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De concentv amisso qvaerendo: An investigation into the relative benefits of three different types of ambient music on the observed agitated behaviour and quality of life of dementia sufferers in residential aged care facilities

Peter Wilkinson
Edith Cowan University

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DE CONCENTV AMISSO QVAERENDO:

An investigation into the Relative Benefits of Three Different Types of Ambient Music on the Observed Agitated Behaviour and Quality of Life of Dementia Sufferers in Residential Aged Care Facilities

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EDITH COWAN UNIVERSITY

This thesis is presented as a requirement for the degree of

Doctor of Philosophy of Edith Cowan University

8th December 2014

USE OF THESIS

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Thesis Abstract

There is an increasing body of research evidence to support the use of music as a therapeutic modality in reducing the agitated behaviour frequently associated with late-stage dementia. Although much of this evidence suggests that music interventions are most effective when they are “individualized”, this type of intervention is often difficult to implement in large, busy, aged care facilities where residents may be located together in communal areas during the day. The challenge therefore is to try and identify a particular musical genre which, when played as “ambient” or “background” music, demonstrates a consistent capacity to reduce agitated behaviour in late-stage dementia across resident populations in multiple facilities. This study was designed to test the comparative utility of three different types of background music identified in the existing research literature as being of possible benefit in this context. These three types of music were: gentle classical music, familiar music and baroque music.

Using a sample of 65 older people with late-stage dementia living in a total of eight residential aged care facilities, this quasi-experimental study used quantitative measures to assess a specific range of agitated behaviours over a one week intervention period. The specific agitated behaviours were documented using the Scale for the Observation of Agitation in Persons with Dementia (SOAP-D) scale (Hurley, Volicer, Camberg, Ashley, Woods, Odenheimer, Ooi, McIntyre, & Mahoney, 1999). In addition, the Quality of Life in Alzheimer’s Disease (QoL-AD) tool (Logsdon, 1999) was used to collect collateral information from family members or experienced care staff at each of the participating facilities about whether they perceived that the playing of music exerted any influence on the quality of life of participants.

Participants were randomly assigned to one of five experimental sub-groups of equal size. Participants in three of the five groups received exposure to audio recordings of music. Participants in one of the two remaining sub-groups were exposed to a non-musical intervention (audio recordings of storybooks) at the same time of day as the participants in the three music groups. Data relating to behaviour and perceived quality of life were recorded in the same manner for this group. The final group of participants acted as the control group for the study. Quantitative data were collected in the same manner for this group: however, they were exposed to no intervention.

In addition, a series of structured interviews was undertaken with experienced care providers at each of the participating residential aged care facilities. The purpose of this procedure was to determine whether the experiences and subjective opinions of staff regarding the utility of music as an intervention to settle agitated behaviour in late-stage dementia and improve quality of life, were consistent with the observational data recorded using the SOAP-D scale in conjunction with the proxy-rated QoL-AD scale.

Results of the study indicated that overall levels of agitated behaviour were less within the three groups exposed to music compared with the non-music intervention group and the control. However, perceived quality of life was not measurably improved in any of the three music intervention groups. This study supports the continued use of music as a therapeutic intervention in the management of maladaptive behaviour associated with late-stage dementia, although the results do not support the preferential use of any of the three selected music forms.

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Definition of Terms

“DE CONCENTV AMISSO QVAERENDO” can be translated loosely from Latin as “Searching for the missing chord”. This phrase has been selected for use in the thesis title as being representative of the challenge of finding the most therapeutically useful type of ambient music intervention.

“Residential aged care facility (RACF)” is the term used in this study to describe an environment that provides the type of professional nursing and personal care required by persons with a high level of frailty and disability who are unable to reside in their own homes. Residents in a residential aged care facility would normally have long-term care needs and require access to 24 hour care delivered by, or provided under the supervision of, a Registered Nurse.

“Ambient music” is the term used in this study to describe audio recordings played discreetly, at an easily audible, but not excessive volume, which all persons in the communal areas of a residential aged care facility hear at the same time.

“Baroque music” is the general term given to the western European music composed between about 1600 and 1750. It is a period of distinct musical composition and is associated with composers such as Bach, Handel, Pachelbel and Vivaldi. For the purposes of this study, all of the selected pieces of Baroque music were orchestral compositions with a lively (allegro or allegro moderato) tempo and were written in major keys. Examples of such pieces are the first movement of Vivaldi’s Concerto No. 1 in E major, Op. 8, RV269 (“La primavera”) and the first movements of each of the six

Brandenburg concertos written by J.S. Bach. A complete playlist of the selected works is provided in Appendix K.

“Gentle classical music” for the purposes of this study, is defined as the slower, stylistically simple orchestral compositions of well-known western European classical composers. Examples of this style of music are the second movement of J.S. Bach’s Orchestral Suite No. 3 in D major, BWV 1068, commonly referred to as the “Air on the G string” and Gabriel Fauré’s Pavane in F sharp minor, Op.50. A complete playlist of the selected works is provided in Appendix L.

“Familiar music” is defined for the purposes of this research, as the popular music of the 1940s and 1950s that would have been well known to the Anglo Saxon and Western European participants in the study. Examples of such music would be the songs of Bing Crosby, Judy Garland, Frank Sinatra and Doris Day. A complete playlist of the selected works is provided in Appendix M.

“Audio recordings of storybooks” are the popular novels and short stories of western European and American authors such as Hans Christian Andersen, Charles Dickens, Robert Louis Stevenson and Mark Twain. A complete list of the selected novels is provided in Appendix N.

“Agitation” has been defined as “inappropriate verbal, vocal, or motor activity that is not a necessary by-product of the needs or confusion of the agitated individual” (Cohen-Mansfield & Billig, 1986).

CHAPTER 1: INTRODUCTION

The following chapter highlights the global significance of dementia and its negative impact on health-related quality of life for the dementia sufferer. The advanced stages of dementia are frequently characterized by agitated behaviors which present significant practical, economic and ethical challenges for the provision of care. The difficulties which frequently confront care providers are explored in this chapter, and the limitations of the most commonly utilized treatment modalities are discussed. The emerging role of music as a clinically effective, yet easily implemented therapeutic intervention is examined and the foundation for the current study is presented. Health-related quality of life is also discussed as this is a significant issue for persons with dementia who often have little control over their environment. Consideration is given to the question of whether music can have a measurable effect on the quality of life of the person with advanced dementia.

The significance of the problem of dementia

The Alzheimer's Association (2012) estimated there were approximately 300,000 people in Australia living with dementia in 2011, representing about 1.7% of the total Australian population, and an estimated 1.2 million Australians caring for someone with dementia. The report estimates the current cost of dementia to the Australian health and aged care sectors to be at least Aus\$4.9 billion per annum. Furthermore, if current trends continue, the total number of people living with dementia in Australia will be in excess of 900,000, or 5% of the total population by 2050.

Global estimates of the prevalence of dementia vary, but may be as high as 35.6 million people (Alzheimer's Disease International, 2011) with

projections estimating the number of sufferers to increase to as many as 115 million people worldwide by 2050. The global cost of dementia in 2010 was estimated at over US\$630 billion, the equivalent of over 1% of GDP worldwide (Alzheimer's Disease International, 2011). This estimate included the work carried out by unpaid relatives, the cost of formal community support services, medical expenses and the cost of permanent residential care.

Dementia is not a specific disease, but rather a term used to describe the progressive and irreversible deterioration in intellectual and physical functioning that is a feature of many neurodegenerative illnesses. One of the most common of these illnesses, and perhaps the most well-known, is Alzheimer's disease. However, there are other diseases which, in their later stages, can also cause dementia. Examples of these include Creutzfeldt-Jakob disease, Huntington's disease, Pick's disease, chronic alcoholism, Lewy body disease, Human Immunodeficiency Virus (HIV) infection, normal pressure hydrocephalus, multi-infarct (vascular) dementia and Parkinson's disease. In the majority of these diseases, the onset of dementia manifests itself with subtle symptoms, which usually exacerbate over the course of several years. Symptoms of dementia are many and varied, but include the progressive impairment of memory, perception and judgment, the loss of language skills, disorientation and, frequently, personality changes. As dementia becomes more established, the affected person usually experiences greater difficulty undertaking routine activities of daily living and inevitably becomes increasingly dependent on others for assistance and support (Alzheimer's Association, 2012).

Caring for a person with dementia presents a unique set of challenges. Many family members who provide informal dementia care in the domiciliary setting experience high levels of stress and negative effects on

their health, employment, income and financial security (Alzheimer's Association, 2012). Care needs usually increase significantly as the person with dementia nears the end of their life and as a consequence, the emotional burden on family care providers increases significantly (Hooker, Bowman, Coehlo, Sim, Kaye, & Guariglia, 2002; Schulz, Mendelsohn, Haley, Mahoney, Allen, & Zhang, 2008). A high percentage of family caregivers said they experienced some relief when the person with dementia died (Schulz et al., 2008; Alzheimer's Association, 2012).

Dementia and the problem of agitated behaviour

In the later stages of dementia, as cognitive function declines, behavioural and psychological symptoms frequently manifest themselves. Such behavioural changes may include agitation, delusional ideation, lack of sexual inhibition, verbal or physical aggression, repetitive vocalizations, hoarding and reluctance to cooperate with caregivers. Up to 90% of elderly people with dementia may demonstrate one or more of the above-mentioned problem behaviours at some stage during their illness (Davis, Buckwalter, & Burgio, 1997). This disturbed behaviour has been given the term 'behavioural and psychological symptoms of dementia' (BPSD) by the International Psychogeriatric Association (Finkel, de Silva, & Cohen, 1996) and often presents significant challenges for care providers (Cohen-Mansfield, 1999; Léger, Moulias, & Robert, 2002; Porth, 2004). It has been suggested that the most common causes for expressed agitation are discomfort, a wish to be served immediately, conflict between patients or with nursing staff, reactions to environmental noises or sound, and invasion of personal space (Ragneskog, Gerdner, Josefsson, & Kihlgren, 1998).

Dementia and quality of life

Operational definitions of quality of life may be quite broad. The World Health Organisation defines quality of life as “an individual’s perception of their position in life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns” (Skevington, Lofty, & O’Connell, 2004).

Issues surrounding quality of life become particularly important for persons who have dementia as these individuals are frequently unable to exercise their autonomy and may have little influence over their environment or the provision of their care. As a consequence, they may experience an increased level of frustration which, in turn, may manifest itself as agitated behaviour.

Measuring quality of life in dementia

Until recently, little was known about the quality of life of persons with advanced dementia as it was generally assumed such individuals with significant cognitive impairment were unable to communicate their feelings reliably or consistently. As many people with advanced dementia reside permanently in residential care facilities, it is important to be able to measure quality of life in this setting as this can provide important information about the effects of treatment and other interventions (Logsdon and Albert, 1999). However, current understanding about this issue remains incomplete.

A correlation between the stage of dementia and the quality of life of the sufferer has been demonstrated by a number of studies (Volicer & Bloom-Charette, 1999; Gonzales-Salvador, Lyketsos, Baker, Hovanec,

Roques, Brandt, & Steele, 2000: Selai, Trimble, & Rossor, 2001: Kane, 2003: Whitehouse, Patterson, & Sami, 2003: Abrahamson, Clark, Perkins, & Arling, 2011: Vogel, Bhattacharya, Waldorff, & Waldemar, 2012). Lawton (1994) explored quality of life in older people with dementia, developing a multidimensional framework to define this concept which included both objective and subjective measures. As interest in this area developed further, efforts to define and measure quality of life in dementia resulted in the development of new conceptual frameworks and tools. Brod, Stewart, Sands, & Walton (1999) developed a conceptual framework based on domains considered to be important for people with dementia. One of these domains, described as the *sense of aesthetics*, is related to the ability to enjoy sensory stimuli, such as listening to music.

Mozley, Huxley, & Sutcliffe (1999) have provided research evidence to suggest that elderly persons with mild to moderate cognitive impairment are able to provide information about their own quality of life. Their study, involving 308 elderly people with dementia, concluded that a high proportion (77.5%) of informants could respond to questions about their own quality of life, even in the presence of significant cognitive impairment. Participants who were “interviewable” scored 10 or greater when their cognition was tested using the Mini Mental State Examination (MMSE) (Folstein, Folstein & McHugh, 1975). However, the finding that it was not possible for 22.5% of participants to be interviewed because of their profound cognitive loss highlighted the ongoing challenge of measuring quality of life in persons with more advanced dementia.

Rabins, Kasper, Kleinman, Black, & Patrick (1999) developed a proxy-rated measure, the Alzheimer’s Disease-Related Quality of Life (ADRQL) tool, which contains domains considered to be most important to care providers, such as social interaction, awareness of self, feelings and mood.

Logsdon, Gibbons, McCurry, & Teri (1999) developed a 13-item measure (the QoL-AD tool) which combines quality of life ratings from the perspective of both the caregiver and the patient. The measures focus on domains thought to be important in individuals with cognitive loss, such as mood, friendships, family and memory. Weiner, Martin-Cook, Svetlik, Saine, Foster, & Fontaine (2000) developed an 11-item scale, the Quality of Life in Dementia (QUALID) scale to enable proxies to rate quality of life in persons with late-stage Alzheimer's disease and other dementing illnesses. Other proxy-rated scales have been developed more recently (Smith, Lamping, & Banerjee, 2005) to measure quality of life in persons with advanced dementia who are unable to self-report.

Hoe, Hancock, Livingston, & Orrell (2006) undertook a study of 238 residents with dementia living in 24 residential aged care facilities in the United Kingdom, to determine whether the resident's perception of their own quality of life was correlated with staff perception. Using the Quality of Life in Alzheimer's Disease (QoL-AD) scale (Logsdon et al., 1999), quality of life was rated by the residents themselves and compared with observational ratings provided by their care providers. The study determined that the proxy-rated QoL-AD could be used as an accurate measure of the quality of life of many people with dementia living in residential care facilities. The QoL-AD scale has been found to have good reliability and validity and can be used for people with mild, moderate and severe dementia (Thorgrimsen, Selwood, Spector, Royan, de Madariaga-Lopez, Woods, & Orell, 2003; Hoe et al., 2006). However, a study by Kane, Kane, Bershadsky, Degenholtz, Kling, Totten, & Jung (2005), suggested that proxy ratings of quality of life cannot simply be substituted for resident reports. Beer, Flicker, Horner, Bretland, Scherer, Lautenschlager, Schaper, & Almeida (2010) found that informant ratings consistently underestimated

self-ratings of the quality of life of people with dementia. A more recent study by Bárrios, Narciso, Guerreiro, Maroco, Logsdon & de Mendonça (2013) suggests that self reports of quality of life of persons with mild cognitive impairment are better than the opinion of their informants.

Dementia and residential aged care

The majority of care provision for people with early to moderate dementia occurs in the domiciliary setting (Alzheimer's Association, 2012). As dementia progresses, the sufferer usually becomes increasingly dependent on others for assistance with instrumental activities of daily living. BPSD frequently emerge later in the disease and are a common reason for the institutionalization of people with dementia as they increase the burden and stress on caregivers (Gibbons, Teri, Logsdon, McCurry, Kukull, Bowen, McCormick, & Larson, 2002; Phillips & Diwan, 2003; Buhr, Kuchibhatla, & Clipp, 2006; Schultz & Williamson, 1991).

Wagner, Logsdon, Pearson, & Teri (1997), identified agitated behaviour as one of the most challenging symptoms associated with caring for a person with dementia. Caregiver stress is an important predictor of future nursing home admission (Spillman & Long, 2007) with care givers who report a high stress level being more likely to place the person receiving care into a nursing home (Yaffe, Fox, Newcomer, Sands, Lindquist, & Dane, 2002; Taylor, Ezell, Kuchibhatla, Ostbye, & Clipp, 2008). Although domiciliary-based support services for frail older people and their carers have become more widely available in Australia in recent years, these services are often unable to meet the individual needs of people with advanced dementia, especially those who live alone. In these cases,

admission to a permanent residential care facility is often unavoidable at the present time.

The provision of high quality care for persons with advanced dementia living in a residential care setting presents a unique set of challenges. The majority of these residents require a high level of assistance with activities of daily living such as bathing, dressing, feeding and toileting. In addition, many nursing home residents with advanced dementia experience agitated behaviour. It is well recognised that this type of behaviour in dementia is often worse in the late afternoon and early evening (Evans, 1987; Bliwise, 2000). Although the underlying reason for this is still largely conjectural, the terms “sundowning” or “sundowner syndrome” are now used commonly to describe this undesirable behavioural phenomenon (Hopkins, Rindlisbacher, & Grant, 1992). It is estimated that between 20-45% of people with Alzheimer’s disease experience some form of “sundowning” behaviour during the course of their illness (Smith, 2011).

Sundowner syndrome presents a particular challenge in residential aged care settings because it often occurs in the late afternoon / early evening when fewer care staff may be on duty. The level of close supervision necessary to ensure the safety and wellbeing of the “sundowning” resident is often difficult to provide as care staff may be occupied with other routine care tasks, such as assisting residents with feeding, toileting, preparing for bed and other duties. Thus managing the agitated behaviour associated with dementia has traditionally relied very heavily on the use of physical restraints and / or chemical sedation, especially in the nursing home setting. Several studies (Werner, Cohen-Mansfield, Braun, & Marx, 1989; Miles & Irvine, 1992; Bradley, Siddique, & Dufton, 1995; Ames, Ballard, Cream, Shah, Suh, & McKeith, 2005; Schneider, Dagerman, & Insel, 2005) have found such interventions to have the potential of being legally and ethically

problematic, and alternative interventions are urgently required. In addition to these latter problems associated with chemical restraint, undesirable physical side-effects such as falls, tardive dyskinesia, weight-gain and sedation are well documented (Rochon, Normand, & Gomes, 2008; Muench & Hamer, 2010; Jalbert, Eaton, Miller, & Lapane, 2010). Other studies suggest that pharmacological interventions may lead to reduced well-being and quality of life (Ballard, O'Brien, Reichelt, & Perry, 2002) and may even accelerate cognitive decline (McShane, Gedling, Keene, Fairburn, Jacoby, & Hope, 1998). Kitwood (1997) suggests that many traditional care practices within residential aged care facilities evolved out of convenience for those delivering the care, rather than to meet the individual needs of the dementia sufferer.

Given the well documented problems associated with the use of chemical and physical restraints, clinicians have been recommended to first exclude the possibility that observed behavioural or psychological symptoms in dementia are a consequence of such treatable acute conditions as constipation, infection and pain, before considering the use of pharmacological interventions or physical restraint (Peisah & Skladzien, 2014). Once acute illness has been excluded, non-pharmacological interventions should be considered first (Douglas, James, & Ballard, 2004).

Standard non-musical interventions to replace physical and chemical restraint in residential aged care facilities

Although some advances in the search for an effective treatment for dementia have occurred in recent years, the focus of management for this syndrome is still directed essentially towards improving care and quality of life once a diagnosis has been made, rather than being able to offer a cure.

The interest in identifying effective alternatives to the use of physical and chemical restraints in such circumstances has stimulated a range of interesting and potentially useful intervention research studies. These studies have investigated the possible therapeutic benefits of such non-pharmacological interventions as gentle hand massage (Remington, 2002), sensory stimulation (Smallwood, Brown, Coulter, Irvine, & Copland, 2001; Burns, Byrne, & Ballard, 2002; Holmes, Hopkins, Hensford, MacLaughlin, Wilkinson, & Rosenvinge, 2002; Ballard, O'Brien, Reichelt, & Perry, 2002), reality orientation (Bleathman & Morton, 1988; Spector, Orrell, Davies, & Woods, 2001) environmental manipulation (Hussian, 1988), reduced stimulation (Cleary, Clamon, Price, & Shullaw, 1988), pet therapy (Laun, 2003), doll therapy (Ellingford, James, Mackenzie, & Marsland, 2007) and bright light therapy (Lyketsos, Veiel, Baker, & Steele, 1999; Haffmans, Sival, Lucius, Cats, & Van Gelder, 2001; Figueiro, Rea, & Eggleston, 2003; Mishima, Okawa, Hishikawa, Hozumi, Hori, & Takahashi, 2007). Although several studies of these environmental modifications and psychosocial interventions have demonstrated potential benefits (Haffmans, et al., 2001; Remington, 2002; Van Weert, et al., 2005; Mishima et al., 2007), many of these studies have relied on relatively small sample groups and therefore provide only a fragile evidence base.

A study by Cohen-Mansfield, Jensen, Resnick, & Norris (2011), indicated a variability of attitudes amongst health care professionals towards the use of common non-pharmacological interventions to manage behavioural and psychological symptoms in dementia. In spite of the encouraging results of some studies using non-pharmacological interventions in this context, pharmacological regimens continue to be the first-line management approach in many instances. Cohen-Mansfield et al.,

(2011), suggest that all health professionals might benefit from training and experience with a wider range of non-pharmacological interventions.

One of the major impediments to the broader acceptance of behavioural and psychosocial interventions in dementia care may be that some residential care facilities regard such practices as fiscally impractical. Many of the non-pharmacological interventions mentioned above require the investment of considerable staff time as they are targeted to individual needs, thereby reducing their cost-effectiveness in large residential aged care facilities (RACF's). The challenge therefore is to find interventions that are clinically effective, yet both simple and inexpensive to implement across the entire resident population within a care facility.

Music as a therapeutic intervention in dementia care

In an effort to find clinically effective, non-pharmacological interventions to reduce the distressing behavioural and psychological symptoms of late-stage dementia amongst nursing home residents, an increasing amount of research attention is being devoted to exploring the possible therapeutic usefulness of music in residential care facilities. Although several early studies suggested that music can ameliorate some of the distressing behavioural and psychological symptoms associated with dementia (Groene, 1993; Goddaer & Abraham, 1994; Gerdner, 2000; Heim, Kichu-Nair, Mowbray, and Tavender, 2003), these studies have employed a variety of musical styles and have used differing methodological approaches. This indicates that the type of music conferring the greatest therapeutic benefit is still a matter for further scientific research. For example, several of the studies undertaken so far have involved only small sample groups or have weak experimental design. Furthermore, variable data

collection methods, effect size inconsistencies and the methodological limitations of several studies cloud the overall data. As a consequence, there are limitations about the conclusions that can be drawn from the resulting data. The strongest research evidence emerges when multiple well-designed studies involving large sample sizes, demonstrate consistent patterns.

It has been estimated that on average, a nursing home resident with dementia requires 229 hours more care per year than a resident without dementia, resulting in an average additional annual cost of US\$3,865 for each nursing home resident with dementia (O'Brien & Caro, 2001). If it is possible to identify a particular style of ambient music which consistently produces a beneficial effect on maladaptive behaviour in people with late-stage dementia, or which demonstrates an improvement in their quality of life, it may provide a safe, cost-effective, non-pharmacological intervention for the clinical management of dementia patients in RACF's. Of additional interest in this context, research by Brotons and Pickett-Cooper (1996) suggested that the introduction of music in residential care facilities may have the secondary benefit of making the work environment more relaxed, and thus reducing staff burnout.

