.

- At a minimum, an annual report on the progress of the project is required as well as at the conclusion (or abandonment) of the project. Information on project monitoring and variations/additions, self-audits and progress reports can be found on the Research EthicsInternet pages.

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A duly authorised external or internal audit of the project may be undertaken at any time.

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Please contact the Research Ethics Office if you have any queries about on-going ethics clearance, citing the Swinburne project number. A copy of this email should be retained as partof project record-keeping.

Best wishes

for the

project.

Yours

sincerely

Astrid
Nordmann
Secretary,
SUHREC

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