The theoretical basis for the use of music in dementia care

The ability of music to influence mood and behaviour is well recognized. References to the beneficial effect of music on health and social order can be found throughout history: in ancient Chinese texts (Tame, 1984): and biblical references to the calming properties of music (1 Samuel 16:16; Psalm 81; Cook, 1981). No past or present culture has been without music (Huron, 2001; Sloboda & Juslin, 2001). The English poet William

Congreve (1670-1729) in his play *The Mourning Bride*, wrote “Music has charms to soothe a savage breast”.

Although cognitive function usually declines progressively throughout the continuum of dementia, with language skills, short-term memory and verbal fluency frequently being lost early in the disease, the ability of people with dementia to respond to music is often retained until the more advanced stages (Crystal, Grober, & Mauser, 1989; Beatty, Zavadil, Bailey, Rixen, Zavadil, Farnham, & Fisher, 1988; Chavin, 1991; Aldridge, 1996; Baird, 2007; O’Callaghan, 1999). Gfeller (2002) suggests that music elicits its emotional response by direct access to the “affective domain” as opposed to travelling through the higher brain. Gardner (1985) asserts that in terms of its influence in dementia, the ability to appreciate music may be a “relative island in a sea of impairments”. This view is supported by Ansdell (1995) who contends that although these people have cognitive deficits, the ability to recognise and recall familiar musical material is retained. Miller, Boone, Cummings, Read, & Mishkin (2000), have proposed that persons with frontotemporal dementia may have less damage to their right cerebral hemisphere, the side of the brain which is associated with creativity and such artistic abilities as music. They suggest that loss of function in one area of the brain may release new functions elsewhere.

Using techniques such as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) scanning, several recent studies have explored the changes in brain activity when music is played (Blood, Zatorre, Bermudez, & Evans, 1999; Menon & Levitin, 2005; Koelsch, 2009; Pereira, Teixeira, Figueiredo, & Xavier, 2011). These studies concur that listening to music modulates activity in the amygdalae, the ventral striatum, the ventral tegmental area of the midbrain and the hippocampus. These anatomical structures within the human brain are each

involved in the complex process of emotional and behavioural regulation and the processing of memory, making these findings highly significant for the field.

Other studies (Bardo, 1998; Salimpoor, Bosch, Kovacevic, McIntosh, Dagher, & Zatorre, 2013; Gardner & Vorel, 1998) have implied that the production of endogenous opioid peptides (endorphins) released naturally in response to pleasurable stimuli, may be responsible for the feeling of relaxation and well-being often experienced by people when listening to music. Figure 1 and Figure 2 below illustrate the major regions of the human brain involved in the modulation of mood and behaviour. These anatomical structures become increasingly active during periods when music is being played (Peretz & Zatorre, 2004).

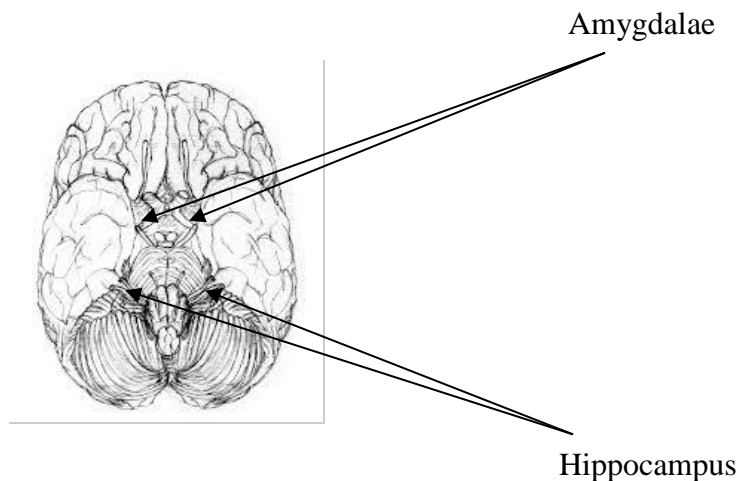


Figure 1. Inferior view of the major neuroanatomical regions of the human brain responsive to music.

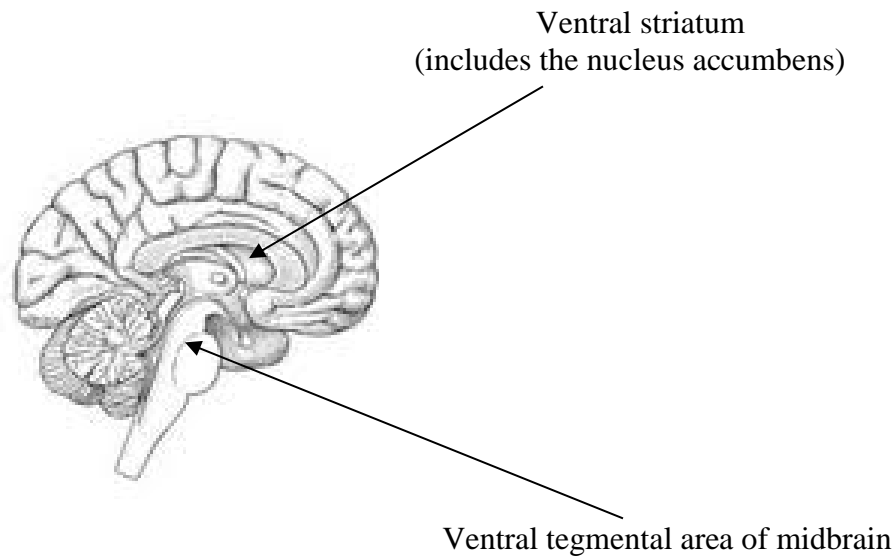


Figure 2. Saggital view of the major neuroanatomical regions of the human brain responsive to music

For the majority of individuals, music frequently provides an accompaniment to significant events in life, and passive exposure to appropriate music later in life presents an opportunity for these significant events to be recalled. In the middle and later stages of dementia, as language skills and verbal fluency are lost, sufferers may have difficulty understanding and interpreting their environment (Thornbury & King, 1992) and may therefore be much more vulnerable to feelings of powerlessness, anxiety and fear. Music may evoke reminiscence, providing a familiar source of comfort and reassurance in these circumstances. Baker (2001) suggests that music benefits individuals with Alzheimer's Disease by greatly increasing their familiarity with their environment, and by filling the patients' rooms with music they recognize, thereby inviting them to be part of it.

Passive listening to music may also reduce the levels of some hormones associated with stress such as cortisol, chromogranin A and immunoglobulin

A (Khalifa, Bella, Roy, Peretz. & Luien, 2003; Suzuki, Kanamori, & Watanabe, 2004; Takahashi & Matsushita, 2006). Decreased levels of the hormone melatonin have been linked to the oxidative stress associated with Alzheimer's Disease (Srinivasan, Pandi-Perumal, Cardinali, Poeggeler, & Hardiland, 2006). A study by Kumar, Tims, Cruess, Mintzer, Ironson, Loewenstein, Cattan, Fernandez, Eisdorfer, & Kumar (1999), found beneficial increases in serum melatonin levels in response to music.

The purpose and aims of the present study

In light of the potential utility of music as a feasible, fiscally responsible, non-pharmacological intervention in dementia management, and the controversies still surrounding the validity of specific background music therapies as an intervention for agitation in this context, the purpose of this study was to determine which of three musical styles, when played as background music, evokes the most beneficial effect on observed agitated behaviour and quality of life among late stage dementia sufferers living permanently within residential aged care settings. This study selected three different types of music which the extant research literature has suggested may have therapeutic benefits in reducing agitated behaviour in the context of late-stage dementia. These musical styles were: gentle classical music (Goddaer & Abraham, 1994; Gerdner, 2000; Hicks-Moore, 2005), familiar music (Lord & Garner, 1993; Svansdottir & Snaedal, 2006) and baroque music (Heim et al., 2003).

Although there have been several previous studies affirming that the “live” performance of music by musicians can play an important role in calming the agitated person with dementia (Pollock & Namazi, 1992; Groene, 1993; Holmes, Knights, Dean, Hodkinson, & Hopkins, 2006), it is

presently unclear whether the reported benefits of this type of live intervention are the result of the music, or the result of other independent variables such as social stimulation, touch and inter-personal contact. Furthermore, the use of live music may be impracticable in many large residential care facilities with limited therapy budgets and limited access to available musicians. For this reason, the study only tested the effectiveness of high quality recorded music, as it is easier to implement by non-musically trained staff in residential aged care facilities.

As there is an established correlation between dementia and quality of life (Brod et al., 1999; Gonzales-Salvador et al., 2000; Selai et al., 2001), data were also gathered to explore whether the quality of life of people with late-stage dementia can be improved through passive exposure to background music. Thus, outcome measures for this study were a reduction in agitated behaviour and an improvement in quality of life of the participants.

Summary

Although our understanding about the relationship between music and agitated behaviour in late-stage dementia is still evolving, an increasingly large body of research evidence reveals that the playing of certain types of background music may have a beneficial influence on the behaviour and cooperation of elderly people with dementia in spite of their often profound cognitive loss. Chapter two reviews the literature which provided the foundation for the present study.

CHAPTER 2: LITERATURE REVIEW

Introduction

Over the past two decades there has been an increasing body of research evidence to suggest that music may confer a therapeutic benefit on the agitated behaviour frequently seen in late-stage dementia (Witzke, Rhone, Backhaus, & Shaver, 2008). Understanding about the relationship between music and dementia is still evolving and research in this area is ongoing: yet much has already been written about this subject. The purpose of this literature review is to acknowledge the important work already achieved in this area, to identify areas which require further research and to provide a rationale for the present study.

At the present time, limited data-based outcome studies relating to the therapeutic use of music in dementia have been published in indexed journals. However, much of the evidence emerging from studies so far supports the suggestion that music can provide a positive and beneficial therapeutic effect on the agitated elderly person with dementia. In spite of these encouraging findings, many of the existing studies have used only small, convenience samples or have weak experimental design. As a result, there are limitations about the conclusions that can be drawn from much of the existing data.

Several analytical reviews of the published literature have been undertaken (Koger, Chapin, & Brotons, 1999; Sherratt, Thornton, & Hatton, 2004; Vink, Bruinsma, & Scholten, 2011) which highlight the inconsistent methodological and reporting quality of existing studies. These meta-analyses suggest there is insufficient evidence at present to either support or discourage the use of music in this context, and that further studies using rigorous scientific methods are needed.

Method of literature review

A structured on-line search for relevant research published between 1985 and 2011 was undertaken using the broad search terms “music”, “behaviour” “quality of life” “agitation” and “dementia”. Only those studies that had been published in peer-reviewed journals and written in English were included. Case studies or studies involving only a small sample size ($n=5$) were not included in the literature review. In addition, studies not including a control group were excluded.

The following on-line databases were searched for the purposes of the review: The Cumulative Index of Nursing and Allied Health Literature (CINAHL): Academic One File: The Cochrane Dementia and Cognitive Improvement Group (CDCIG) database: ProQuest: Meditext: MEDLINE: PsychINFO: EBSCOhost: Ingenta Connect: JSTOR: ScienceDirect: Music Index Online: and Oxford Journals.

Although some studies conducted prior to the past twenty years suggest that music has therapeutic usefulness in this context, particularly the seminal works by Norberg, Melin, & Asplund, (1986), and Bright (1986), most of the relevant research has been undertaken within the past two decades. The majority of studies selected for inclusion, were within-subjects (repeated measures) designs.

Outcome measures used in previous studies

The majority of extant studies into the therapeutic benefits of music in dementia have focused on improving outcomes in undesirable behaviour such as agitation, aggression, verbal disruption and wandering (Groene, 1993; Cohen-Mansfield & Werner, 1997; Clark, Lipe, & Bilbrey, 1998;

Gerdner, 2000). These studies demonstrated statistically significant reductions in wandering (Groene, 1993), verbally disruptive behaviour (Cohen-Mansfield & Werner, 1997), aggression (Clark et al., 1998) and agitation (Gerdner, 2000) amongst participants who had been subjected to a music intervention of some form. Other studies were primarily concerned with aspects of cognition, such as autobiographical memory (Brotons & Koger, 2000; Irish, Cunningham, Walsh, Coakley, Lawlor, Robertson, & Coen, 2006) or verbal fluency (Brotons & Koger, 2000; Thompson, Moulin, Hayre, & Jones, 2005). These studies demonstrated improvements on both autobiographical memory and verbal fluency. A study by Lord and Garner (1993) used emotional wellbeing as an outcome measure, finding that participants exposed to some form of music intervention were happier and more alert.

Age-related changes in patterns of sleep have been well documented (Van Someren, 2000; Myers & Badia, 1995). In the elderly with advanced dementia, alterations to the usual circadian cycle of wakefulness and rest can lead to increased nocturnal activity (Van Someren, Hagebeuk, Lijzenga, Scheltens, Rooij, Jonker, Pott, Mirmiran, & Swaab, 1996), which can create difficulties for the provision of care. A study by Lindenmuth, Patel, & Chang (1992), examined the effects of gentle classical background music on sleep patterns in a group of elderly people with dementia. To determine whether listening to gentle background music at the end of the day improved sleep, an observational assessment was undertaken by nurses on night shift. Comparison between an experimental group and a control group demonstrated a strong relationship between the use of gentle classical music and an increase in the number of hours of sleep.

Other intervention studies have measured biological markers, such as salivary chromogranin A, immunoglobulin A and cortisol as indicators of

stress (Khalifa et al., 2003; Suzuki et al., 2004; Takahashi & Matsushita, 2006) finding beneficial changes in the levels of these hormones when music was being played. Although some of the beneficial effects of music appear to be mediated through the release of neurohormones and neurotransmitters, the understanding of the specific neurohormonal systems involved remains incomplete. Kumar et al., (1999) examined the effect of music therapy on levels of serum melatonin, epinephrine, norepinephrine, prolactin and serotonin in 20 elderly males with Alzheimer's disease. Blood samples were taken prior to and following four weeks of live group music therapy. The study found significant increases in serum melatonin levels following the music therapy sessions. Several studies (Lieberman, Waldhauser, Garfield, Lynch, & Wurtmanz, 1984; Mishima et al., 1999) have shown that melatonin has a significant influence on health, with decreased levels being associated with mood disorders and poor patterns of sleep.

Levels of research evidence

Although there is no single, globally-accepted hierarchy of research evidence, Ciliska (2006) defines evidence-based nursing research as “the incorporation of the best research evidence, along with patient's preferences, the clinical setting, circumstances and healthcare resources, into decisions about patient care”. LoBiondo-Wood & Haber (2006) contend the strength of evidence may be defined quite tightly by some researchers, who consider only the findings of randomized clinical trials, while others also include case reports and expert opinion. Melnyk and Fineout-Overholt (2005) developed a seven level rating system for nursing evidence in the following manner;

Level I: a systematic review or meta-analysis of randomised controlled trials or clinical practice guidelines based on randomised controlled trials.

Level II: a well-designed randomised controlled trial.

Level III: a well-designed non-randomised controlled trial.

Level IV: a well-designed case control or cohort study.

Level V: a systematic review of descriptive or qualitative studies.

Level VI: a single descriptive or qualitative study.

Level VII: the opinion of expert authority

This literature review employed the above rating framework to identify, select and include articles for inclusion, examining many intervention studies. Various methodological limitations were evident in much of the existing research. Small sample sizes and the use of purposive or convenience sampling in many of the studies reduced their external validity. In addition, a wide degree of variability existed between the type, duration and frequency of the musical interventions. Table 1 presents those studies which provided strong research evidence, defined as at least level III or above by the Melnyk and Fineout-Overholt (2005) rating scale. These studies are discussed later in this chapter.

Table 1:

A chronological summary of important high level research evidence studies into the effect of music on agitated behaviour in dementia

Author / Year	LOE	Music intervention type	Sample	Design	Outcome measures	Conclusions
Groene (1993)	II	Group music therapy (participants received seven one-to-one sessions by a music therapist)	N=30	RCT (parallel)	MMSE Wandering behavior assessed by seating duration	Significant decrease in wandering during the music intervention

Lord & Garner (1993)	II	Listening to recordings of “big band” music from the 1920’s and 1930’s	N=60	RCT (parallel)	Questionnaire	Significant improvement in emotional well-being and autobiographical memory
Clair & Bernstein (1994)	III	Listening to recordings of stimulative & sedative music	N=28	Quasi-experimental time series, within-participants	Observers count the number of participants demonstrating agitated behaviour at one-minute intervals over a 30-minute period. (plachek method)	No significant change in observed agitated behaviour under either experimental condition
Goddaer & Abraham (1994)	III	Listening to recordings of relaxing music	N=29	Quasi-experimental repeated measures ABAB (A=no music B=music)	Modified CMAI	Significant differences in cumulative incidence of physically non-aggressive and verbally disruptive behaviours during music
Tabloski et al. (1995)	III	Listening to recordings of calming music	N=20	Quasi-experimental repeated measures. Each participant is their own control.	ABS	Significant reduction in agitation during and following music
Cohen-Mansfield & Werner (1997)	II	Listening to recordings of preferred music	N=32	Repeated measures prepost-test crossover design	ABMI CMAI Tape recording	31% reduction in verbal disruptive behavior during music
Clark et al. (1998)	II	Listening to recordings of preferred music during bathing	N=18	RCT with crossover design	Observational checklist for aggressive behaviors	Decrease in 12 out of 15 aggressive behaviors during music. Significant decrease in hitting behaviors
Gerdner (2000)	III	Listening to preferred music & relaxing classical music	N=39	Multi-centre experimental repeated measures prepost-test crossover design	Modified CMAI	Significant reduction in agitation during and following preferred music compared to classical music

Brotons & Koger (2000)	II	Group music therapy (sessions of singing with guitar accomp. twice a week for 30 minutes)	N=26	RCT with crossover design	MMSE WAB	Significant improvements in verbal fluency and content following music. No statistically significant difference in M.M.S.E. results between the two groups.
Hicks-Moore (2005)	III	Listening to recordings of relaxing music at mealtimes	N=30	Quasi-experimental	Modified CMAI	Decreased occurrence of agitated behaviours during music
Sung et al. (2006)	III	Listening to preferred music	N=32	Quasi-experimental	CMAI RAID	Significant reduction in overall agitation and physically non-aggressive behaviours
Guétin et al. (2009)	III	Individual receptive music therapy using preferred music	N=30	RCT (parallel)	HAS-A GDS MMSE	Significant improvements in anxiety and depression

Abbreviations used;

LOE: Level of Evidence (as defined by Melnyk & Fineout-Overholt, 2005)

MMSE: Mini Mental State Examination (Folstein, Folstein & McHugh, 1975)

ABMI: Agitation Behaviour Mapping Instrument (Cohen-Mansfield et al., 1989)

CMAI: Cohen-Mansfield Agitation Inventory (Cohen-Mansfield, 1999)

WAB: Western Aphasia Battery (Shewan & Kertesz, 1980)

ABS: Agitated Behaviour Scale (Corrigan, 1989)

HAS-A: Hamilton Anxiety Rating Scale (Hamilton, 1960)

GDS: Geriatric Depression Scale (Yesavage et al., 1983)

RAID: Rating Anxiety in Dementia scale (Shankar, Walker, Frost, & Orrell, 1999)

The principle types of musical intervention used in dementia studies

Music interventions can be divided into two main forms: passive music interventions, whereby the participant listens passively to music

without contributing: or active music interventions whereby the participant actively becomes involved in the creation of the music. The reviewed studies incorporated a variety of music modalities that included listening to recordings of various styles of music (Khalifa et al., 2003), playing percussion instruments (Suzuki et al., 2004), listening to “live” piano music (Takahashi & Matsushita, 2006) and singing (Suzuki et al., 2007). While the results of these studies are mixed and often contradictory, research into which type of musical intervention provides the greatest therapeutic benefit to sufferers of dementia is ongoing. The most commonly used music intervention types will now be explored in more detail and the research evidence to support the use of each intervention will be evaluated. Where reported, significance values are included.

Recordings of gentle classical music

The effect of recordings of gentle classical music on the agitation associated with late-stage dementia has been explored in several important studies (Courtright et al., 1990; Tablowski, McKinnon-Howe & Remington, 1995; Denney, 1997; Gerdner, 2000; Irish, 2006). These studies played gentle classical music as a “background” intervention and several reported statistically significant beneficial results on agitated behaviours. Many of these studies examined the effects of background music on behaviours such as sleep, verbal disruption and agitation at mealtimes.

Mealtimes in residential aged care facilities are often associated with an increased level of agitation amongst residents. It has been speculated (Courtright, Johnson, Baumgartner, Jordan, & Webster, 1990) that this may be the result of the increased environmental stimuli occurring as staff move about during the serving of meals. In a significant 1994 study conducted by

Goddaer and Abraham, 29 elderly nursing home residents with dementia were observed during mealtimes over a four week period. During the first week, no music was played and initial “baseline” data about behaviours were recorded for later comparison following the musical intervention. During the following three weeks, recorded classical music described in the study as “peaceful”, “unobtrusive” and “melodic” was played as background music during mealtimes. Employing a modified version of the Cohen-Mansfield Agitation Inventory, an observational checklist comprised of 29 indicators of behaviours associated with agitation seen commonly in dementia sufferers, a statistically significant reduction (63.4%) in the cumulative incidence of total agitated behaviours was observed during mealtime when the music was played. However, no statistically significant reductions were observed in hiding or hoarding behaviour, a common behavioural feature amongst the ambulant elderly with later stage dementia. This study was replicated by Denney (1997) using a smaller sample of participants between the ages of 65 and 84 years ($n=9$). The results supported the findings of the previous study, demonstrating a statistically significant reduction of up to 46% in agitated behaviour during mealtimes when compared with behaviours prior to the introduction of music. The playing of gentle background music at mealtimes was also found to promote a meaningful interaction between residents (Gerdner, 2005).

Tablowski, McKinnon-Howe, & Remington, (1995) studied a convenience sample of 20 cognitively impaired, agitated male and female nursing home residents between 68 and 84 years of age who were exposed to recordings of gentle classical music (Pachelbel’s canon in D) for fifteen minutes on two separate occasions. Mean pre, during and post intervention scores differed significantly ($F=33.45$; $df=2$; $p<.001$) using R-ANOVA. In addition, Hicks-Moore (2005) undertook a four week study of elderly

residents ($n=30$) with dementia living in a permanent care facility, to determine whether gentle classical background music reduced agitated behaviour. A convenience sample was played “relaxing” classical music during their evening meal time. The type of music selected was “Relax with the Classics”, a compilation of gentle classical largos and adagios (Lind Institute, 1987). This music had a tempo of between 55-70 beats per minute and was similar to the music selected for the earlier study by Goddaer and Abraham (1994). The Cohen-Mansfield Agitation Inventory (Cohen-Mansfield et al., 1989) was utilized to measure 29 indicators of agitation. At the conclusion of the study, results indicated that a statistically significant reduction in agitated behaviour occurred both during and after the musical intervention.

More recently, Irish et al. (2006) also studied the influence of recordings of gentle classical music in a group of individuals ($n=10$) with mild dementia of Alzheimer-type on certain aspects of cognitive function. Interviews were conducted with each of the participants on two separate occasions: firstly whilst listening to an excerpt from Vivaldi’s “Four Seasons” and then without any music. Results indicated that autobiographical memory improved under the music condition ($p<0.005$). These authors suggest that reduced anxiety levels as a result of listening to recordings of gentle classical music may explain this improvement.

Thus, the results of several intervention studies using soft, stylistically simple classical music have reported some therapeutic benefits on some aspects of behaviour and cognition amongst study populations of elderly people with dementia. However, whether this particular style of background music is more beneficial than other styles is unclear at present as other

studies using different styles of background music have reported similar benefits.

Recordings of familiar music

As discussed earlier, older people with dementia may have difficulty interpreting their environment (Camberg, Woods, & McIntyre, 1999; Thornbury & King, 1992) and may therefore be more susceptible to feelings of powerlessness. Cuddy and Duffin (2005) reported that memory for familiar melodies is often preserved in elderly persons with Alzheimer's disease. Recognizable music may introduce a sense of familiarity for the older person with dementia in an otherwise confusing environment, thereby reducing agitated behaviours or improving quality of life. Svansdottir and Snaedal (2006) explored the possible benefits of playing familiar music to persons with dementia in a controlled case study of 38 persons with moderate or severe Alzheimer's disease. Participants were randomly assigned to either a music group or a control group. Following a six week intervention period, results indicated a significant reduction in behavioural symptoms within the music group ($p=0.2$), but not within the control group ($p>0.5$). In this study, familiar music was defined as music that would have been generally popular and frequently heard when the participants were much younger. This type of music is generally preferred by older persons (Gibbons, 1977). The authors suggested familiar music to confer a beneficial effect on a range of psychosocial, cognitive and behavioural features, although the benefits had largely disappeared four weeks after the cessation of the music. In a review of the literature regarding the therapeutic use of music as an intervention to decrease agitated behaviour, Goodall and Etters (2005) concluded that familiar music evoked a more positive response than unfamiliar music.

Limitations in the literature regarding the use of familiar music include a lack of consideration of ethnicity, cultural and social factors. These need to be taken into consideration when attempting to develop a familiar music program and this presents a significant challenge for care providers, especially those who work within the increasing number of multicultural aged care facilities. Dilworth-Anderson and Gibson (1999), inform that issues of ethnicity and culture, as they relate to Alzheimer's disease and related disorders, continue to be under-studied. Ethnicity, cultural and social factors become extremely important when an attempt is made to implement familiar music programmes, as what may be familiar for one group, may not be familiar for another.

Recordings of preferred music

The therapeutic benefit of "preferred" or "individualised" music in dementia has been explored in several studies (Gerdner & Swanson, 1993; Casby & Holm, 1994; Sung, 2006; Guétin, Portet, Picot, Pommie, Messaoudi, Djabelkir, Olsen, Cano, Lecourt, & Touchon, 2009). In these studies, preferred music is described as the type of music that the participant themselves might have chosen to listen to preferentially prior to their illness. The selection of music for these studies was generally guided by information gathered from close family members.

Gerdner and Swanson (1993) undertook one of the earliest intervention studies using preferred music. The choice of music in their study was determined after consultation with the residents' close family members using the Modified Hartsock Music Preference Questionnaire (Hartsock, 1982), a tool developed to determine whether favourite music influences levels of anxiety in the listener. Their study reported a statistically significant

decrease of over 50% in agitated behaviour amongst the entire population being observed following exposure to the musical intervention. However, the small size of the study population ($n=5$) limits the conclusions that can be drawn from this study.

Cohen-Mansfield and Werner (1997) undertook a study into the benefit of preferred music by observing thirty-two nursing home residents manifesting verbally disruptive behaviour in the context of dementia. Three types of intervention were compared to a control, no-intervention, phase. These interventions consisted of: (a) presentation of a videotape of a family member talking to the older person: (b) in vivo social interaction: and (c) use of preferred music. Results indicated a 31% reduction in verbally disruptive behaviour during the preferred music intervention. Another study into the benefits of preferred music was undertaken by Sung (2006) who explored the effectiveness of preferred music on levels of agitation and anxiety in people with dementia living in residential care facilities. Twenty-nine participants in the experimental group received a six week program of preferred music for thirty minutes each afternoon, twice a week. Meanwhile, a control group of 23 participants received only their usual care. Anxiety was measured using the Rating Anxiety in Dementia (RAID) scale (Shankar, Walker, Frost, & Orrell, 1999) at baseline and week six. Agitation was measured using the Cohen-Mansfield Agitation Inventory (Cohen-Mansfield, 1989). Analysis of covariance (ANCOVA) results concluded that the participants in the preferred music group had significant reductions in anxiety compared to the control group ($F = 12.15, p = 0.001$). The therapeutic benefits which Sung (2006) attributes to recordings of preferred music are supported by a more recent study undertaken by Guétin et al. (2009), which examined the effects of preferred music on anxiety and depression amongst individuals with mild to moderate Alzheimer's Disease.

The study group ($n=15$) were involved in a weekly music therapy session in which the choice of music was decided by the participant themselves, while a control group ($n=15$) participated in weekly reading sessions. The Hamilton Anxiety Rating Scale (Hamilton, 1960) and Geriatric Depression Scale (Yesavage, Brink, & Rose, 1983) were used as measures of anxiety and depression throughout the study. Significant improvements in anxiety ($p < 0.01$) and depression ($p < 0.01$) were reported in the music group after four weeks and were sustained for up to eight weeks following the cessation of music.

These recent studies built upon important earlier work by Clark et al. (1998) who undertook a crossover study into the effects of preferred music on the agitated behaviour of dementia sufferers during bathing, identified as a trigger for agitated behaviour, especially screaming (Cohen-Mansfield et al., 1990). The study by Clark et al., observed 18 participants with severe cognitive impairment over a two week period during bathing sessions. Participants were randomly assigned to either a no music control group or an experimental group in which recordings of preferred music were played throughout the duration of the bathing period. The results indicated a decrease in 12 out of 15 identified agitated behaviours.

Recordings of Baroque music

During the 17th and early 18th centuries, a distinct style of classical musical composition emerged known as the Baroque period. This period of music is associated with well-known European composers such as Bach, Handel, Vivaldi, Telemann and Corelli. In a small single-centre study ($n=14$), Heim et al. (2003) reported the beneficial effects of playing ambient baroque music to older residents with dementia in a nursing home setting.

The authors of the study suggested that Baroque music possesses a unique compositional structure which equalises the right and left cerebral hemispheres by stimulating the production of more alpha and theta waves. Alpha and theta waves are commonly associated with a more relaxed state of consciousness. By contrast, beta waves are associated with a more aroused state of consciousness. In addition, Heim et al. contended that because Baroque music has a constant and predictable tempo and style, it decreases arousal. Structurally repetitious music evokes familiarity in the listener and does not require them to give the music any additional attention (Gardner, 1993).

Adding support to the contention that constant tempo might decrease arousal, Gadberry (2011) investigated whether listening to a steady beat decreased feelings of anxiety in healthy people. In this study, participants ($n=36$) aged between 20 and 50 years were randomly assigned to one of two independent groups: an experimental group and a control. All participants were subjected to experimental anxiety induced through the rapid completion of a modified Stroop colour-word test (Golden, 1975) during which subjects in the experimental group were played a repetitive sub-contra C bass tone at 66 beats per minute for two minutes. Subjects in the control group sat in silence for two minutes. Participants who had listened to the repetitive beat reported feeling less anxiety than the participants who sat in silence.

As the literature review was unable to identify additional studies to either support or challenge the assertion that Baroque music has a unique ability to settle the agitated behaviour of late-stage dementia, the present study explored this further. The majority of previous music intervention studies in this context have involved the use of recordings of various forms of soft, stylistically simple music. However, whether a gentle style of music

intervention is more beneficial than a more stimulative style remains unclear, some studies having demonstrated that more stimulative forms of music can have a therapeutic benefit.

Recordings of stimulative music

A significant study by Lord and Garner (1993) suggested that more stimulative styles of music can also ameliorate some of the distressing symptoms of late-stage dementia. In their study, a group of nursing home residents ($n=60$) with Alzheimer's Disease was observed in an effort to determine whether music influenced mood and cognitive performance. The selected participants were randomly assigned to one of three equally-sized experimental groups. Group one listened to "big band" music from the 1920's and 1930's, the second being given puzzle exercises and the third participating in drawing and painting. At the commencement of the study and after six months, all participants were asked to complete a subjective questionnaire about their feelings and mood. Results indicated that the individuals in the "big band" music group felt happier, were more alert and had better autobiographical memory than the participants in the other two groups.

Clair and Bernstein (1994) compared the effects of three different experimental conditions: no music, stimulating music (recordings of popular big band music) and calming, sedative music (recordings of the CD "Music for Mellow Minds") on the agitated behaviours of a research cohort of 28 patients with dementia. Data analysis indicated no difference in the frequency of agitated behaviours under each experimental condition.

A more recent study undertaken by Ziv, Granot, Hai, Dassa, & Haimov, (2007), examined the influence of stimulative music on both the

positive and negative behaviours of 28 elderly nursing home residents. Results indicated a general increase in positive behaviour, a reduction of agitated behaviour and a reduction of undesirable behaviours such as wandering, fidgeting and aggression when music was played. The literature review was unable to identify similar studies to support the use of stimulative music in this context and therefore it is difficult to draw conclusions about the effectiveness of this type of intervention.

Live group music

A significant early study into the effect of live group music was undertaken by Groene (1993) who observed and compared the behaviour of 30 nursing home residents during a series of live music and reading sessions. The participants, aged between 60 and 91, were all in the late stage of dementia. Each of them was randomly assigned to either a group that received a mostly musical intervention, that is five live music sessions and two reading sessions, or a group receiving five reading sessions and two live music sessions. The music sessions consisted of fifteen minutes of playing instruments, singing, dancing and listening to music, while the reading intervention consisted of a therapist reading aloud to each of the participants for fifteen minutes each day. Baseline data were collected for three days prior to the introduction of the interventions and then throughout the five day duration of the study. The data indicated wandering, which is a familiar behavioural feature of middle and late stage dementia, decreased significantly during the musical intervention.

A more recent study of significance was undertaken by Brotons and Koger (2000) who researched the comparative benefits of live group singing with guitar accompaniment, and conversation sessions, on individuals with

dementia. Using a crossover design, language skills were assessed using the Western Aphasia Battery (W.A.B.) (Kertesz, 1980), with cognitive performance being assessed using the Mini Mental State Examination (M.M.S.E.) (Folstein et al., 1975). Verbal fluency and content were declared to be significantly better following group music therapy, than after conversation sessions. However, the study reported no statistically significant difference in M.M.S.E. results between the two groups.

Several other studies (VanderArk, Newman, & Bell, 1983; Pollock & Namazi 1992; Brotons & Pickett-Cooper, 1996; Engstrom, Hammar, Williams, & Gotell, 2000; Jennings & Vance, 2002; Ridder, 2003; Harrison, Cook, Moyle, Shum, & Murfield, 2010) have reported similar benefits using live or group music, whereby participants actively engage with music through interactive tasks such as singing, clapping or playing percussion instruments. However, the relatively small sample size of some of these studies limits the conclusions that can be drawn.

Using salivary biomarkers as an indicator of stress, Suzuki et al., (2004) studied changes to sympathetic nervous system activity in response to live group music. In their study, salivary chromogranin A (CgA) samples were taken from participants at various stages throughout a live group music session. Previous studies (Yanaihara, Nishikawa, & Hoshino, 1998; Kirschbaum & Hellhammer, 1994; Noto, Sato, & Kudo, 2005) had affirmed that salivary CgA is a sensitive biomarker of psychological stress. Although saliva samples can be difficult to obtain from participants displaying agitated behaviour, the study by Suzuki and co-authors observed a slight decrease in salivary CgA levels amongst the music therapy group ($n=10$), thereby suggesting that the participants were less stressed.

Takahasi and Matsushita (2006) assessed the long-term effects of weekly live group music therapy sessions on the cognitive performance of

24 elderly dementia sufferers in a nursing home. A control group of 19 elderly dementia sufferers, also resident in the nursing home, did not participate in the music therapy sessions. Using a nine-item scale, the Revised Hasegawa Dementia Scale (HDS-R) (Hasegawa, Inoue, & Moriya, 1974), the cognitive performance of all participants was assessed prior to the start of the first therapy session and again at six months, one year and two years. HDS-R scores were maintained in the music therapy group after two years, compared with a decline in the non-music therapy group.

Svansdottir and Snaedal (2006) undertook a case-control study of 38 patients with middle and late-stage Alzheimer's Disease. The research cohort members were randomly assigned to a live music therapy group or a control group, to determine whether music therapy influenced levels of agitation. Using the Behaviour Pathology in Alzheimer's Disease Rating Scale (BEHAVE-AD), the study was carried out by qualified music therapists who reported a significant reduction in disturbed activity at six weeks within the music therapy group. The study also noted that the beneficial effects had almost disappeared within four weeks of the cessation of the music therapy intervention.

A crossover study undertaken by Bruer, Spitznagel, & Cloninger, (2007) explored whether live group music therapy improved MMSE scores in a group of 17 participants with a formal diagnosis of dementia. Results showed that these scores improved by an average by 2.00 points immediately following the music therapy compared to the control group. MMSE scores the following day were even more remarkable, showing an average improvement of 3.69 points amongst the live music therapy group compared to the control.

Ledger and Baker (2007), investigated whether live group music conferred any longer-term benefits on levels of agitation. In their study, a

convenience sample of older people with advanced dementia of Alzheimer-type were selected from thirteen high care facilities and provided with a weekly live group music therapy session. The selected participants were assigned to either an experimental group ($n=26$) or a control group ($n=13$). The program was administered under the guidance of a music therapist who observed and documented a range of undesirable behaviours prior to and following each of the sessions, using the Cohen-Mansfield Agitation Inventory (CMAI). Analysis of the data indicated that levels of agitation were less during and immediately following the live music therapy, but with no measurable longer-term effect.

Raglio, Bellelli, Traficante, Gianotti, Chiara, Villani, & Trabucchi (2008), undertook a study of 59 nursing home residents with moderate to severe dementia, to determine whether live group music influenced their behavioural and psychological symptoms. The participants were randomly assigned to one of two experimental groups: group one, the experimental group, participated in 16 weeks of live group music therapy: and group two, the control group, participated in other recreational activities. Assessment of the BPSD was made using the neuropsychiatric inventory (N.P.I.) (Cummings, Mega, Gray, Rosenberg-Thompson, Carusi, & Gornbein, 1994). Analysis of data at the commencement of the project and again at eight, sixteen and twenty weeks, indicated a significant reduction over time in the NPI scores for both groups ($F_{7,357} = 9.06, p < 0.001$). A significant difference was apparent between groups ($F_{1,51} = 4.84, p < 0.05$) with a greater reduction of delusions, agitation, anxiety, apathy, irritability, aberrant motor activity, and night-time disturbances in the music intervention group at the end of the treatment (Cohen's $d=0.63$).

Another recent randomised controlled study was undertaken by Cooke, Moyle, Shum, Harrison, & Murfield (2010) who investigated whether live

music had any influence on quality of life in 47 older people with dementia who were involved in a structured, live music program. Using the Dementia and Quality of Life instrument (DQoL) (Brod et al., 1999), findings indicated that live music could improve self-esteem and depression in some older people with dementia.

Live versus recorded music

A qualitative study by Götell, Brown, and Ekman, (2003), concluded that live group music, in particular, caregiver singing, can improve communication, body posture and sensory awareness in a person with advanced dementia. In their study, nine participants with late-stage dementia were each videotaped during routine care provision under three different environmental conditions: no music: recorded background music: and caregiver singing. Using qualitative content analysis procedures, participants were demonstrated as showing: a more upright posture: increased responsiveness: more symmetric movement: and a greatly increased awareness of themselves and their environment when caregivers sang during routine care provision.

Holmes et al. (2006) undertook a study involving a sample of 32 residents with moderate to severe dementia living in nursing homes. Participants were randomly assigned to one of three experimental groups: live interactive music: passive pre-recorded music: and silence. The results indicated that live interactive music had an immediate and positive effect on participants with apathy regardless of the severity of their dementia. They concluded that although pre-recorded music was non-harmful, it was also less beneficial than live group music.

Live group music therapy sessions are usually part of a structured program delivered under the supervision of a staff member, musician or trained music therapist. Bruscia (1998) points out that these types of musical intervention are unique because they always involve the therapist or staff member acting as a partner in the process. However, this conclusion raises the question as to whether the reported therapeutic benefits are a consequence of the music itself, or are the result of a combination of music and other confounding factors, such as social interaction or touch. To minimise the influence of these possible confounding factors, the study described in this dissertation tested only the effectiveness of high quality recorded music, a type of intervention that is easy to implement by non-musically trained staff in residential aged care facilities. In addition, as stated earlier, the use of live or “individualized” music may be impracticable in many large residential care facilities with limited therapy budgets, co-located residents and limited access to available musicians.

Comparisons between musical styles

Although various musical styles have been reported as providing therapeutic benefits in previous research, few studies have compared comparative benefits between different background musical styles. It is therefore difficult to be confident about which musical style confers the greatest benefit across a study population. However, a significant early study referred to previously in this thesis by Clair and Bernstein (1994), observed 28 male dementia sufferers in a residential aged care facility who were exposed to three different experimental conditions: no music: the stimulating music of recordings by popular big bands: and the calming, sedative music provided by the CD “Music for Mellow Minds”. Data analysis indicated no

difference in the frequency of agitated behaviours under each experimental condition.

Ragneskog, Brane, Karlsson, & Kihlgren (1996), implemented a small study ($n=5$) which examined the relative benefits of three different types of music: i) soothing classical music: ii) popular old Swedish tunes from the 1920s and 1930s: and iii) contemporary pop music. There was a seven day “washout” period in between each intervention. Each of the three types of music was played for two weeks immediately prior to and during mealtimes to test whether food consumption increased and whether agitated behaviour decreased. Food portions for each participant were weighed before and after each meal. The five participants in the study were videotaped throughout the study. Analysis of these recordings demonstrated that four of the five participants remained seated at the dining table for longer during the soothing classical music sessions, than during the control period when no music was played. However, only one of the participants was noted to increase their food intake during this time. The researchers concluded that of the three types of music, the soothing music appeared to have the most beneficial effect in reducing agitation and increasing food consumption.

Gerdner (2000) undertook a larger study to test the mid-range theory of individualised music intervention for agitation, by evaluating the effects of individualised music, described in the study as music which has specific meaning to the individual, against a comparison intervention of classical relaxation music, on participants diagnosed with dementia with an average age of 82 years. Using a crossover design, the study involved 30 female and 9 male participants being assigned to either group A or group B. Musical preferences were identified for each participant using the Modified Hartsock Music Preference Questionnaire (Hartsock, 1982). Baseline data were collected from both groups for three weeks. Group A was then played

preferred music for thirty minutes each day for six weeks. This was followed by a 14 day “washout” period. The same group then received another six weeks of gentle classical music. Group B were subjected to the same musical interventions, but in reverse order. The level of agitated behaviour was assessed by certified nursing assistants using a modified version of the CMAI (Cohen-Mansfield, 1986). Data from the study indicated the frequency of agitated behaviours to be reduced significantly during the sessions when individualised music was played and during the thirty minute period following cessation of the individualised music. Reductions in agitated behaviour were less during the first twenty minutes of classical music. However, there was a slight reduction in agitation scores during the final ten minutes of classical music and for the ten minutes immediately following the cessation of classical music. This finding suggests that individualised music has a greater degree of effectiveness in reducing agitated behaviour than classical music *per se*.

Methodological limitations of previous studies

The review of the existing literature on this subject clearly reveals there to be an increasing body of research evidence to support the use of music as an effective therapeutic modality in late-stage dementia. However, various methodological limitations are evident in much of the existing research. Small sample sizes, the lack of a control group and the use of convenience sampling in many of the extant studies reduced their external validity. In addition, a wide degree of variability exists between the type, duration and frequency of the musical interventions. As a result, there remains an incomplete and sometimes conflicting understanding about which type of music provides the greatest therapeutic benefit.

In addition, the measurement of behavioural outcomes is variable in the existing research. Moreover, although several studies used validated and reliable observational assessment tools, other studies employed behavioural checklists, the reliability and validity of which were not reported. Only three studies (Gerdner, 2000; Gerdner, 2005; Sung, 2006) used a validated musical preference assessment tool and only two studies (Gerdner, 2000; Sung, 2006) highlighted the importance of cultural factors in developing an appropriate music therapy intervention for elderly people with dementia. Although participants for the study by Gerdner (2000) were drawn from six long-term care facilities, the literature review shows there to be a lack of well designed multi-centre studies.

All of the reviewed studies used some form of musical intervention as an independent variable. However, few of the studies introduced a secondary independent variable. Therefore it was difficult to draw a comparison between the effect of music and the effect of other interventions. To provide an additional level of scientific rigour, the present study was designed with a secondary independent variable, audio recordings of storybooks, to enable a comparison to be drawn between the effects of this and the three main background music interventions.

Summary and conclusions

The existing research literature is theoretically and methodologically diverse. Several meta-analytical reviews of it have recommended the need for further studies with a more rigorous scientific design (Opie, Rosewarne, & O'Connor, 1999; Lou, 2001; Sherratt, Thornton, & Hatton, 2004; Wall & Duffy, 2010; Vink et al., 2011). Such studies must have larger sample sizes, utilize a variety of musical styles, and be conducted across multiple centres.

The present study has been designed and undertaken with these recommendations in mind. Whilst the positive results reported in many of the “preferred” or “individualized” music (Sung, 2006, Gerdner, 2012) and “live” music (Cooke et al., 2010) intervention studies are noteworthy and encouraging, it may be difficult, especially in large, busy, dementia-specific aged care facilities with limited therapy budgets, to develop and implement an individualised music therapy program for each resident. Although many residential aged care facilities now employ therapy staff or activities coordinators, the difficulties in planning, implementing and maintaining time-consuming individualised music therapy programs to multiple residents often seated together in communal areas, may render this approach impracticable in many facilities. Furthermore, the use of live music may be impracticable in many large residential care facilities with limited therapy budgets and limited access to available musicians.

The challenge therefore is to try and identify a particular musical genre which, when played as “ambient” or “background” music, demonstrates a consistent capacity to reduce agitated behaviour in late-stage dementia across resident populations in multiple facilities. For this reason, the study was restricted to testing the effectiveness of high quality recorded music. As a result of this literature review, some unanswered questions remain, which the present study sought to answer.

The Research Questions

The specific research questions in this study were;

1. Which, if any, of three different types of ambient music (gentle classical music, familiar music, baroque music), reduces observed

agitated behaviour in persons with advanced dementia living permanently in a residential aged care setting when compared to control conditions of audio recordings of storybooks and no intervention?

2. Which, if any, of three different types of gentle, ambient music has a beneficial, effect on the perceived quality of life of persons with advanced dementia living permanently in a residential aged care setting when compared to control conditions of audio recordings of storybooks and no intervention?
3. What are the perceptions of the residential aged care facility's staff regarding the effect of music in general and ambient music in particular, on agitation and quality of life of persons with advanced dementia living permanently in such institutions?

Significance of the present study

In light of the small number of multi-centre intervention studies using recorded ambient music thus far conducted, the present research was undertaken across a total of eight different sites. The literature review was unable to identify any previous studies involving such a relatively large number of care facilities, the majority of previous studies having focused on behavioural outcomes comparing the effect of a single type of music intervention, against other non-musical, independent variables, or against a control. The present study gathered both behavioural and quality of life data. Although some previous studies have tested the comparative effects of two different types of recorded music (Clair & Bernstein, 1994; Gerdner, 2000), the literature review was able to identify only one previous study (Ragneskog et al., 1996) which involved the use of three different types of music. However, this study involved only a relatively small sample

population ($n=5$) and was conducted at a single site. In addition, it did not involve the introduction of a secondary non-musical, independent variable.

Thus, using a relatively large study population ($n = 65$), the present study examined the effect of three different types of ambient music on both behaviour and perceived quality of life. In addition, it was conducted across eight different residential aged care facilities and involved the introduction of a secondary independent variable, recordings of storybook readings. The current study also involved the gathering of data from a series of structured interviews with experienced care staff, the purpose being to determine whether the subjective opinions of staff were supported by the collected observational data and whether this anecdotal information provided any additional insights into the utility of music in this context. These combined features present a novel research approach.

The following chapter provides detail about the present research design, the sample and setting, the types of intervention, and data collection and analysis methods. Consideration is also given within this chapter to the ethical and practical issues associated with the study.

CHAPTER 3: METHODOLOGY

Introduction

The following chapter outlines the methods used to undertake this study. The research design is described, along with the sample and setting, the specific intervention types, data collection methods and instruments. Threats to internal and external validity are discussed and the steps taken to minimize these are described. The process of data analysis is discussed and the ethical issues relating to the study are addressed.

Conceptual model underpinning the research design

A number of conceptual frameworks have been developed to describe and classify the behavioural symptoms of dementia. These frameworks have been developed on the basis of nursing, medical or psychological concepts and include the Need-Driven Dementia-Compromised Behavior (NDB) model (Algase, Beck, Kolanowski, Whall, Berent, & Richards, 1996): the Antecedent-Behavior-Consequence model (ABC) (Smith & Buckwalter, 2005): the Habilitation Approach (Raia, 1999): and the Psychobehavioral Metaphor model (Tariot, 1999). Although these conceptual models have been developed to provide some guidance in the management of behavioral symptoms of dementia, each of them has some limitations (Volicer & Vongxaiburana, 2009). The conceptual model underpinning this study is Hall and Buckwalter's (1987) model of the Progressively Lowered Stress Threshold (PLST), which posits that an individual's threshold for tolerating stress progressively lowers as their cognitive function declines. This conceptual model has two main themes: firstly that all individuals, including those with dementia, will attempt to exercise a degree of control over their

personhood and their environment: and secondly, that all human behaviour has meaning including that for persons with dementia. However, because of their cognitive impairment, individuals with dementia may have great difficulty understanding and interpreting their environment and are therefore much more vulnerable to feelings of powerlessness, anxiety and fear. The PLST model postulates that stressors such as a change in environment or routine, fatigue or physical stressors such as pain may precipitate disruptive behaviour in the person with late-stage dementia. In addition, congruent with PLST theory, the agitated behaviour of the elderly person with dementia may be viewed as an attempt to communicate feelings and regain some control over their circumstances. Understanding this may help to explain why repetitive vocalizations, shouting out, and resistive behaviour are common features of middle and late stage dementia. Hall & Buckwalter suggest that such behaviour should be regarded as an expression of fear or anxiety and that all individuals have the basic right to be comfortable and free of fear.

Research design

Using Hall and Buckwalter's (1987) PLST model as a conceptual basis, this empirical study modified environmental conditions within participating aged care facilities through the introduction of gentle recorded background music, in an effort to minimise external stimuli that require understanding and interpretation. A mixed methods design was used for the study. A pretest-posttest (repeated measures), between groups, randomized, controlled design (Shuttleworth, 2008) was employed to determine the effectiveness of three different types of music in reducing agitated behaviour and improving perceived quality of life in persons with late-stage dementia.

In addition, structured interviews were undertaken with experienced care staff at each of the participating residential care facilities to determine whether the subjective opinions of experienced staff were supported by the data collected.

This particular experimental design was decided upon following the review of recent research literature which identified the need for further studies with a more rigorous scientific design (Lou, 2001; Sherratt et al., 2004; Vink et al., 2011; Wall and Duffy, 2010). There is broad agreement on the relative strength of a randomized, controlled trial (RCT) when compared with other types of research design (Chalmers, Smith (jnr.), Blackburn, Silverman, Schroeder, Reitman, and Ambroz, 1981). In addition, several meta-analytical reviews of the existing literature (Lou, 2001; Sherratt et al., 2004; Wall & Duffy, 2010; Vink et al., 2011) recommended that future studies have larger sample sizes, use a variety of musical styles and be conducted across multiple sites. The present study was designed with these recommendations in mind.

In this study, four experimental groups and a control group were compared to determine the comparative effectiveness of three different types of ambient music in reducing agitated behaviour in people with late-stage dementia residing permanently in residential care facilities. Three of the experimental groups received exposure to a particular type of music which the extant literature had identified as reducing anxiety and behavioural disturbance in the agitated elderly person with late-stage dementia. The fourth experimental group received a non-musical intervention consisting of exposure to audio recordings of popular storybook readings. This non-musical intervention was administered to control for possible confounding variables and to bring an additional level of scientific rigour to the study. If post-test data analysis revealed a measurable reduction in agitated behaviour

within this (non-music) experimental group, the presence of a confounding factor could be inferred.

In addition, to determine whether passive exposure to any of these interventions influenced the perceived quality of life of participants, proxy raters were asked to assess perceived quality of life using a modified version of the Quality of Life in Alzheimer's Disease (QoL-AD) tool developed by Logsdon (1999).

Instruments

Instruments used to collect the data included the Scale for the Observation of Agitation in Patients with Dementia (SOAP-D) (Hurley et al., 1999), the Quality of Life in Alzheimer's Disease (QOL-AD) tool (Logsdon, 1999) and the Standardised Mini-Mental State Examination (Folstein et al., 1975). Where required, permission was obtained to use these tools.

Scale for the Observation of Agitation in Persons with Dementia

Specific agitated behaviours were documented using the Scale for the Observation of Agitation in Persons with Dementia (SOAP-D) scale (Hurley et al., 1999). This seven item scale is a validated observational tool which objectively assesses both the magnitude and the duration of a clearly-defined set of agitated behaviours: these are scored on a 0 – 3 point scale (Appendix A). The tool was developed for use in clinical environments such as residential aged care facilities and has been designed to be completed by raters in approximately five minutes. In a study by Hurley et al., (1999) which was undertaken to assess the reliability and validity of the SOAP-D

scale, Cohen's kappa values ranged from 0.55 to 0.90, with a Chronbach's alpha coefficient of 0.70.

Quality of Life in Alzheimer's Disease (QoL-AD) tool

Perceived quality of life was measured using the Quality of Life in Alzheimer's Disease (QoL-AD) scale (Appendix B), a thirteen item tool developed by Logsdon (1999), where each item is rated on a four point scale, with 1 being poor and 4 being excellent. Available data suggests this instrument has good content validity and interrater reliability, with Cohen's kappa values >0.70 (Thorgrimsen et al., 2003). Internal consistency was also found to be good, with a Cronbach's alpha coefficient of 0.82 (Thorgrimsen et al., 2003). The QoL-AD scale can be utilized for people with mild, moderate and severe dementia (Thorgrimsen et al., 2003) and as an accurate measure of the quality of life of many people with dementia living in RACF's (Hoe et al., 2006). However, quality of life is a subjective construct and as individuals with late-stage dementia generally have a diminished capacity to provide reliable responses to specific questions about their own quality of life (Mozley, Huxley, & Sutcliffe, 1999), the QoL-AD form was completed by a nominated proxy who knew the participant well. Appropriate persons included spouses, close family members or senior members of staff from the participating care facilities.

The QoL-AD test was administered on day one of the observation cycle and was repeated on day seven, to determine whether any of the interventions made a measurable difference to the perceived quality of life of any of the participants.

Mini-Mental State Examination

The Mini Mental State Examination (Folstein et al., 1975) is a widely applied screening test for cognitive impairment in older adults and is also used frequently as a tool to evaluate patients' suitability for inclusion / exclusion in clinical trials (Molloy & Standish, 1997). The tool asks participants a series of questions testing several components of intellectual functioning such as memory, orientation, attention and calculation. A total score of 30 indicates that the participant has no cognitive impairment identifiable following administration of this instrument, although scores between 26 and 30 are considered to be within the normal range amongst the general population (Folstein et al., 1975). The tool has good reliability and construct validity (Mitrushina & Satz, 1991; Tombaugh and McIntyre, 1992).

Persons with scores ranging between 0 and 10 are regarded as having severe cognitive impairment (Folstein et al., 1975) and to be eligible for inclusion in this study, participants scored less than 10 on MMSE examination. The MMSE was administered to all participants prior to their inclusion in the study.

Outcome Measures

Quantitative measures were used to assess the magnitude and duration of a specific range of agitated behaviours over the one week intervention and observation period. The specific agitated behaviours were documented applying the SOAP-D scale (Hurley et al., 1999).

Quality of life data were also gathered to determine whether any of the interventions influenced perceived quality of life. As persons with late-stage

dementia are generally unable to reliably self-report their own quality of life (Mozley et al., 1999), close family members or experienced care staff at each of the facilities were asked to complete the QoL-AD tool (Logsdon, 1999) on behalf of the participants. These proxy raters completed the QoL-AD prior to and following the intervention period. The sum of all items was combined into a single score for each participant. Comparisons were then drawn between pre and post-intervention measures.

In addition to the behavioral and quality of life data, structured interviews were undertaken with experienced care staff at each of the participating residential care facilities to determine whether the subjective opinions of experienced staff were supported by the other data collected.

Sample and Setting

Study population

Participants for this study were drawn from a total of eight permanent care facilities in metropolitan Western Australia with predominantly European resident populations. Residential aged care facilities in Australia are subsidized by the Australian Federal Government. They must comply with required standards of care, these being monitored by Standards Monitoring Teams using Australian Accreditation Standards. Access to residential aged care facilities in Australia is regulated by the national Aged Care Assessment Program. Eligibility for admission is based upon an individual's need for assistance with a range of activities of daily living including mobility, bathing, dressing, toileting and feeding. Only those persons meeting the eligibility criteria for admission are able to access this type of care. As a consequence of the pre-admission eligibility requirements for access to residential aged care services, there exists a similarity in the

degree of functional impairment of all residents within and between facilities throughout Australia.

Each of the participating facilities provided a similar level of 24-hour care to its residents and was accredited with the Australian Federal Government Department of Health and Ageing. Efforts were made to ensure diversity with respect to age, gender and ethnicity: therefore non-English speaking and non-Caucasian participants were sought for inclusion in the study. However, as the research was undertaken at facilities where residents were of predominantly European background, no non-Caucasian people were identified as suitable for inclusion.

Care regimes in each of the facilities were similar and consisted of assistance with routine nursing care and activities of daily living together with the provision of basic therapy services and all meals as required under the Australian Accreditation Standards.

Inclusion criteria

As dementia is a feature of a large number of neurodegenerative diseases, the inclusion criteria for this study was limited to Alzheimer's Disease, one of the most common dementia sub-types. Alzheimer's Disease is classified by the World Health Organisation as an organic mental disorder and has been ascribed a specific diagnostic coding of F00 (World Health Organisation, 2003). To ensure that the selected participant population was as homogeneous as possible, the following eight inclusion criteria were applied rigorously:

- (i) Aged over 60 years
- (ii) Resident in the care facility for *at least* 1 month

- (iii) Mini Mental State Examination score below 10
- (iv) Formal medical diagnosis of Alzheimer-type dementia
- (v) No significant hearing impairment
- (vi) No co-existing formal psychiatric disorder (schizophrenia / paranoia etc.)
- (vii) No acute illness
- (viii) Regularly displaying agitated behaviour(s) as defined by the Scale for the Observation of Agitation in Persons with Dementia S.O.A.P.-D. (Hurley et al., 1999)

Phases of the Study

The research was undertaken at each of the participating facilities in the following thirteen-stage process. Figure 3 provides a visual representation of the steps in the data collection process.

- (i) **Initial meetings with senior staff.** The first phase of the study involved the principal researcher meeting with management staff at aged care facilities to discuss the project, to answer questions and to invite their organization to participate.
- (ii) **Identification of participants suitable for inclusion.** Once the management of an aged care facility had agreed for their organization to participate in the study, senior facility staff were provided with a copy of the selection criteria and were asked to identify residents who might be suitable for inclusion in the project.

- (iii) **Information letter to relatives / next of kin.** Once participants meeting the selection criteria had been identified, the principal researcher contacted their relatives / next of kin in writing, to provide information about the study and why it was being undertaken (Appendix E). The letter also advised them that their relative had been selected for possible inclusion in the study and that they would be contacted in the near future to discuss this.
- (iv) **Discussion with relatives / next of kin.** Relatives were then contacted by telephone to discuss the research project and to seek a written agreement for their relative to be included in the study.
- (v) **Consent.** Once family members had been given an opportunity to ask questions about the study and had provided verbal agreement, a formal letter of agreement was sent to them (Appendix F).
- (vi) **Confirmation of eligibility.** Once written agreement had been received from the relatives / next of kin, the principal researcher visited the aged care facility again to meet the selected residents and to confirm their eligibility for inclusion in the study. This process involved reading the notes held by the facility to verify that the resident met all of the eight inclusion criteria. The Standardised Mini-Mental State Examination (Folstein et al., 1975) was also administered at this stage.

- (vii) **Information letter for facility staff.** Prior to the intervention stage, care staff at each of the participating facilities, were provided with an information letter advising them that the study was being undertaken and the reason for it being conducted. To minimize the possibility of caregiver bias, care staff were not advised which residents had been selected for inclusion into the study and were requested to continue to deliver care to all residents in the usual manner (Appendix G).
- (viii) **Selection of close family members or senior facility staff to complete the Quality of Life (QoL-AD) questionnaire.** Once a participant's eligibility for inclusion in the study had been confirmed, the principal researcher sought to identify suitable close family members to assist with the completion of the quality of life questionnaire before and after the intervention phase. Where no close family members were available, senior facility staff were asked to complete this questionnaire.
- (ix) **Completion of initial (baseline) quality of life questionnaire with close family / senior staff member.** Prior to any intervention, the principal researcher completed the first of two QoL-AD questionnaires, using responses provided by the close family / senior staff member acting as a proxy for the participant. This provided "baseline" information for later comparison with a repeat (post-intervention) QoL-AD questionnaire.

- (x) **Intervention, observation and data collection.** During this stage, the specific audio intervention was implemented for participants in the four experimental groups. Participants were observed and behavioral data were collected. Participants in the control group were observed in the same manner and behavioral data were collected. However, no audio intervention was implemented for this group.
- (xi) **Repeat quality of life questionnaire.** On the final day of the intervention (day seven), the QoL-AD was repeated with the close family member / senior staff member acting as proxies. This allowed for pre and post-intervention responses to be compared.
- (xii) **Structured interviews with experienced care facility staff.** Following the intervention and data collection stage, structured interviews were undertaken with selected senior staff at each participating facility. These experienced care staff were routinely engaged in the provision of social and recreational activities to residents with advanced dementia who regularly displayed agitated behavior. The purpose of these structured interviews was to gather anecdotal information about the utility of music as an intervention to settle the maladaptive behavior of late-stage dementia and to determine whether these anecdotes are supported by the more rigorous scientific evidence collected. A copy of the staff consent to interview is attached as Appendix H.

- (xiii) **Data analysis and the reporting of findings.** The final stage of the study involved collating and analyzing all of the collected data. The Statistical Package for the Social Sciences (SPSS) v.18 was used to identify differences in behaviour between the five experimental groups and to determine pre and post-intervention differences in perceived quality of life scores. In addition, the information provided by experienced care staff during a series of individual structured interviews was analyzed to determine whether there were recurring themes which might provide additional insights into the circumstances in which music achieves its optimum benefit.

Participant recruitment

A non-probability, purposive sampling method was used to recruit participants. In this type of sample, individuals are purposively selected on the basis of particular features. It is this feature that makes them well suited to small-scale, in-depth studies (Ritchie, Lewis, & Elam, 2003). The principal researcher met with management representatives from each of the participating facilities to explain the purpose of the study. The nurse managers at each of the facilities were then provided with a copy of the inclusion criteria and were asked to identify potential participants. Prior to the inclusion of each participant, the principal researcher was given access to the progress notes held by each of the residential care facilities. These notes provided information about each participant's social background, their medical history, current medication regime, care needs and usual pattern of behavior. The purpose of this procedure was to confirm each participant's eligibility for enrolment in the study.

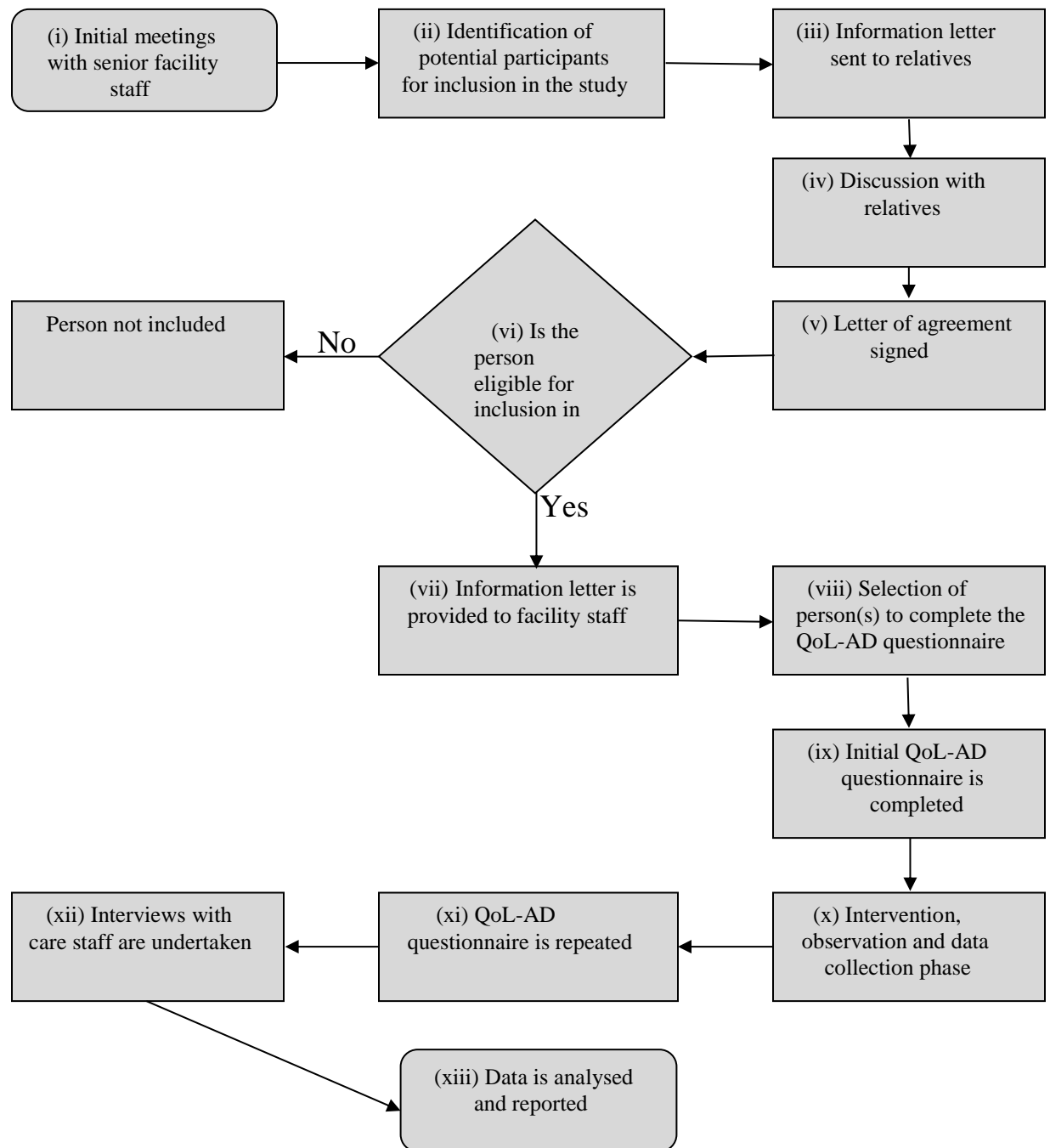


Figure 3. Process map outlining the 13 phases of the study

An M.M.S.E. was also undertaken by the principal researcher on each of the potential participants prior to their inclusion into the study. The MMSE is a well-established and easily administered assessment tool which asks participants a series of questions testing several components of

intellectual functioning such as memory, orientation, attention and calculation. A total score of 30 indicates that the participant has no cognitive impairment identifiable by application of this instrument, although scores between 26 and 30 are considered to be within the normal range amongst the general population. Participants with scores ranging between 0 and 10 are regarded as having severe cognitive impairment (Folstein et al., 1975).

Agreement of relatives / next of kin

Once participants had been selected for inclusion in the study, their next of kin or legal guardian was contacted by the principal investigator, providing them with written information about the research (Appendix E). As each of the selected participants had severe cognitive impairment which rendered them unable to provide informed consent, their legal next of kin / guardian was asked to sign an agreement on behalf of the participant (Appendix F). Only those participants whose next of kin / legal guardian signed the written agreement, were included in the study.

A total of sixty-six ($n=66$) elderly people with dementia met the eligibility criteria for inclusion in the study. Of these, the family / next of kin of 65 individuals agreed to their participation.

Sample size and statistical power calculations

The statistical power of a study is influenced by three factors: the sample size, the alpha level, and the effect size. For this study, sample size was determined *a priori*, using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). Each of the five groups was estimated as requiring 13 participants to

achieve 60% power for statistical analysis in order to conduct Chi-square testing with an effect size of 0.5 and an alpha level of 0.05.

Participant groupings

Selected participants were randomly assigned to one of five groups as described below (see Table 2). Four of the five groups (groups A(i), A(ii), A(iii) and B) received exposure to differing audio interventions as described below. A fifth group (group C) acted as the control for the study and received no intervention.

Table 2:

Participant groupings

Participant Group		Intervention type
Group A (i)	n =13	Baroque music
Group A (ii)	n =13	Gentle classical music
Group A (iii)	n =13	Familiar music
Group B	n =13	Storybook recordings
Group C	n =13	No intervention (control group)

Randomization

Once the agreement of family / next of kin had been obtained, each of the selected participants was randomly assigned to one of the five groups described above (see Table 2). Prior to enrolling participants into the study,

single sheets of paper were individually marked to indicate allocation to either one of the four experimental groups or the control group. These sheets were then placed inside numbered opaque envelopes and sealed. Participants accepted into the study were allocated a unique number and subsequently assigned to a particular group in accordance with the contents of their corresponding sealed envelope.

Threats to internal validity

Internal validity reflects the extent to which a causal relationship between two variables can be properly demonstrated (Brewer, 2000). The scientific rigour of a study is largely determined by the extent to which it minimizes systematic error (or 'bias'). The experimental design selected for this study controls for many of the threats to internal validity described by Campbell and Stanley (1963) and by Cook and Campbell (1979). The manner in which this design controls for these threats include the following:

- Maturation. This can be described as the changes which may occur within subjects as a result of the passage of time. The study design controls for this threat to internal validity as changes which occur as a function of time are distributed equally between the experimental and control groups.
- Instrumentation. This may be described as changes to the tool(s) being used to collect data or changes to the rater(s) during the course of the experiment. This study controls for this threat to internal validity by using a single observer throughout the duration of the study and by using the same tools throughout the data collection period.

- Statistical regression. An additional threat to internal validity is created when subjects are selected for inclusion in a study based on their extreme behavioural characteristics. This experimental design controls for this threat by randomly assigning participants from the same pool to an experimental or control group regardless of the extremity of their behaviour.
- Selection. This may be described as the bias which results from purposive selection of comparison groups. This threat to internal validity is controlled by randomization.

Threats to external validity

External validity refers to the extent to which the results of a study can be generalized to other situations and to other people (Aronson, Wilson, Akert, & Fehr, 2007). The manner in which this study controlled for these threats include the following:

- Multiple treatments effect. This threat to external validity occurs as a result of an intervention, on the results of subsequent interventions. Observed changes in the dependent variable, in this study, agitated behaviour, may be confounded by prior interventions, rather than being a function of the independent variable. This threat was controlled for by each participant being exposed to only one intervention. In addition, prior to the commencement of any observations or the introduction of any audio intervention, a two-day pre-intervention “washout” phase was undertaken to minimise the possibility that participants had been influenced by any previous intervention.

- Reactive or situational effects (Hawthorn effect). This effect results when experimental subjects respond differently because they know they are being studied. This threat to external validity is controlled for by the selected participants having a profound level of cognitive impairment and as a consequence, being unaware that they were part of a research project.
- Sample bias. This threat occurs when the characteristics of study participants do not accurately represent those characteristics in the population. Various forms of sample bias are based on such factors as gender, race, age, culture. Although a non-probability, purposive sampling method was used to recruit participants, the target population for the study was clearly defined and the sample population matched it as closely as possible. In addition, the research was undertaken at multiple centres and at different times.

Pre-intervention “washout” phase

Observed changes in the dependent variable may be confounded by prior or multiple interventions, rather than being a function of the independent variable. In such cases, the external validity of a study can be threatened. To minimise this, all participants were given a two day “washout” period prior to the commencement of any observations. During this period, staff were instructed not to play any audio material within the facility.

Intervention method

For each participant, the observation and data collection phase of the study was undertaken over a period of seven days commencing immediately after the two day “washout” phase. Each participant was observed daily from day one of the study until day seven, for a period of five minutes, in accordance with the guidelines for the administration of the SOAP-D, between 4.30p.m. and 5p.m. The rationale for selecting this particular time is that agitated behaviour in dementia is frequently at its most extreme during the late afternoon / early evening period (Volicer, Harper, Manning, Goldstein, & Satlin, 2001; Van Someren, 2000; Myers & Badia, 2000).

During days one and two of the study, no audio intervention occurred. However, participants were observed and observational data were recorded. This “baseline” data enabled comparisons to be made between a participant’s behaviour prior to and following each of the interventions.

Commencing on day three of the study and continuing until day seven, each of the participants in the four experimental groups (A(i), A(ii), A(iii) and B) was exposed to their specific audio intervention between the hours of 3p.m. and 5p.m. each day. Participants in the control group (C) received no intervention. Although each of the audio interventions commenced daily at 3.00p.m. and continued until 5p.m., observation and data recording did not commence until 4.30p.m. This allowed some time for the participants to adjust to the modified environmental conditions.

The audio source was situated close to the observer. Once the initial volume settings had been made at the commencement of the project, the volume remained constant. The importance of this was emphasised with the staff at each of the facilities prior to the commencement of the project. With the exception of the audio interventions, the usual environmental conditions

remained unchanged throughout the study and all participants received their usual care. Data collection activities did not interfere with the usual routine at the facilities.

The research was conducted systematically at each of the selected residential care facilities and data related to both behaviour and perceived quality of life were gathered. With the exception of the various audio interventions, the usual routine and environmental conditions within the facilities remained unchanged at all times during the intervention. Pre and post-intervention differences in observed agitation and quality of life were compared between the five groups. A summary of the participant groupings and their respective interventions is provided in Table 3.

Observation of participants and the collecting of behavioural data

The SOAP-D scale (Hurley et al., 1999) was used to observe and record each participant's behaviour during this phase of the study. Throughout the data collection phase, each participant was observed for a five minute period between 4.30p.m. and 5.00p.m. daily for the seven days of the intervention. Data relating to both the duration and the frequency of specific behaviours were recorded at each observation using the SOAP-D scale.

Following the two day pre-intervention “washout” period, the seven day period of observation and data recording commenced. Throughout the first two days of the seven day observation and data recording cycle, no music and no storybook recordings of any form were played (see Table 3). However, during this time behaviour was observed and recorded to provide “baseline” data for comparison with behaviours during the following five days. The specific behaviours that were observed for included repetitive

vocalisations, shouting, screaming, wandering and acts of striking. A full list of these behaviours is detailed in Appendix A.

Table 3:

Summary of interventions

Day of study	Data collected	Group A(i) Baroque music	Group A(ii) Gentle classical music	Group A(iii) Familiar music	Group B Audio recordings of storybooks	Group C No intervention
1	SOAP-D & QoL-AD	No intervention	No intervention	No intervention	No intervention	No intervention
2	SOAP-D	No intervention	No intervention	No intervention	No intervention	No intervention
3	SOAP-D	Music intervention occurs	Music intervention occurs	Music intervention occurs	Audio intervention occurs	No intervention
4	SOAP-D	Music intervention occurs	Music intervention occurs	Music intervention occurs	Audio intervention occurs	No intervention
5	SOAP-D	Music intervention occurs	Music intervention occurs	Music intervention occurs	Audio intervention occurs	No intervention
6	SOAP-D	Music intervention occurs	Music intervention occurs	Music intervention occurs	Audio intervention occurs	No intervention
7	SOAP-D & QoL-AD	Music intervention occurs	Music intervention occurs	Music intervention occurs	Audio intervention occurs	No intervention

Abbreviations used;

SOAP-D: Scale for the Observation of Agitation in Persons with Dementia (Hurley et al., 1999).

QoL-AD: Quality of Life in Alzheimer's Disease scale (Logsdon, 1999).

During the final five days of intervention, participants in the three music groups were exposed to two hours of ambient music as follows: group

A(i), baroque music: group A(ii), gentle classical music: and group A(iii), familiar music, between 3.00p.m. and 5.p.m. each day. Participants in group B were exposed to two hours of spoken audio recordings of popular novels during the same time period. Participants in the control group C received no intervention. All groups received their usual routine of care. Although the audio interventions commenced at 3.00p.m., observations and data recording did not commence until 4.30p.m. This allowed some time for each of the residents to adjust to the environmental change. The music and storybook recordings were played at an easily audible, but not excessive volume.

Collection of data related to quality of life

Self-report questionnaires are being used increasingly as a tool to measure health-related quality of life (HRQoL) in clinical research (Sneeuw, Aaronson, Osoba, Muller, Hsu, Yung, Brada, & Newlands, 1997). However, the collection of reliable subjective data regarding quality of life presents difficulties when subjects have a significant degree of cognitive loss and an impaired capacity to make judgements. The use of proxies is commonly employed in such circumstances (Logsdon et al., 2002). Research suggests the importance of considering HRQoL in dementia cannot be overstated (Ready, Ott, Grace, & Fernandez, 2002) and that the view point of the proxy rater is important (Bryan, Hardyman, Bentham, & Laight, 2005).

In the present study, data related to quality of life were collected by asking proxy raters to complete the QoL-AD questionnaire (Logsdon, 1999) on day one of the observation cycle and again on day seven. Comparisons could then be drawn between QoL scores before and after the planned interventions. Logsdon et al. (2002), concluded that persons with a mini-mental state examination (MMSE) score of less than 10 are usually unable to

complete the QoL-AD. All participants selected for inclusion in this study had MMSE scores of less than 10, and therefore an appropriate proxy rater was required. This person was either a close family member or, where a suitable family member was not available, a senior staff member at each of the facilities. However, it was important for the identified proxy to know the participant well. Prior to completing the QoL-AD tool, each nominated proxy was interviewed to ensure that they understood how to complete the questionnaire correctly and to confirm they knew the participant well. Proxies generally took between five to ten minutes to complete the questionnaire on each occasion.

Interviews with care staff

Structured interviews were undertaken with experienced care providers at each of the participating residential aged care facilities. The purpose of this was to determine whether the subjective opinions and anecdotes of staff regarding the utility of music as an intervention to settle the agitation of late-stage dementia and improve quality of life, were consistent with the observational data collected using the SOAP-D scale and the proxy-rated QoL-AD scale. Although anecdotes may be regarded as a weak form of evidence (Bearden, 2013), they are often the most compelling (Novella, 2012) and may provide additional insights into the circumstances in which music achieves its optimum benefit. Experienced care staff routinely engaged in the provision of social and recreational activities to residents, were questioned specifically about their experiences capitalizing on music as a therapeutic intervention in the context of late-stage dementia. The specific questions are outlined in Appendix I.

Interviews were recorded digitally and subsequently transcribed using a denaturalised transcription method (Mero-Jaffe, 2011) which removed breaks in speech, laughter, mumbling, involuntary sounds and gestures. At interview, the same series of questions was asked of each interviewee, in the same sequence. The researcher maintained an engaging and professional communication style throughout each of the interviews by employing an active listening style (Kvale, 1996). Active listening encourages the participant to talk and ascribe meaning (Kvale, 1996; Silverman, 2006; Wengraf, 2001).

Interviews were digitally recorded and subsequently transcribed to enable the data to be managed and organized, since only written language can be managed, copied, examined, evaluated and quoted (Lapadat, 2000). Responses were collated and reviewed for recurring themes.

Data collection

The collection of data was undertaken between May 2010 and November 2011 at a total of eight residential aged care facilities in urban Western Australia. During the week prior to the commencement of data collection, staff members at each of the participating facilities were sent a brief introductory letter outlining the duration and purpose of the study (Appendix G).

As all observation and data collection was undertaken by a single researcher, it was not possible for more than one participant to be observed at the same time. Therefore each participant was observed for a period of five minutes (in accordance with the guidelines for administration of the SOAP-D), after which time the observer moved on to observe another participant. As a result of this, no more than six participants could be

observed during any 30-minute observation period (4.30p.m.–5p.m.) on each day.

All data relating to observed behavior was collected by the principal researcher, thereby avoiding the threat to internal validity created by multiple raters and instrumentation. To minimise the possible influence of social and inter-personal factors, the data collector remained at a discreet distance from participants during the study (≥ 10 metres), which also ensured that each resident's dignity was respected during this procedure.

Blinding

Steps were taken to minimize the possibility of the so-called “Hawthorn Effect”. This reactive phenomenon occurs when subjects modify or improve an aspect or aspects of their behavior simply as a consequence of knowing they are being observed and not in response to an independent variable. The possibility of a Hawthorn Effect was considered unlikely, as participants all had profound cognitive loss and were unaware they were the subject of an observational study. However, to minimize the possibility of caregiver bias, care staff were not advised which residents had been selected for inclusion into the study and were requested to continue to deliver care to all residents in the usual manner. Although care staff were aware of the presence of the data collector, they were not aware which participants were being observed as all observations were undertaken in a communal area, commonly referred to as a “day room” where residents gather during daylight hours. To minimize the possibility of observer bias, a validated observational tool, the SOAP-D scale (Hurley et al., 1999) was used for consistent collection of all behavioural data.

Management of Data

Each participant was assigned a unique identification number which was used on all data collection forms. These numbers were linked to a master list of participant's names kept securely and separately from the data. All data were collected by the principal researcher and stored securely in a locked drawer.

Data analysis

Observational data related to agitated behaviour

At the completion of the observations, the data collected using the SOAP-D (Hurley et al., 1999) were collated and entered into the Statistical Package for the Social Sciences (S.P.S.S.) v.18. The sample characteristics of all five groups were analysed to determine between-groups comparability, all data being initially screened to test for assumptions of normal distribution using Kolmogorov-Smirnov and Shapiro-Wilks. Both the duration and the intensity of the seven different types of behaviour described in Appendix A were measured over a period of one week for each participant. Data outputs were examined for normality and homogeneity of variance and for patterns and trends.

Using a linear, mixed effects model, two Kruskal-Wallis ANOVAs were conducted to determine whether significant median differences were present with regard to either duration or intensity on the basis of respondent group. Following this, a series of chi-square analyses were conducted to determine further whether any significant differences in these measures were present based on respondent group.

Quality of life data

The pre and post-intervention Quality of Life responses provided by nominated proxies using the QoL-AD questionnaire (Logsdon, 1999), were assigned numeric values and entered into the Statistical Package for the Social Sciences (S.P.S.S.) v.18. Proxies were required to select from one of four responses to a series of questions regarding perceived quality of life. These responses were; “Poor”, (value of “0”), Fair” (value of “1”), “Good” (value of “2”) and “Excellent (value of “3”). Therefore, higher mean scores were indicative of perceptions of better quality of life. Data outputs were examined for normality and homogeneity of variance and for patterns and trends. The mean scores of two scales (pre-intervention and post-intervention) were analysed using a mixed-design ANOVA with a within-subjects factor of time, that is before and after intervention, and a between-subject factor of participant group, namely: A(i), Baroque music: A(ii), gentle classical music: A(iii), familiar music: B, audio storybook recordings: and C, control.

Interviews with care staff

All the structured interviews were recorded in a digital format and subsequently transcribed to facilitate the management and organization of data. They and their subsequent transcriptions were undertaken by the researcher. The transcription process in data analysis has been described as central in qualitative research (Lapadat, 2000; Oliver, Serovich, & Mason, 2005). Interviews were transcribed using a denaturalised transcription method (Mero-Jaffe, 2011) which removed breaks in speech, laughter, mumbling, involuntary sounds and gestures. Content analysis was used to

identify recurring themes within the denaturalised transcripts. Burns and Grove (2009, p. 528) describe the process of content analysis as the division of text into “units of meaning”, that is, idea categories, which are then quantified according to specific rules.

Ethical considerations

This study was approved by the Human Research Ethics Committee of Edith Cowan University, Western Australia (ethics approval no. 4054). Prior to the commencement of any data collection, an information letter (Appendix E) was sent to the documented next of kin of persons considered to be eligible for inclusion in the study. This letter provided general information about the nature and purpose of the study and advised them that their relative had been selected for inclusion.

Because of the nature of their illness, persons considered suitable for inclusion in the study were unable to provide their informed consent to participate. The person’s legal next of kin was therefore requested to sign an agreement (Appendix F) which granted approval for their relative to participate in the study. In cases where there was a legally appointed guardian, or person with an enduring power of attorney, this was the person from whom the approval was requested.

The proprietors of the care facilities involved in the study were advised about all ethical issues and were also asked to agree for the researcher to obtain relevant medical, nursing and social information about each of the participants, from the clinical management notes held by each of the facilities. To ensure that the privacy and dignity of each participant in the study was respected, participants were not observed, nor data about them recorded, if they were involved in any activity or procedure requiring

privacy, for example, toileting, showering, etc., at the time when data about them would normally have been recorded. In such instances, the resident was observed and data recorded as soon as their need for privacy was over. Any change to observation and data collection times was documented. The data collector exercised discretion when observing and collecting data by remaining a discreet distance from the participants during the study (≥ 10 metres).

Participants' names and any identifying information remained confidential. Data were collected using code numbers which were linked to a master list of participant's names kept securely and separately from the data. In accordance with National Health and Medical Research guidelines, the data will be retained securely for five years from the date of publication, after which time they will be destroyed. Although passive exposure to the interventions outlined in this dissertation would seem to be innocuous, any participant who appeared to find any of the interventions unpleasant was to be withdrawn from the study immediately. However, in this instance the situation did not occur. Prior to the commencement of data collection at each site, an information session was held with all involved care staff to ensure they understood the nature, purpose and duration of the study.

Summary

This chapter described the study of the relative benefits of three different types of ambient music which the extant research literature suggests may have therapeutic usefulness in settling the maladaptive behavior seen frequently amongst people with late-stage dementia living permanently in residential care facilities. The research design, sample and setting were discussed and an overview of each of the interventions was

presented. The data collection instruments, data management and data analysis methods were described and ethical issues were discussed. The following chapter describes the findings of the study.

CHAPTER 4: RESULTS

Introduction

In this chapter, an analysis of the data is presented. Sample characteristics are described and group comparability is examined for homogeneity of variance between groups. Behavioral and quality of life findings are reported based on data collected from 65 participants with late-stage Alzheimer's Disease, recruited into the study to determine the relative utility of three different types of ambient music in reducing agitated behavior and improving perceived quality of life. In addition, the major themes emerging from structured interviews with experienced care staff are discussed. Results are presented in three sections: firstly the observed effects of the interventions on agitated behavior are summarized: secondly, the data related to perceived quality of life is presented: and thirdly, common themes emerging from the structured interviews are discussed.

Sample characteristics

Across the eight sites involved in the present study, the average number of residents within each facility was 88.85 (SD: 15.61, range: 66 to 120). The participant sample of 65 comprised of 39 females and 26 males, with a mean age of 79.86 years (SD: 4.86, range: 70 to 94). Thirty-nine residents (60%) were widowed, with the remaining twenty-six (40%) married, although living apart permanently from their spouse. All had a formal medical diagnosis of Alzheimer's Disease. Forty-four (67.69%) of the participants were born in Australia with the remaining twenty-one (32.30%) being born in either Europe ($n=19$, 29.23%) or New Zealand ($n=2$, 3.07%). The majority of participants ($n=63$, 96.92%) spoke English as

a first language, with the remaining two participants (3.07%) speaking Italian and Dutch respectively as their first language. However, both of these participants had a good understanding of English, having been resident in Australia for many years.

When discussing the past musical preferences of participants with their family or next of kin, 28 (43.07%) were identified as having had a strong interest in music, while music was thought to have been moderately important to 30 of them (46.15%). The remaining 7 participants (10.79%) were identified by family or next of kin as having had no real interest in music. The demographic characteristics of each of the five participant groups of the research cohort are listed below (see Table 4).

Table 4:
Demographic characteristics of participants (n=65).
Group means are displayed with standard deviations in parentheses.

<i>Variable</i>	<i>Participant groupings</i>				
	<i>A(i)</i> <i>Baroque Music</i>	<i>A(ii)</i> <i>Gentle classical music</i>	<i>A(iii)</i> <i>Familiar music</i>	<i>B</i> <i>Storybook recordings</i>	<i>C</i> <i>Control</i>
Age	85.92 (6.06)	81.15 (2.54)	83.00 (3.05)	85.30(4.87)	81.61 (5.54)
Gender					
Male	5	7	3	4	6
Female	8	6	10	9	7
Length of time in facility (months)	19.38 (9.90)	17.84 (9.51)	20.15 (8.17)	19.61 (9.02)	20.61 (9.90)
Marital status					
Married	5	6	5	6	4
Widowed	8	7	8	7	9
Previous musical interest					
Strong interest	6	5	5	6	6
Moderate interest	6	7	6	5	6
No musical interest	1	1	2	2	1

Comparability between the five participant groupings

Prior to data analysis, the demographic characteristics of the total cohort were examined to ensure that categorical data such as gender, age, length of time in the care facility, previous interest in music and marital status were normally distributed. As the purpose of the study was to compare five groups which differed only with respect to the independent variable, music or storybooks, it was important to ensure that all participants in the study group were similar with respect to these important baseline characteristics. Although Green (1982, p.189) contends “because of randomization, it is not actually required to establish comparability of treatment groups”, Altman (1985, p.126) provides a contrary view, “it is generally felt desirable to establish the comparability of randomized groups and to adjust for imbalance where necessary”. However, examination of the data using Shapiro-Wilk testing revealed the data to be normally distributed approximately.

Analysis of behavioral outcome variables

Findings are based on data obtained from five minute observations of all participants, namely 455 periods (65 participants x 7 days) during which the presence or absence of a defined set of seven maladaptive behaviors was documented using the SOAP-D scale (Hurley et al., 1999). Both the duration and the intensity of each type of behaviour were measured. Thus the total number of data entry points for each participant was 98, comprising 7 days x 7 behaviour types x duration x intensity. The final number of data entry points for the 65 participants, each of whom was measured 98 times, was 6370. Approximately 90% of possible observable behaviours able to be coded (5756 / 6370) were coded as “0 = not present”. This important observation highlights the inherent difficulty

of attempting to capture fluctuating behaviour profiles within a five-minute data collection window.

Initially, two Kruskal-Wallis ANOVAs ($p = 0.05$) were conducted in order to determine whether significant median differences were present between any of the five participant groups with regard to either the duration or the intensity of agitated behaviour as defined by the SOAP-D. The descriptive statistics regarding the overall duration and intensity of observed agitated behaviour for each of the five participant groups on the basis of scores obtained from the SOAP-D are summarized below (see Table 5). While differences were only moderate in size, higher mean scores were found within the control group with respect to both the duration as well as the intensity of agitated behaviour. However, these differences were not statistically significant with respect to duration, ($K = 6.069$, $df = 4$, $p = .194$), or intensity, ($K = 6.341$, $df = 4$, $p = .175$).

Table 5:

Descriptive Statistics:

Duration and Intensity of agitated behaviour by group

<i>Group</i>	<i>Statistic</i>	<i>Duration Score</i>	<i>Intensity Score</i>
A (i) Baroque music	Mean	.16	.22
	Median	.00	.00
	N	637	637
A (ii) Gentle classical Music	Mean	.14	.23
	Median	.00	.00
	N	637	637
A (iii) Familiar music	Mean	.14	.23
	Median	.00	.00
	N	637	637
B Storybook recordings	Mean	.18	.31
	Median	.00	.00
	N	637	637
C Control group	Mean	.21	.32
	Median	.00	.00
	N	637	637
Total	Mean	.17	.26
	Median	.00	.00
	N	3185	3185

Key to calculating scores for the duration of agitated behaviour using the SOAP-D scale

Agitated behaviour not present during the observation period was scored “0”

Agitated behaviour present for a short duration (<16seconds) was scored “1”

Agitated behaviour present for a medium duration (>16 seconds, but < 2½ minutes) was scored “2”

Agitated behaviour present for a long duration (>2½ minutes) was scored “3”

Key to calculating scores for intensity of agitated behaviour using the SOAP-D scale

Agitated behaviour not present during the observation period was scored “0”

Agitated behaviour considered by the rater to be mild in intensity was scored “1”

Agitated behaviour considered by the rater to be moderate in intensity was scored “2”

Agitated behaviour considered by the rater to be extreme in intensity was scored “3”

Duration of agitated behaviour

A series of chi-square analyses was also conducted in order to determine whether any significant differences in the *duration* of agitated

behaviour were present based on the participant group. Table 6 below summarizes a cross tabulation table constructed from the data which focuses upon the *duration* of agitated behaviour within and between each of the five participant groups. Results indicate *small non-significant variations in percentages between the groups*, with the storybook group and the control group being found to have higher total durations of agitated behavior, than each of the music intervention groups.

Table 6:

Cross Tabulation Table: Duration and participant Group

		<i>Duration</i>				<i>Total</i>
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	
<i>Group A (i)</i>	Count	588	14	14	21	637
Baroque music	% within Group	92.3%	2.2%	2.2%	3.3%	100.0%
	% of Total	18.5%	0.4%	0.4%	0.7%	20.0%
<i>Group A (ii)</i>	Count	585	30	13	9	637
Gentle classical music	% within Group	91.2%	5.1%	2.2%	1.5%	100.0%
	% of Total	16.9%	0.9%	0.4%	0.3%	18.5%
<i>Group A (iii)</i>	Count	578	34	20	5	637
Familiar music	% within Group	90.7%	5.3%	3.1%	0.9%	100.0%
	% of Total	18.1%	1.1%	0.6%	0.2%	20.0%
<i>Group B</i>	Count	567	31	29	10	637
Storybook recordings	% within Group	89.0%	4.9%	4.6%	1.6%	100.0%
	% of Total	17.8%	1.0%	0.9%	0.3%	20.0%
<i>Group C</i>	Count	577	19	26	15	637
Control	% within Group	88.9%	3.6%	4.5%	2.9%	100.0%
	% of Total	19.2%	0.8%	1.0%	0.6%	21.5%
Total	Count	2895	128	102	60	3185
	% within Group	90.4%	4.2%	3.4%	2.0%	100.0%
	% of Total	90.4%	4.2%	3.4%	2.0%	100.0%

Key to calculating scores for the duration of agitated behavior using the SOAP-D scale

Agitated behaviour not present during the observation period was scored “0”

Agitated behaviour present for a short duration (<16seconds) was scored “1”

Agitated behaviour present for a medium duration (>16 seconds, but < 2½ minutes) was scored “2”

Agitated behaviour present for a long duration (>2½ minutes) was scored “3”

Intensity of agitated behaviour

A further series of chi-square analyses was then conducted focusing upon the *intensity* of agitated behaviour within each of the five participant groups. Table 7 presents a cross tabulation of the association between the *intensity* of agitated behaviour and each of the five participant groups.

These results indicate *only slight differences in the intensity of agitated behaviour* on the basis of group membership, although behaviours of high intensity (coded as “3”) occurred more frequently in the control group and the storybook group, when compared with each of the three music intervention groups.

Table 7:

Cross Tabulation Table: Intensity and participant group

		<i>Intensity</i>				<i>Total</i>
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	
<i>Group A (i)</i>	Count	588	3	1	45	637
Baroque music	% within Group	92.3%	0.5%	0.2%	7.0%	100.0%
	% of Total	18.5%	0.1%	0.0%	1.4%	20.0%
<i>Group A (ii)</i>	Count	567	18	0	52	637
Gentle classical music	% within Group	91.2%	1.7%	0.0%	7.1%	100.0%
	% of Total	16.9%	0.3%	0.0%	1.3%	18.5%
<i>Group A (iii)</i>	Count	578	12	7	40	637
Familiar music	% within Group	90.9%	1.7%	1.1%	6.3%	100.0%
	% of Total	18.1%	0.3%	0.2%	1.3%	19.9%
<i>Group B</i>	Count	567	3	5	62	637
Storybook Recordings	% within Group	89.0%	0.5%	0.8%	9.7%	100.0%
	% of Total	17.8%	0.1%	0.2%	1.9%	20.0%
<i>Group C</i>	Count	561	0	9	67	637
Control	% within Group	88.9%	0.0%	1.2%	9.9%	100.0%
	% of Total	19.2%	0.0%	0.3%	2.1%	21.5%
Total	Count	2861	36	22	266	3185
	% within Group	90.4%	0.8%	0.7%	8.1%	100.0%
	% of Total	90.4%	0.8%	0.7%	8.1%	100.0%

Key to calculating scores for intensity of agitated behavior using the SOAP-D scale

Agitated behavior not present during the observation period was scored “0”

Agitated behavior considered by the rater to be mild in intensity was scored “1”

Agitated behavior considered by the rater to be moderate in intensity was scored “2”

Agitated behavior considered by the rater to be extreme in intensity was scored “3”

Comparisons between each experimental group and the control group

In order to explore the associations between duration, intensity, and participant group in further detail, a series of pair-wise comparisons was undertaken using chi-square analyses, each focusing upon the comparison between a specific experimental group and the control group.

Comparison between experimental group A (i) and the control group C

The first two chi-square analyses focused specifically upon the pair-wise comparison between experimental group A(i), the baroque music intervention group, and group C, the control group, concerning the duration and intensity of agitated behaviours respectively (see Tables 8 & 9). Findings indicated *significant differences between the two groups for both duration*, $\chi^2(3) = 8.150, p = .043$, *and intensity*, $\chi^2(3) = 11.731, p = .008$. Thus, these analyses indicate significantly higher duration and intensity scores in the control group C compared with the experimental group A(i).

Table 8:

Cross Tabulation Table: Duration of agitated behaviour within group A(i) and group C

<i>Group</i>		<i>Duration</i>				<i>Total</i>
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	
A (i) Baroque music	Count	588	14	14	21	637
	% within Group	92.3%	2.2%	2.2%	3.3%	100.0%
	% of Total	44.4%	1.1%	1.1%	1.6%	48.1%
C Control	Count	571	21	27	18	637
	% within Group	88.9%	3.6%	4.5%	2.9%	100.0%
	% of Total	46.1%	1.9%	2.3%	1.5%	51.9%
Total	Count	1159	35	41	39	1274
	% within Group	90.6%	2.9%	3.4%	3.1%	100.0%
	% of Total	90.6%	2.9%	3.4%	3.1%	100.0%

Table 9:

Cross Tabulation Table: Intensity of agitated behaviour within group A(i) and group C

<i>Group</i>		<i>Intensity</i>				<i>Total</i>
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	
A (i) Baroque music	Count	588	3	1	45	637
	% within Group	92.3%	.5%	.2%	7.1%	100.0%
	% of Total	44.4%	.2%	.1%	3.4%	48.1%
C Control	Count	562	0	8	67	637
	% within Group	88.9%	0.0%	1.2%	9.9%	100.0%
	% of Total	46.1%	0.0%	.6%	5.1%	51.9%
Total	Count	1150	3	9	112	1274
	% within Group	90.6%	.2%	.7%	8.5%	100.0%
	% of Total	90.6%	.2%	.7%	8.5%	100.0%

Comparison between experimental group A (ii) and the control Group C

The following two chi-square analyses focused upon a pair-wise comparison between experimental group A(ii), the gentle classical music

intervention group, and the control group C regarding the duration and intensity of agitated behaviour respectively (see Tables 10 & 11). Findings indicated *significant differences between groups on duration*, $\chi^2(3) = 9.311, p = .025$, *as well as on intensity*, $\chi^2(3) = 21.537, p < .001$, indicating significantly higher duration and intensity within the control group C when compared with the experimental group A(ii).

Table 10:

Cross Tabulation Table: Duration of agitated behaviour within group A(ii) and group C

Group		Duration				Total
		0	1	2	3	
A (ii) Gentle classical music	Count	579	32	17	9	637
	% within Group	91.2%	5.1%	2.2%	1.5%	100.0%
	% of Total	42.1%	2.4%	1.0%	.7%	46.2%
C Control	Count	561	25	31	20	637
	% within Group	88.9%	3.6%	4.5%	2.9%	100.0%
	% of Total	47.8%	2.0%	2.4%	1.6%	53.8%
Total	Count	1140	57	48	29	1274
	% within Group	90.0%	4.3%	3.5%	2.3%	100.0%
	% of Total	90.0%	4.3%	3.5%	2.3%	100.0%

Table 11:

Cross Tabulation Table: Intensity of agitated behaviour within group A(ii) and group C

Group		Intensity				Total
		0	1	2	3	
A (ii) Gentle classical music	Count	571	11	0	55	637
	% within Group	91.2 %	1.7%	0.0%	7.1%	100.0%
	% of Total	42.1%	.8%	0.0%	3.3%	46.2%
C Control	Count	556	0	9	72	637
	% within Group	88.9%	0.0%	1.2%	9.9%	100.0%
	% of Total	47.8%	0.0%	.6%	5.3	53.8%
Total	Count	1127	11	9	127	1274
	% within Group	90.0%	.8%	.6%	8.6%	100.0%
	% of Total	90.0%	.8%	.6%	8.6%	100.0%

Comparison between experimental group A (iii) and the control Group C

Next, further chi-square analyses were conducted focusing upon a pair-wise comparison between experimental group A(iii), the familiar music intervention group, and control group C with regard to the duration and intensity of agitated behaviours respectively (see Tables 12 & 13). *Statistical significance was again indicated in the analysis conducted on duration, $\chi^2(3) = 11.789, p = .008$, as well as the analysis conducted on intensity, $\chi^2(3) = 17.300, p = .001$. In both cases, greater duration as well as greater intensity were indicated in control group C as compared with the experimental group A(iii).*

Table 12:

Cross Tabulation Table: Duration of agitated behaviour within group A(iii) and group C

Group		Duration				
		0	1	2	3	Total
A(iii) Familiar music	Count	578	34	20	5	637
	% within Group	90.7%	5.3%	3.1%	.8%	100.0%
	% of Total	43.6%	2.6%	1.5%	.4%	48.1%
C Control	Count	563	24	31	19	637
	% within Group	88.9%	3.6%	4.5%	2.9%	100.0%
	% of Total	46.1%	1.9%	2.3%	1.5%	51.9%
Total	Count	1141	58	51	24	1274
	% within Group	89.8%	4.5%	3.9%	1.9%	100.0%
	% of Total	89.8%	4.5%	3.9%	1.9%	100.0%

Table 13:

Cross Tabulation Table: Intensity of agitated behaviour within group A(iii) and group C

Group		Intensity				Total
		0	1	2	3	
A (iii) Familiar music	Count	578	11	7	41	637
	% within Group	90.9%	1.7%	1.1	6.3%	100.0%
	% of Total	43.7%	.8%	.5%	3.0%	48.1%
C Control	Count	569	0.0%	8	60	637
	% within Group	88.9%	0.0%	1.2%	9.9%	100.0%
	% of Total	46.2%	0.0%	.6%	5.1%	51.9%
Total	Count	1147	11	15	101	1274
	% within Group	89.9%	.8%	1.1%	8.2%	100.0%
	% of Total	89.9%	.8%	1.1%	8.2%	100.0%

Comparison between experimental group B and the control group C

Finally, two additional chi-square analyses were calculated in order to compare experimental group B, the storybook recordings intervention group with control group C. *Statistical significance was not indicated in the analysis conducted on duration, $\chi^2(3) = 3.804, p = .283$, or in the analysis conducted on intensity, $\chi^2(3) = 3.730, p = .292$.* These results indicate no significant differences in either duration or intensity of agitation when comparing experimental group B with control group C.

Summary of comparisons between experimental groups and the control group

The results of the above chi-square analyses indicate that overall levels of agitated behaviour, with respect to both duration and intensity, were *smaller within each of the three music intervention groups when compared with both the storybook recordings intervention group and the*

control group. In order to answer the first research question, each of the three music intervention groups was then compared against each other.

Comparisons between Music Groups A (i), A (ii) and A (iii)

Initially, two Kruskal-Wallis ANOVAs were conducted in order to determine whether significant median differences were present with regard to either the duration or the intensity of agitated behavior within the three music intervention groups: A (i), baroque music: A (ii), gentle classical music: and A (iii), familiar music. *No significant differences were found with respect to duration, $K = .589$, $df = 2$, $p = .745$, or intensity, $K = .749$, $df = 2$, $p = .688$.* Table 14 summarizes the descriptive statistical analysis conducted on the duration and intensity of agitated behaviour on the basis of the three music intervention groups. *Differences found were very minimal in size.* Very small variations in scores were found based on the relevant experimental group in with regard to both measures.

Table 14:

*Descriptive Statistics: Duration and Intensity by Music Intervention**Groups: A(i), A(ii) and A(iii)*

<i>Group</i>	<i>Statistic</i>	<i>Duration Score</i>	<i>Intensity Score</i>
A (i)	Mean	.16	.22
Baroque music	Median	0.00	0.00
	Std. Deviation	.616	.774
	N	637	637
A (ii)	Mean	.14	.23
Gentle classical music	Median	0.00	0.00
	Std. Deviation	.507	.779
	N	637	637
A (iii)	Mean	.14	.23
Familiar music	Median	0.00	0.00
	Std. Deviation	.479	.762
	N	637	637
	Total Mean	.15	.23
	Median	0.00	0.00
	Std. Deviation	.538	.771
	N	1911	1911

Comparison between music intervention groups A(i) and A(ii)

Table 15 which follows, presents the results of the pair-wise comparison between *duration* and experimental groups A (i), baroque music, and A (ii), gentle classical music. These results indicated a *significant association between duration and participant group*, $\chi^2(3) = 11.105$, $p = .011$. Slightly lower overall durations were found within experimental group A(ii), gentle classical music, with a higher proportion of the duration of behavior lasting <16 seconds in group A(ii). Higher proportions were present for the categories “behavior not present” and “behavior present for >2½ minutes”, in group A(i). This finding indicates that agitated behaviour of short duration, <16 seconds, was observed more than twice as frequently in group A(ii), gentle classical music, and that

agitated behavior of long duration (>2½ minutes), was observed more than twice as frequently in group A(i), the Baroque music group.

Table 15:

Cross Tabulation Table: A comparison between the duration of agitated behavior and music intervention groups A(i) and A(ii)

		Duration				Total
		0	1	2	3	
Group A (i)	Count	588	14	14	21	637
Baroque music	% within Group	92.3%	2.2%	2.2%	3.3%	100.0%
	% of Total	48.2%	1.1%	1.1%	1.7%	52.1%
A (ii)	Count	585	30	13	9	637
Gentle classical music	% within Group	91.2%	5.1%	2.2%	1.5%	100.0%
	% of Total	43.7%	2.4%	1.1%	0.7%	47.9%
Total Count		1173	44	27	30	1274
% of Total		91.9%	3.5%	2.2%	2.4%	100.0%

The table below (Table 16) presents the results of the cross tabulation conducted between intensity and participant group for experimental groups A(i), baroque music, and A(ii), gentle classical music. *No significant association between these two measures was found, $\chi^2(3) = 5.314, p = .150$.*

Table 16:

Cross Tabulation Table: A comparison between the intensity of agitated behavior and music intervention groups A(i) and A(ii)

		Intensity				Total
		0	1	2	3	
Group A (i)	Count	588	3	1	45	637
Baroque music	% within Group	92.3%	0.5%	0.2%	7.0%	100.0%
	% of Total	48.0%	0.2%	0.1%	3.7%	52.0%
A (ii)	Count	567	18	0	52	637
Gentle classical music	% within Group	91.2%	1.7%	0.0%	7.1%	100.0%
	% of Total	43.8%	0.8%	0.0%	3.4%	48.0%
Total Count		1155	21	1	97	1274

Comparison between music intervention groups A(i) and A(iii)

The results of the cross tabulation conducted between duration of agitated behaviour and music intervention groups A(i), baroque music, and A(iii), familiar music, are presented below (see Tables 17 & 18). The chi-square analysis conducted found *a significant association between these two measures*, $\chi^2(3) = 19.341$, $p < .001$, with experimental group A(i) having *higher proportions for a duration of zero* (behavior not present) and a duration of three (behavior present for $> 2\frac{1}{2}$ minutes), while experimental group A(iii) (familiar music) had higher proportions of a duration of one (behaviour present for < 16 seconds) and two (behaviour present for > 16 seconds, but $< 2\frac{1}{2}$ minutes).

Table 17:

Cross Tabulation Table: A comparison between the duration of agitated behavior and music intervention groups A(i) and A(iii)

		Duration				Total
		0	1	2	3	
Group A (i)	Count	588	14	14	21	637
Baroque music	% within Group	92.3%	2.2%	2.2%	3.3%	100.0%
	% of Total	46.2%	1.1%	1.1%	1.6%	50.0%
Group A (iii)	Count	578	34	20	5	637
Familiar	% within Group	90.7%	5.3%	3.1%	0.9%	100.0%
music	% of Total	45.3%	2.7%	1.6%	0.4%	50.0%
Total	Count	1166	48	34	26	1274
	% of Total	91.5%	3.8%	2.7%	2.0%	100.0%

The following table (Table 18) summarizes the results of the pair-wise comparison between the intensity of agitated behaviour and music intervention groups A (i), baroque music, and A (iii), familiar music. A *significant association between these two measures was found*, $\chi^2(3) = 9.466$, $p = .024$. A linear association was not indicated, with experimental group A (i) having higher proportions of intensities zero and three, with

experimental group A (iii) having higher proportions of intensities one and two.

Table 18:

Cross Tabulation Table: A comparison between the intensity of agitated behavior and music intervention groups A(i) and A(iii)

		<i>Intensity</i>				<i>Total</i>
		<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	
<i>Group A (i)</i>	Count	588	3	1	45	637
Baroque music	% within Group	92.2%	0.5%	0.2%	7.1%	100.0%
	% of Total	46.2%	0.2	0.1%	3.5%	50.0%
<i>Group A (iii)</i>	Count	578	12	7	40	637
Familiar music	% within Group	90.9%	1.7%	1.1%	6.3%	100.0%
	% of Total	45.4%	0.9%	0.6	3.1%	50.0%
Total Count		1166	15	8	85	1274
% of Total		91.6%	1.1%	0.6%	6.7%	100.0%

Comparison between music intervention groups A(ii) and A(iii)

Table 19 below summarizes the results of the pair-wise comparison conducted between duration and music intervention groups A(ii) (gentle classical music) and A (iii) (familiar music). *No significant association was found between these two measures, $\chi^2(3) = 2.514, p = .473$.*

Table 19:

Cross Tabulation Table: A comparison between the duration of agitated behavior and music intervention groups A(ii) and A(iii)

		Duration				Total
		0	1	2	3	
Group A (ii)	Count	585	30	13	9	637
Gentle classical music	% within Group	91.2%	5.1%	2.2%	1.5%	100.0%
	% of Total	43.8%	2.4%	1.1%	0.7%	48.0%
Group A (iii)	Count	578	34	20	5	637
Familiar music	% within Group	90.7%	5.3%	3.1%	0.9%	100.0%
	% of Total	47.2%	2.8%	1.6%	0.4%	52.0%
Total	Count	1163	64	33	14	1274
	% of Total	91%	5.2%	2.7%	1.1%	100.0%

The final table (Table 20) summarizes the cross tabulation conducted between intensity and respondent group for groups A (ii) (gentle classical music) and A (iii) (familiar music). *No significant association between these two measures was found, $\chi^2(3) = 6.814, p = .078$.*

Table 20:

Cross Tabulation Table: A comparison between the intensity of agitated behaviour and music intervention groups A(ii) and A(iii)

		Intensity				Total
		0	1	2	3	
Group A (ii)	Count	567	18	0	52	637
Gentle classical music	% within Group	91.2%	1.7%	0.0%	7.1%	100.0%
	% of Total	43.9%	0.8%	0.0%	3.4%	48.1%
Group A (iii)	Count	578	12	7	40	637
familiar music	% within Group	90.9%	1.7%	1.1%	6.3%	100.0%
	% of Total	47.1%	0.9%	0.6%	3.3%	51.9%
Total	Count	1114	21	7	82	1224
	% of Total	91.0%	1.7%	0.6%	6.7%	100.0%

Summary of findings related to observed agitated behavior

Overall, the Kruskal-Wallis ANOVA analysis indicated *higher duration and intensity scores* within the control group when compared to the four experimental groups. However, these differences were not statistically significant.

The Chi-square analysis found *no significant differences* between group B (audio recordings of storybooks) and the control group with regard to duration and intensity scores. However, a series of Chi-square tests comparing groups indicated *higher levels of both duration and intensity* within the control group when compared to *all* music groups. These scores suggest that *all three music interventions* reduced agitated behavior more effectively than audiotapes of storybooks. However, when the three music intervention groups were compared to identify which, if any was the most effective, Chi-square testing indicated *no statistically significant differences* between *any* of the three groups with regard to either the intensity or the duration of agitated behaviour.

Analysis of quality of life variables

Findings are based on data provided by nominated proxies who each completed the QoL-AD questionnaire (Logsdon, 1999) prior to any intervention and on completion of the intervention stage, during day seven. Results were calculated using mean pre- and post-intervention scores, each item on the QoL-AD scale receiving the same weight. The two scales at pre and post-intervention, had high skewness and kurtosis scores (see Table 21), but a subsequent Kolmogorov-Smirnov test for both scales was *not significant* (scale 1: $D(65) = 0.096$, $p = 0.200$; scale 2: $D(65) = 0.097$, $p = 0.200$) indicating a normal data distribution. Cronbach's alpha scores for the two scales were high - 0.85 (pre-intervention) and 0.86 (post-

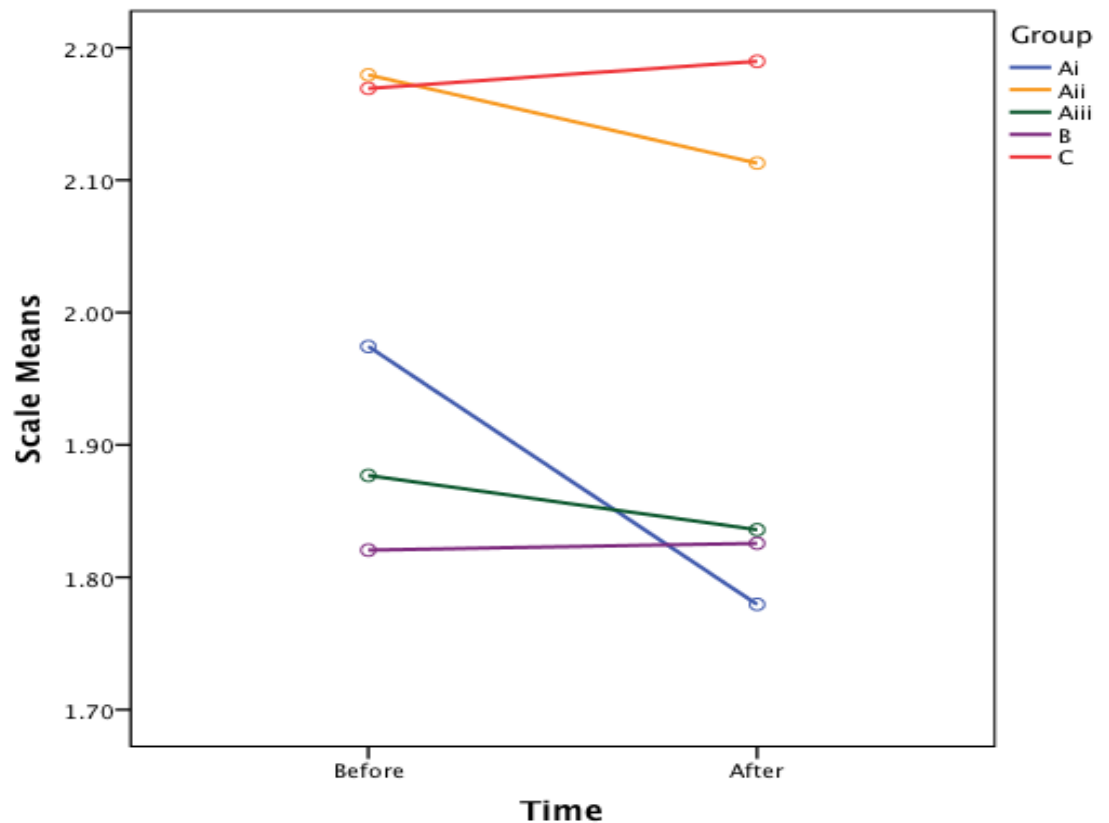
intervention) respectively, *demonstrating the internal consistency and reliability of the two scales.*

Table 21:
Distribution of Quality of Life data

	Scale 1 (Pre-intervention)	Scale 2 (Post-intervention)
Mean (standard deviation)	2.00 (0.389)	1.949 (0.385)
Skewness	-0.212	-0.078
Kurtosis	-0.451	-0.794
Cronbach's alpha	0.847	0.859
No. of items on the scale	13	
N = 65		

The scores of the two scales 'pre-intervention' and 'post-intervention' were analysed using a mixed-design ANOVA with a within-subjects factor of time, before and after intervention, and a between-subject factor of participant group (A(i), Baroque music, A(ii), gentle classical music, A(iii), familiar music, B, audio storybook recordings, and C, control). This analysis revealed *a significant difference in the mean score of the scales across all of the five participant groups*, $F(4,60) = 2.97$, $p = 0.026$, $\eta^2 = 0.165$. As can be seen from figure 4 below, participants in Group A(i), the Baroque music group, were found to have a much lower post-intervention mean score than the remaining groups. For groups Aii, Aiii, and B, *no significant difference was indicated.*

Of particular interest, for group C, the mean score of the 13 items *increased* slightly at the second time point. This interaction between time and experimental group is significant, $F(4,60) = 6.29$, $p < 0.001$, $\eta^2 = 0.296$.



Key to calculating mean scores using the Quality of Life in Alzheimer's Disease (QoL-AD)

Proxy-raters responding to questions with "Poor" assigned a score of "0"

Proxy raters responding to questions with "Fair" assigned a score of "1"

Proxy raters responding to questions with "Good" assigned a score of "2"

Proxy raters responding to questions with "Excellent" assigned a score of "3"

Figure 4. Pre and post-intervention perceived Quality of Life findings.

Separate analyses were conducted for each of the five participant groups. Interestingly, for experimental group A(i), there was *a significant difference* in the mean of quality of life scales before and after treatment, $F(1, 12) = 13.752, p = 0.003, \eta^2 = 0.534$, *indicating that perceived quality of life had actually deteriorated*. However, for the other experimental groups, no statistically significant difference was found for group A(ii), $F(1, 12) = 3.545, p = 0.084$; for group A(iii), $F(1, 12) = 2.560, p = 0.136$; for group B, $F(1, 12) = 0.044, p = 0.837$; or for the control group (group C), $F(1, 12) = 0.787, p = 0.392$.

Summary of findings related to perceived quality of life

Applying mean scores, results of the quality of life analysis indicate that none of the three music intervention types improved perceived quality of life for the participants. Indeed of great interest, it was found that mean scores for participants within all three music intervention groups were *slightly lower following the music interventions, indicating that the participant's perceived quality of life was slightly poorer following the music interventions*. However, this perceived deterioration was *statistically significant* for only *one of the music intervention groups*; namely A(i), $F(1, 12) = 13.752, p = 0.003, \eta^2 = 0.534$. Participants in Groups B and C were perceived as having *slightly improved quality of life* at the end of the intervention period, although these perceived improvements were not statistically significant.

Information gathered from informant interviews

In addition to the observational and quality of life data discussed above, a series of structured interviews were undertaken with a total of 17 experienced care staff at each of the participating aged care facilities. Prior to each interview, written consent to participate was obtained from each of the interviewees. The specific questions are detailed in Appendix I. The characteristics of the respondents are detailed below (see Table 22).

Table 22:

Characteristics of interviewees (n=17)

Gender		Average length of experience (years)	Average length of time in facility (months)
Male	4	3.2	15
Female	13	7.3	46

The collective responses to each of the specific interview questions were content analysed: a summary follows.

Question 1: *What type(s) of behavioural disturbance do you feel are the most difficult for nurses and carers to manage?*

Interviewees cited a range of frequently observed dysfunctional behaviours in residents with Alzheimer's disease. These included wandering, aggression, refusal to cooperate with care providers and repetitive vocalising. These behavioural symptoms have been well documented in the research literature and were consistent with observations recorded by the researcher during the observational data collection phase of this study. Several interviewees commented on the poorly understood, but familiar behavioural phenomenon often referred to in the research literature as "sundowner" or "sundowning" behaviour, whereby an individual's behavioural symptoms tend to worsen in the late afternoon / early evening. Many of the informants felt that the unpredictable nature of this behaviour made it particularly challenging for care providers, as staffing levels were not always adequate to enable provision of the appropriate level of supervision and support to agitated residents. Several respondents described a "domino effect", whereby the maladaptive "sundowning" behaviour of one resident, seemed to trigger behavioural disturbance in other residents. Interviewee WB stated:

I work a variety of shifts and have often wondered why there's such a variability of behaviour from day to day and even between morning and afternoon. I don't know whether it's because of something that has happened earlier in the shift, but quite often the behaviour of a particular resident can be very different in the afternoon or evening.

Question 2: *What do you think is the best way to manage this type of behaviour?*

The majority of interviewees expressed the view that behavioural disturbance needed to be individually managed and that there was no universally beneficial intervention. One respondent (RF) remarked:

I try a variety of approaches. Often just holding the hand of a resident, or talking calmly to them, is enough to settle their agitation. One problem though, is that limited staff numbers make it very difficult to provide that type of one to one care for an extended period during a shift. Sometimes I've found that giving a soft toy or a doll to a female resident seems to provide them with some comfort and reassurance. This doesn't seem to work so well for males.

Other interventions regarded by informants as effective included touch, stimulus control and pet therapy. Several of them stated that during periods of extreme agitated behaviour, it was often beneficial to reduce external stimuli by turning off televisions, music or radios, thereby reducing the amount of sensory information needing to be processed by the resident. Pharmacological solutions were regarded by most interviewees as having a place in the management of aggressive behaviour, but the majority of respondents felt this should be an intervention of last resort.

Question 3: *Do you think that music has a place in the management of agitated behaviour in late-stage dementia?*

Almost all respondents expressed the view that music was an extremely important therapeutic tool in this context. However, most

respondents also felt that music should be regarded as only one of several effective non-pharmacological interventions for settling agitated behaviour in this setting. One interviewee expressed a view that music may potentially increase agitated behaviour in some individuals, especially those who may not have had a fondness for music prior to the onset of their illness. Interviewee WB commented:

On one or two occasions, when I've put music on to try and create an atmosphere of calm, I've had residents who have actually started to shout out and demand that I turn it off.

Question 4: *What type or types of music do you think are the most useful?*

Although the majority of informants felt music often to have a calming effect on some agitated residents, no consensus existed as to the type of music having the greatest therapeutic benefit. A diverse range of opinions were expressed in response to this question. Several interviewees expressed a preference for “live” or interactive music interventions whereby participants actively engage with the musicians by singing, clapping or playing percussion instruments, but also acknowledged that any beneficial effects of this intervention may be due partially to factors other than music, such as interpersonal contact or a sense of group participation.

The majority of informants felt that music interventions needed to be individualized and that it was important to understand which type(s) of music the person with dementia had expressed a preference for prior to the onset on their illness. The majority of interviewees contended that although individualised music interventions usually took longer to implement, they were much more effective.

Question 5: *What benefit(s) have you noticed when music is played?*

Although almost unanimous (16/17) in their support for music as an effective therapeutic modality in this context, interviewees offered varying opinions about the specific benefits of this type of intervention. Several expressed the view that when music was being played, the mood of residents appeared to improve and that they were more likely to cooperate with care providers. Three respondents indicated that repetitive, disruptive vocalizations were fewer when music was being played; however, this opinion was not supported by several other interviewees, who felt that vocal outbursts actually increased during periods when music was being played. Finally, most interviewees were of the notion that recorded music was an effective method of maintaining an already calm environment within a facility, but was less effective in settling extreme agitated behaviour once it had become evident.

Question 6: *Why do you think this effect occurs?*

The majority of respondents expressed the view that the therapeutic benefit of music in this context lay in its ability to allow reminiscence and to provide a sense of group contact. One interviewee (CH) stated: “I think a lot of it has to do with people perhaps thinking back to an earlier event or a time in their lives that is linked to the music”.

In addition, the capacity of music, and in particular familiar and preferred music, to distract the agitated person, was regarded as important by several respondents. One interviewee (SM) offered the following insight:

I sometimes see that the residents become distracted by the music and seem to forget about why they

were agitated, especially if it's a piece of music that they know. It doesn't always work, but that may be because we haven't found the right type of music for that person, or because that person just doesn't like music.

Question 7: *What other factor(s) do you think might influence agitated behaviour (positively or negatively) in late-stage dementia?*

All interviewees highlighted the importance of appropriate dementia training for staff. Several informants felt that at times inexperienced care staff may unintentionally act in a manner which inflames rather than de-escalates a difficult behaviour. One informant (ST) was unequivocal:

I think the level of training that staff receive in a dementia unit is very important. Sometimes I think that staff may act in a way – not deliberately – which might inflame an already volatile situation, rather than de-escalating things. For me, I would like to have more time to work with residents, especially one to one, instead of having to spend so much time doing paperwork.

Summary of findings from informant interviews

Some common themes emerged from the informant interviews, such as the importance of an individualised approach to behaviour management and the need for dementia-specific training for staff. However, some variability of opinion was evident regarding the utility of some behavioural management interventions in this setting, with several informants expressing somewhat contradictory views. Of particular interest was the finding that none of the interviewees cited evidence-based research as a consideration in their choice of clinical intervention. The

decision about which intervention to implement, was largely “trial and error” and it would appear that the increasing body of research evidence supporting the use of music is not linked to clinical decision-making in many settings.

CHAPTER 5: CONCLUSIONS AND DISCUSSION

Introduction

The primary aim of this intervention study was to investigate the comparative effects of three different types of ambient music on the observed agitated behaviours and perceived quality of life of advanced dementia sufferers who reside permanently in residential aged care facilities. The research was predicated upon previous intervention studies discussed in chapter two of this thesis, which have demonstrated the therapeutic utility of certain types of ambient music in this setting. However, only a limited number of studies to date have compared various musical forms against each other or have been undertaken across multiple sites.

The following chapter recapitulates the study and its findings. Firstly the results are summarized and discussed. Following this, the implications of the research findings for clinical practice are outlined. The limitations of the study are then presented. The chapter also discusses some more recent studies and concludes with recommendations for future research.

Summary of the results of the study

This empirical intervention study was undertaken to examine the relative benefits of three different types of background music on agitated behaviour and perceived quality of life in persons with late-stage dementia who reside permanently in residential aged care facilities. Interventions were undertaken over a seven day period for each participant. Mean total scores using the SOAP-D scale and the QoL-AD scale were used to assess group differences in agitated behaviour and perceived quality of life. ANOVA was used to examine variations in responses between groups and chi-square analysis was used to explore pair-wise comparisons of agitated

behaviour between each group. In addition, a series of structured interviews was undertaken with experienced care staff at each of the participating facilities. The purpose of this was to explore whether their subjective opinions and anecdotes regarding the utility of music as an intervention to settle the agitation of late-stage dementia and to improve quality of life, were consistent with the findings of the observational and quality of life data reported.

Study participants in five groups of equal size ($n=13$) were each observed over a one week period. The number of participants in each group was not large: however, the groups were of sufficient size to enable statistical significance to be detected. Three of the participant groups were exposed to recordings of particular musical styles. A fourth group was exposed to a non-musical audio intervention while the fifth group received no intervention and acted as the control. The five participant groups were evenly matched with regard to clinical and demographic characteristics. By having the same data collector throughout the duration of the study, possible inter-rater differences were avoided.

Agitated Behaviour

Data were analysed from mean total scores for agitated behaviour using the SOAP-D scale. Other studies (Gerdner, 2005; Sung, 2006) have also used mean total scores to compare agitated behaviour within groups. Results from the present study indicated that participants in the three music groups displayed lower mean levels of agitated behaviour with regard to both intensity and duration, than participants in both the non-musical audio intervention group and the control group. These results support the use of music as a therapeutic intervention in addressing agitated behaviour in dementia residents. However, the results do not

indicate that any one of the three musical styles used in this study had a greater capacity to settle agitated behaviour than the others.

Perceived Quality of Life

In this study, the perceived quality of life of participants was assessed by nominated proxies who knew the participants well. Close family members or senior staff at each of the care facilities were asked to rate each participant's quality of life using the QoL-AD tool prior to and following each of the interventions. Outcome data indicated that none of the three music intervention types improved perceived quality of life amongst participants. In fact, post-intervention mean scores for perceived quality of life were lower within the three music groups. Of interest however is the finding that post-intervention mean group scores for perceived quality of life were actually higher for the control group and the storybook group.

Discussion of the results of the study

Results of the study indicate that all three of the music interventions reduced both the frequency and the duration of agitated behaviour. Findings support the use of music as a therapeutic intervention to reduce maladaptive behaviour in this setting. However, no evidence emerged from the study to support the preferential adoption of any one of the three particular musical styles used.

Results based on comparisons of mean group data indicated that none of the three music interventions improved perceived quality of life. In fact, analysis of post-intervention mean group scores indicated that perceived quality of life actually improved for participants within the control group. How perceived quality of life might improve for individuals not exposed

to any intervention remains unclear and raises questions about the possible influence of subjective bias and personal opinion when engaging proxy raters in this context. Beer et al. (2010), note there to be little data regarding the effect of different interviewers on the reliability of quality of life assessments. Determining how proxy QoL reports can be used for residents who are unable to self-report remains an ongoing challenge.

Notwithstanding these QoL findings, it would be premature to dismiss the benefit of music on perceived quality of life without further studies which perhaps engage alternative methods of quality of life data collection. Such alternative methods could involve multiple care giver perspectives being incorporated into a single rating. Beer et al. (2010), found that consensus could be achieved rapidly in 95% of cases when administering the QoL-AD jointly.

Clinical implications of the research

Based on the accumulating positive data being generated in the research literature, it is becoming increasingly accepted that non-pharmacological interventions for the management of behavioural symptoms of dementia have potential for addressing agitated behaviour in some RACF residents so afflicted, and that these interventions should be trialled prior to pharmacological interventions. The results of the present study support the use of ambient music as an effective intervention to reduce the frequency and intensity of behavioural disturbance amongst the elderly with dementia living in permanent care facilities, although no one particular type of music showed greater effect than the others. Nevertheless, it is important that care providers consider the implementation of music as an effective alternative to physical and chemical restraint. The findings herewith, as well as those identified in the

literature review, support the use of various forms of music to reduce the frequency and intensity of behavioural disturbance among residents.

Permanent care residents with severe cognitive impairment may have a diminished ability to understand and interpret their environment, and may therefore associate the setting of a residential care facility with uncertainty and fear. The ability of music to restore a sense of familiarity and to provide an opportunity for reminiscence should not be underestimated. Music may also bring meaning to the lives of residents who no longer possess the capacity to create meaningful activity for themselves. Such reassuring familiarity could be provided simply and cost-effectively in aged care facilities in the form of a playlist of recordings of favourite music on a music player positioned near to the resident.

One of the major benefits of music-based interventions is that the associated cost remains relatively low. Aged care facilities with limited therapy budgets are able to implement these types of interventions at little cost and without the need for specialist therapy skills. Interviews undertaken with care staff as part of the present study suggested that the increasing body of research evidence supporting the use of music is not linked to clinical decision making in many settings. Sung et al. (2011), explored the attitudes of care staff ($n=214$) towards the use of music for older people with dementia in long-term care facilities, finding that although most nursing staff held positive attitudes towards the use of music in this context, less than a third ($n= 66$) had used music as an intervention for those with dementia. The perceptions of the majority of staff members interviewed (72.9%) were that they lacked the requisite skills and knowledge to enable them to implement an appropriate music intervention. In addition, over half of the interviewees reported a lack of time and resources to incorporate a music intervention in their daily work routine. Their interviews recommend the need more formal training in the

use of music for those with dementia. Behavioural and psychological symptoms of dementia remain a challenge for care providers, and the development of guidelines based on scientifically proven psychosocial interventions, including ambient music, is recommended to support care staff. Such an evidence-based protocol has already been developed to guide the implementation of individualized music interventions (Gerdner, 2012). This protocol is currently in its 5th edition.

Limitations of the study

In spite of its global popularity, individuals are not universally attracted to music. It is well documented that Sigmund Freud, the well-known Austrian-born psychoanalyst, had a strong aversion to music (Jones, 1953; Roth, 1986). Although the underlying reason for Freud's aversion to music remains unclear, it has been estimated that up to 4% of the population may suffer from a condition known as amusia, more commonly referred to as "tone deafness" (Hyde & Peretz, 2004). This condition may be congenital or may be acquired as a result of brain injury. Sufferers of amusia appear to have a deficit in pitch discrimination and are frequently unable to hum familiar melodies even though other aspects of their cognitive functioning may be normal or even above average. Some individuals may even experience an extreme form of musical aversion sometimes described as *melophobia*. Affected individuals may even associate music with a distressing event or a negative pattern of thinking and may experience a high level of anxiety when music is being played. It would therefore be unrealistic to assume that music interventions will provide emotional comfort and reassurance in all circumstances. Although this did not occur in the present study, therapists and care staff who engage in music interventions need to be mindful of the possibility that these types

of intervention may actually increase anxiety in a small percentage of individuals.

The present study was undertaken within eight Western Australian aged care facilities using a total population of 65 participants from a predominantly European background. As a consequence, the results from this research can only be assumed to generalize to Anglo-Saxon populations. Although some recent studies (Sung, 2006; Suzuki et al., 2004; Takahashi et al., 2006) have explored the benefits of music within non Anglo-Saxon populations, it would be necessary to explore cultural and ethnic influences further to determine whether music reduces agitated behaviour in late-stage dementia within all cultural and ethnic groups.

The one week duration of the interventions may be insufficient to exert a lasting influence on observed agitation. Follow up of agitated behaviour and perceived quality of life at two or four weeks post-intervention would have provided additional information about the capacity of music to exert a residual or delayed effect. In addition, the present study did not examine the possible influence that prescribed medication may have had on the response of participants. As discussed above, psychotropic medications are routinely administered in residential care facilities to reduce the behavioural and psychological symptoms frequently associated with late-stage dementia. It has been estimated that as many as one in four elderly nursing home residents may be receiving this type of medication (Kamble, Chen, & Sherer, 2008). Because of their powerful neuroleptic effect, these types of medications often produce a state of apathy and dysphoria which may inhibit the dementia sufferer's usual emotional response to external stimuli such as music.

Quality of life is an important variable that needs to be explored in future studies. However, the QoL-AD tool was not specifically developed for use within music studies and the instrument includes items which are

unlikely to be influenced by the effect of music, such as physical health (item 1), living situation (item 4) and money (item 12).

Recent studies and recommendations for further research

To date there are few intervention studies comparing the relative benefits of different background musical styles against each other. Data from some previous studies have provided contradictory evidence: thus the need for continued research using rigorously designed intervention studies remains important. For example, the results of the small, single-centre study ($n=14$), undertaken by Heim et al. (2003), noted earlier, reported the beneficial effects of ambient baroque music. However, these findings were contrary to the recent follow-up study by Nair, Heim, Krishnan, D'Este, Marley, & Attia, (2010), who in their cross-over study, played ambient baroque music to a larger sample of residents ($n=75$) within a multicultural dementia-specific aged care setting. Results indicated significantly *more* episodes of behavioural disturbance during the weeks when Baroque music was played compared to control periods (0.2 more episodes per week, $p=0.01$). These results also conflict with the data presented in the present thesis, which indicate that ambient baroque music settled the agitated behaviour of late-stage dementia residents. The contradictory results of studies so far which have used baroque music, support the need for further research of this type. In particular, it is important to explore whether the multicultural setting of the study by Nair et al., (2010), influenced the results, as cultural factors may also influence a person's response to baroque music.

Although the present study suggests that none of the three music intervention styles was more therapeutically beneficial than the others in reducing agitated behaviour, all three music interventions did appear to reduce agitation in the residents.

In light of the encouraging findings from previous studies by Gerdner and Swanson (1993), Casby and Holm (1994), Sung et al. (2006), Guétin et al. (2009), Montag, Reuter, and Axmacher (2011), and El Haj, Postal, and Allain (2012), which have used preferred or “individualised” music in this context, it is recommended that a future comparative study of this type includes preferred music as one of the independent variables.

The present study randomly assigned the 65 participants into five groups of equal size. Larger studies with a greater number of participants would increase the statistical power of the results. However, recruitment of participants proved to be problematic, taking more time than anticipated and potentially increasing the costs of this type of study. Although scientifically robust methodology has been used, the social context of the music listening experience was not considered in the study design. Humans are complex biopsychosocial beings; therefore it should not necessarily be assumed that the benefits of music are limited to the management of the behavioural and psychological symptoms of dementia. Future empirical studies could engage a “mixed methods” approach which recognises that “music is an inherently social process” (Shepherd & Wicke, 1997), and explore the potential contribution of human interaction and music on the experience of the dementia resident.

The music selected for inclusion in this study consisted of both instrumental pieces and songs with lyrics, providing a rich set of interventions to test the research questions posed. However, the lyrical content of the selected music was not considered in this study design and therefore the influence of lyrics on the dependent variables was not able to be determined. Other researchers have explored the importance of melody and lyrics in cognitively unimpaired individuals. For example, Ali and Peynircioğlu (2006) asked participants to rate their emotional response to the same pieces of music with and without lyrics. Their study found that lyrics detracted from the emotional content of happy music but enhanced

the emotional response to sad music. Other researchers (Brattico, Alluri, Bogert, Jacobsen, Vartiainen, Nieminen, & Tervaniemi, 2011; Sammler, Baird, Valabrègue, Clément, Dupont, Belin, & Samson, 2010; Gordon, Schön, Magne, Astésano, & Besson, 2010) have used functional magnetic resonance imaging to explore the relative importance of music and lyrics in cognitively unimpaired individuals. However, the understanding of the role that song lyrics might play in conveying emotion and influencing the behaviour of individuals with late-stage dementia is incomplete; it is recommended therefore that this becomes the subject of further research.

The influence of music on behaviour involves a complex interaction of social, environmental and neurobiological factors. Although recent research in this area has demonstrated the capacity of some types of music to reduce the behavioural and psychological symptoms associated with dementia, current understanding of the specific mechanisms through which music modulates cortical activity and behaviour is still evolving. Even though some recent studies (Spiro, 2010; McDermott, Crellin, Ridder, & Orrell, 2013) have reviewed the extant literature in an attempt to determine a model of action for the effectiveness of music interventions, further research is required.

Mealtimes in residential aged care facilities have been identified as periods when agitated behaviour may increase (Ragneskog et al., 1996; Denney, 1997; Hicks-Moore, 2005) and several recent studies have explored the association between music and the dietary intake of people with dementia (Chang, Huang, Lin, & Lin, 2010; Ho, Lai, Jeng, Tang, Sung, & Chen, 2011; McHugh, Gardstrom, Hiller, Brewer, & Diestelkamp, 2012). Although the nutritional status of the elderly person with dementia is an extremely important determinant of their general wellbeing, there appears to have been less research attention directed towards the association between music and agitation during other important activities of daily living such as bathing, grooming and toileting.

These periods have also been identified as times when agitated behaviour may increase (Cohen-Mansfield, 1990; Thomas, Heitman, & Alexander, 1997; Clark et al., 1998) and it is therefore recommended that future research also evaluates the effectiveness of music interventions on the cooperation of people with dementia during these times.

Although numerous recent studies (Han, Kwan, Chen, Yusoff, Chionh, Goh, & Yap, 2010; Skingley & Vella-Burrows, 2010; Lin, Chu, Yang, Chen, Chen, Chang, Hsieh, & Chou, 2011; Sung, Lee, Li, & Watson, 2012; McDermott et al., Crellin, Ridder, & Orell, 2012; Sakamoto, Ando, & Tsutou, 2013; Ueda, Suzukamo, Sato, & Izumi, 2013) provide strong research evidence to support the continuing use of music in the reduction of agitated behaviour in people with dementia, the secondary effect of music interventions on the work environment appears to be under-explored. Brotons and Pickett-Cooper (1996) suggested that the introduction of music in residential care facilities may have the secondary benefit of making the work environment more relaxed, and thus reduce staff burnout. At a time when the occupational health and welfare of staff is an important consideration for employers and the attraction and retention of a high quality workforce is essential, the influence of music on staff attitudes and workplace morale should be the subject of further research. Hanser, Butterfield-Whitcomb, Kawata, and Collins (2011), undertook a small ($n=14$) exploratory study to evaluate the effectiveness of a caregiver-administered music program on reducing carer stress and enhancing satisfaction with care giving in the domiciliary setting. Although drop-out was high, six participants withdrawing during the study, carers did express enjoyment in reminiscing through music with the people for whom they were providing care. It is recommended that similar research is undertaken in the residential care setting.

Conclusion

This research has provided new insights into the relationship between background music and the agitated behaviour experienced by many sufferers of dementia who reside in residential aged care settings. The study results have demonstrated that gentle classical music, baroque music and familiar music, when played as background music, all reduced both the frequency and the duration of agitated behaviour compared to the control group and the non-music audio intervention group. Although no improvements in perceived quality of life were found for any of the music intervention groups, subjective opinion about the quality of life of others, especially those with advanced dementia, is problematic and further research using alternative data collection methods or multiple proxy raters is recommended.

Interest in this area of research appears to be gathering momentum and there have been several recent meta-analytical reviews of the existing research literature which support the use of music in this context. Most recently, Ueda (2013) undertook a systematic review of 20 significant studies, concluding that music therapy is effective for the management of BPSD.

Van der Geer, Vink, Schols, and Slaets (2009) identified that although music was a frequent accompaniment to activities occurring within the communal areas of aged care facilities, this music usually did not take into account the individual preferences of the residents. However, during patient-centred care activities, if it was appropriate to play music, this was generally selected on the basis of the preferences of the residents. Consistent with this, many care facilities now seem to be adopting a more individualized approach to care which attempts to improve the quality of life of dementia sufferers by understanding their life story and their personal experience of dementia. A person's musical history is frequently an important part of their life story, informing and guiding individual care

plans in many cases. The training of carers and family in this person-centred approach is now becoming an important component of most dementia care programs. Music can play an important role in this individualized approach.

This study has explored whether three particular styles of background music confer different therapeutic benefits on elderly dementia sufferers residing permanently in residential aged care facilities. Although no evidence emerged to support the preferential use of any of these three musical styles, the outcome data derived from this study cannot be extrapolated to provide unequivocal evidence that all forms of music have equal therapeutic value. Given that a wide range of musical styles exist, further research needs to explore comparisons between other musical styles.

The conceptual framework underpinning this study has been the Progressively Lowered Stress Threshold (PLST) model. As discussed earlier in this thesis, the PLST model suggests that because of their difficulty with memory, perception and communication, persons with advanced dementia may benefit from living within a modified environment which minimises external stimuli requiring understanding and interpretation. In the context of this framework, the results of this study support the use of ambient music as an environmental modification to reduce the confusion and agitation frequently observed amongst elderly persons living in residential aged care facilities.

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APPENDIX A

SCALE FOR THE OBSERVATION OF AGITATION

IN PERSONS WITH DEMENTIA (SOAP-D) (Hurley et al. 1999)

Agitated behaviours are grouped under seven broad headings;

- (i) *Total Body Movements.* i.e. the whole body is moving in a repetitive way. There is a sense of urgency, speed, hyper-activity, restlessness or purposelessness. This group of agitated behaviours includes pacing, repetitive walking and moving while confined to a wheelchair.
- (ii) *Up/down Movements.* i.e a person's body actions are carried out in more than one place and with more speed and/or intensity than is used for purposeful or goal-directed activity.
- (iii) *Repetitive Body Motions in Place.* i.e. making repeated movements that have a restless or fidgety quality, giving the appearance of being jittery, tense, nervous, uneasy or unsettled.
- (iv) *Outward Motions.* This category relates to body actions of the extremities that are directed outwards. Generally this category includes behaviours that involve the person's bodily contact with a surface and include hitting, pinching, kicking, pushing, punching. This category also includes threatening gestures.

- (v) *High-Pitched or Loud Noises*. This category includes words or sounds that are made in a louder than usual volume. Examples of this would be screaming, and, or calling out.
- (vi) *Repetitive Vocalisations*. These include words or sounds that are made over and over again. It also includes repetitive requests for assistance or information (e.g. “where am I?”, “Can I go home now?” etc.).
- (vii) *Negative Words*. These are words that express negativity or a tone that is argumentative or demanding.

The SOAP-D is used to record data following five minutes of direct rater observation. Data collection includes:

- (i) The *duration* of any agitated behaviour occurring during the period of observation. It is noted whether the behaviour lasted for a short duration (i.e. less than 16 seconds), a medium duration (i.e. greater than 16 seconds but less than or equal to 2 ½ minutes), or a longer duration (i.e. greater than 2½ minutes). The person being observed is scored accordingly one point (short duration), two points (medium duration), or three points (long duration).
- (ii) The *intensity* of the agitated behaviour occurring during the period of observation. Two of the agitated behaviours (“repetitive movements in place” and “outward movements”) have been

assigned relative degrees of intensity by the tool's authors. These three degrees of intensity are mild (one point), moderate (two points), or extreme (three points).

The remaining five behaviours (i.e. total body movements, up and down movements, high-pitched or loud noises, repetitive vocalisations and negative words, are defined by the tool's authors as extreme by definition. Therefore if these behaviours are observed, they would be assigned a score of three points.

APPENDIX B

Quality of Life in Alzheimer's Disease (QoL-AD)

Please, circle your response:

1	Physical health	Poor	Fair	Good	Excellent
2	Energy	Poor	Fair	Good	Excellent
3	Mood	Poor	Fair	Good	Excellent
4	Living situation	Poor	Fair	Good	Excellent
5	Memory	Poor	Fair	Good	Excellent
6	Family	Poor	Fair	Good	Excellent
7	Relationships	Poor	Fair	Good	Excellent
8	Friends	Poor	Fair	Good	Excellent
9	Self overall	Poor	Fair	Good	Excellent
10	Ability to keep busy	Poor	Fair	Good	Excellent
11	Ability to do things for fun	Poor	Fair	Good	Excellent
12	Money	Poor	Fair	Good	Excellent
13	Life overall	Poor	Fair	Good	Excellent

Copyright Logsdon (1999)

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.

APPENDIX C



Insert date here

Insert name of aged care facility here

Dear (insert name of Nursing Director here),

I am a Senior Registered Nurse with a particular interest in the care and quality of life of people with late-stage dementia. I am currently involved in a research project through Edith Cowan University, which is looking at whether music can be used as an effective therapeutic tool in the management of agitated behaviour in late-stage dementia.

I am writing to ask whether you would be agreeable to (name of care facility) participating in this project. The study is targeting people with agitated behaviour in the context of late-stage dementia and would involve me visiting your facility for one week to play certain types of recorded music to those residents with agitated behaviour who meet the criteria for inclusion in the study. I would of course, seek the written agreement of families / next of kin.

The study also seeks to gather information from nurses and carers about their experiences with the use of music in late stage dementia.

This study would give (name of care facility) the opportunity to be involved in research with one of Australia's leading universities.

I would like to contact you within the next week or so to discuss whether you are interested in (name of care facility) participating in this project and I would be more than happy to visit you at a time that is convenient for you, to answer any questions you may have.

In the meantime, if you would like to speak with me, please feel free to contact me on 0407 086 965.

I look forward to talking with you in the near future.

Kind regards,

Peter Wilkinson
R.N. MCN PhD (candidate)

APPENDIX D



INFORMATION REGARDING A STUDY INTO THE EFFECTS OF GENTLE MUSIC IN PEOPLE WITH DEMENTIA

I am a Senior Registered Nurse with a special interest in the care and quality of life of people with dementia and would like to advise you that I am presently involved in a study to explore the possible calming effect of gentle music in people with dementia. This project forms part of the requirements for a Doctor of Philosophy degree at Edith Cowan University.

As part of this project, the management of (NAME OF FACILITY) has agreed to recordings of soft music being played for two hours on five separate occasions during the course of one week.

During the week that this music is to be played, I will be observing some of the residents. I will also be documenting information, to see whether the playing of this type of music appears to have any calming effect.

At the present time, no decision has been made about which residents will be included in this project. However, if your relative is selected, I will be contacting you in the near future to discuss this project in more detail and to seek your approval. I would like to emphasise that approval to participate in this study will always be sought from the next of kin, before their relative is included in the project.

If you have any concerns about this project, please feel free to contact me on (insert telephone number) and I would be very happy to discuss this project with you. Alternatively, you are welcome to discuss this project with my supervisor, A/Prof. Anne Wilkinson at the School of

Nursing, Midwifery and Postgraduate Medicine at Edith Cowan University
on 6304 3540.

If you would like to talk to an independent person about this project,
please feel free to contact;

The Research Ethics Officer,
Edith Cowan University,
100 Joondalup Drive,
JOONDALUP 6027
Phone (08) 6304 2170
Email: research.ethics@ecu.edu.au
Kind regards,
Peter Wilkinson *Principal researcher*

APPENDIX E



A STUDY INTO THE EFFECTS OF GENTLE MUSIC IN PEOPLE WITH DEMENTIA

Dear (NAME OF NEXT OF KIN),

You may recall that I wrote to you on (DATE) regarding a study that is currently being undertaken by Edith Cowan University into the possible calming effect of gentle music in people with dementia. I am a senior Registered Nurse with a special interest in the care and quality of life, of people with dementia and am coordinating this study.

(NAME OF PARTICIPANT) has been selected for inclusion in the above-named project. This letter provides more information about the project and why it is being conducted.

There is a growing amount of research evidence to suggest that the playing of certain types of music to people with dementia, can have a calming influence. However, which types of music may have the most benefit, is still not entirely clear. This project has been designed to provide information about which (if any) type of music has any calming effect.

As part of this project, the management of (NAME OF FACILITY) have agreed to various recordings of music and storybooks being played for two hours between 3p.m. and 5p.m. on five separate occasions during a one week period. The recordings will be played at an easily audible, but

not excessive volume.

Throughout this week I would like to observe your relative and document information about their responses.

None of the residents in this project will be identified by name and any information that is collected will remain confidential and will only be used for the purposes of the project. The information that is gathered will be reported without identifying individuals, as part of a Doctor of Philosophy (Nursing) degree being undertaken at Edith Cowan University.

I will be requesting your agreement to obtain information about your relative from the notes held at (NAME OF FACILITY). This information concerns your relative's formal medical diagnosis, their past medical history and their present medications.

I would also like to discuss your relative with you at a time that is convenient for you. I am particularly interested in finding out whether your relative has had any particular musical preferences in the past. This sort of personal information will assist in understanding whether a person's background is a factor in the way they respond to music.

As your relative is unable to provide consent to participate in this project themselves, I will be asking you to agree to their participation. In the near future I will be contacting you to discuss this project and to seek your agreement. I would welcome your questions when we talk.

Participation in this project is completely voluntary. Should you not

agree to your relative's participation in this project, it will not influence the care of your relative in any way. In addition, if you do agree to your relative being included in this project, you may change your mind at any stage without it influencing the care of your relative in any way.

I look forward to speaking with you in the near future. However, if you feel the need to talk with me in the meantime, please contact me on (MOBILE TELEPHONE NUMBER).

Kind regards,

Peter Wilkinson
Principal researcher

APPENDIX F



RELATIVES / NEXT OF KIN AGREEMENT

PROJECT TITLE: “Determining the relative benefits of three different types of ambient music on the observed agitated behaviours of dementia sufferers in residential aged care facilities”.

I, ...(NAME OF NEXT OF KIN).....hereby agree for (NAME OF PARTICIPANT) to be included in the above-named project.

I agree to provide information about my relative’s social history to the researchers for the purposes of the project. Such information will include a summary of any past music preferences.

I also agree to the researchers obtaining information that is relevant to the project, such as formal medical diagnoses, past medical problems and current medications, from my relative’s medical notes.

I understand that any information provided to the researchers will remain confidential and will not be disclosed without consent.

I have been provided with an information letter advising me about the nature and duration of the project and I have read and understand this information. I have been given the opportunity to ask questions and have had any questions about the project answered to my satisfaction. I am

aware that should I have any further questions, I may contact the research team.

I am aware that the project may involve my relative being exposed to audio recordings for two hours, on five separate occasions during the course of one week and that during this time, my relative will be observed and information about their responses will be documented.

I am aware that any information collected during the course of the study, will only be used for the purposes of the research project and I am aware that all of the information that is gathered, will be reported in a study as part of a Doctor of Philosophy degree being undertaken at Edith Cowan University.

I am aware that I may change my mind at any time and that I do not need to give a reason for this. I also understand that should I change my mind, my relative will be withdrawn from the study and that my decision will not influence the care of my relative in any way.

.....(NEXT OF KIN)

Dated thisday of20....

APPENDIX G



INFORMATION LETTER FOR NURSES AND CARERS REGARDING A CURRENT STUDY INTO THE EFFECTS OF MUSIC IN LATE-STAGE DEMENTIA

I am a Senior Registered Nurse with a particular interest in the care and quality of life of people with advanced dementia. I am currently involved in a research project in conjunction with Edith Cowan University, to try and understand more about the effect of background music on agitated behaviour in late-stage dementia. The study hopes to gather a large sample group from across many aged care facilities, including your own.

As part of this study, the management of (name of care facility) has agreed to the playing of particular types of music to your residents between Monday 14th May 2012 and Friday 20th May 2012.

During the week that this music will be played, I will be visiting your facility daily to observe some of the residents selected for inclusion in the study. My observations will be documented and compared with other types of music played at other times and at other care facilities.

I will be asking the care staff on duty, to play only one particular type of music between the hours of three p.m. and five p.m. each day for the duration of the study. I will provide compact discs for you to be able to do this.

During the week of the study, the usual routine of the facility will remain unchanged. You will be able to go about your work in the usual way. The only noticeable differences will be my discreet presence for a short time each afternoon and the music that is being played.

Research of this type relies on the support of care providers such as yourselves. The study can only obtain accurate information if it is supported by you. It is very important therefore that during the week that this study is being conducted, only the music provided on the CD is played between 3p.m. and 5p.m..

Should you have any concerns or questions regarding this study, please do not hesitate to contact me on 0407 086 965 and I would be very happy to talk with you.

Thankyou in anticipation of your support,

Peter Wilkinson
Principal researcher

APPENDIX H



CONSENT TO INTERVIEW

PROJECT TITLE: “Determining the relative benefits of three different types of ambient music on the observed agitated behaviours of dementia sufferers in residential aged care facilities”.

I,.....hereby agree to be interviewed as part of the above-named project in my capacity as.....

I understand that I will be asked to talk about my role and to express my opinions about whether music is a useful therapeutic intervention in the management of agitated behaviour in late-stage dementia.

I understand that any information provided by me to the researchers will remain confidential and will not be disclosed without consent.

I have been provided with information about the nature of the project and about the questions I will be asked and I have read and understand this information.

I have been given the opportunity to ask questions and have had any questions about the project answered to my satisfaction. I am aware that should I have any further questions, I may contact the research team.

I am aware that any information collected during the course of the interview will only be used for the purposes of the research project and I am aware that all of the information that is gathered, will be reported in a study as part of a Doctor of Philosophy degree being undertaken at Edith Cowan University.

I am aware that I may change my mind at any time and that I do not need to give a reason for this. I also understand that should I change my mind, my decision will not influence my substantive role in any way.

Signed..... Dated thisday of20....

APPENDIX I

Interview questions for care staff

- (i) *What type(s) of behavioural disturbance do you feel are the most difficult for nurses and carers to manage?*
- (ii) *What do you think is the best way to manage this type of behaviour?*
- (iii) *Do you think that music has a place in the management of agitated behaviour in late-stage dementia?*
- (iv) *What type or types of music do you think are the most useful?*
- (v) *What benefit(s) have you noticed when music is played?*
- (vi) *Why do you think this effect occurs?*
- (vii) *What other factor(s) do you think might influence agitated behaviour (positively or negatively) in late-stage dementia?*

APPENDIX J

From: Logsdon, Rebecca
Sent: Tuesday 13 April 2010 14:18
To: Wilkinson, Peter
Subject: FW: QoL-AD permission and scale

Dear Peter,

I'm not sure whether I have responded to your request (sorry for the delay, if not). You have my permission to use the QOL-AD in your research. I am attaching the measure, instructions and some additional information about it, FYI. Please feel free to contact me with any additional questions.

Regards,

Rebecca

Rebecca G. Logsdon, PhD
Research Professor
UW School of Nursing
Northwest Research Group on Aging
9709 3rd Ave NE, Ste 507
Seattle, WA 98115-2053

phone: 206-685-1758

fax: 206-616-5588

CONFIDENTIALITY NOTE: This message is intended only for the addressee and may contain information that is considered private, confidential, and exempt from disclosure under applicable law. If you are not the person(s) listed above and have received this communication in error, please notify the sender and delete the information immediately from your system. Thank you.

APPENDIX K

Baroque music resources used in the study

Bach, J.S. (1994). *Brandenburg Concerto No. 1 in F major (allegro)*. [CD]. Germany: Deutsche Grammophon.

Bach, J.S. (1994). *Brandenburg Concerto No. 2 in F major (allegro assai)*. [CD]. Germany: Deutsche Grammophon.

Bach, J.S. (1994). *Brandenburg Concerto No. 3 in G major (allegro)*. [CD]. Germany: Deutsche Grammophon.

Bach, J.S. (1994). *Brandenburg Concerto No. 4 in G major (allegro)*. [CD]. Germany: Deutsche Grammophon.

Bach, J.S. (1994). *Brandenburg Concerto No. 5 in D major (allegro)*. [CD]. Germany: Deutsche Grammophon.

Bach, J.S. (1994). *Brandenburg Concerto No. 6 in B-flat major (allegro)*. [CD]. Germany: Deutsche Grammophon.

Handel, G. (2013). *Suite in D major (overture & allegro)*. [CD]. France: Naïve.

Handel, G. (1995). *Suite in F major (overture and allegro)*. [CD]. France: Naïve.

Handel, G. (1995). *Suite in G major (allegro)*. [CD]. France: Naïve.

Pachelbel, J. (1999). *Partita No. 1 in F major (allegro) from Musicalische Ergötzung*. [CD]. France: Harmonia Mundi.

Pachelbel, J. (1999). *Partita No. 3 in E-flat major (allegro) from Musicalische Ergötzung*. [CD]. France: Harmonia Mundi.

Vivaldi, A. (2009). *Concerto No. 1 in E major (allegro)*. [CD]. United Kingdom: Decca.

Vivaldi, A. (2009). *Concerto No. 3 in F major (allegro)*. [CD]. United Kingdom: Decca.

APPENDIX L

Gentle classical music resources used in the study

- Bach, J.S. (2012). *Orchestral Suite No. 3 in D major*. [CD]. Hong Kong: Naxos.
- Barber, S. (1976). *String quartet in B minor (adagio)*. [CD]. United Kingdom: Argo.
- Dvořák, A. (2006). *Symphony No. 9 in E minor (largo)*. [CD]. Japan: King records.
- Fauré, G. (2004). *Pavane in F sharp minor*. [CD]. United Kingdom: Decca.
- Grieg, E. (2000). *Peer Gynt suite (Act IV, prelude)*. [CD]. Germany: Deutsche Grammophon.
- Pachelbel, J. (1984). *Canon in D major*. [CD]. Germany: Deutsche Grammophon.
- Saint-Saëns, C. (1998). *Carnival of the Animals (the swan)*. [CD]. Hong Kong: Naxos.

APPENDIX M

Familiar music resources used in the study

Arlen, H. (1939). Over the rainbow [sung by Judy Garland] on *Over the Rainbow. The very best of Judy Garland*. [CD]. United Kingdom: EMI. 2007.

Berlin, I. (1940). White Christmas [sung by Bing Crosby] on *Bing Crosby: The voice of Christmas: The complete Decca Christmas songbook*. [CD]. United Kingdom: Decca. 1998.

Black, J. (1930). Paper Doll [sung by The Mills Brothers] on *The Mills Brothers*. [CD]. U.S.: MCA. 1992.

Coots, J., Kenny, N., & Kenny, C. (1931). Love letters in the sand [sung by Pat Boone] on *Pat Boone 18 classics*. [CD]. U.K.: Mastersong. 2000.

Dexter, A. (1943). Pistol packin' mama [sung by Al Dexter] on *Pistol packin' mama*. [CD]. U.K.: ASV. 1999.

Evans, R., & Livingston, J. (1950). Mona Lisa [sung by Nat King Cole] on *Unforgettable Nat King Cole*. [CD]. U.S.: Capitol. 2000.

Gilkyson, T., Dehr, R., & Miller, F. (1955). Memories are made of this [sung by Dean Martin] on *Dean Martin memories are made of this*. [CD]. Germany: Bear. 1997.

Howard, B. (1954). Fly me to the moon [sung by Frank Sinatra] on *Sinatra, best of the best*. [CD]. U.S.: Hear Music. 2007.

Invader, L., & Belasco, L. (1945). Rum and Coca Cola [sung by The Andrews Sisters] on *The Andrews Sisters rum and Coca Cola*. Austria: Document. 2005.

Kern, J., & Hammerstein, O. (1927). Ol' man river [sung by Paul Robeson] on *Best of Paul Robeson*. [CD]. U.S.: Delta. 2006.

Lee, P., & Barbour, D. (1947). Mañana (Is Soon Enough for Me) [sung by Peggy Lee] on *Best of Miss Peggy Lee*. [CD]. U.S.A.: Capitol. 1998.

Livingstone, J., & Evans, R. (1956). Que sera sera [sung by Doris Day] on *The Doris Day collection*. [CD]. U.S.: Music and Melody. 2009.

Merrill, B. (1954). Mambo Italiano [sung by Rosemary Clooney] on *The essential Rosemary Clooney*. [CD]. U.S. :Sony. 2004.

Reid, B. (1945). The gipsy [sung by The Ink Spots] on *We four, the best of The Inkspots*. [CD]. U.S.: MCA. 1999.

Roberts, A., & Fisher, D. (1959). You always hurt the one you love [sung by The Mills Brothers] on *The Mills Brothers*. [CD]. U.S.: MCA. 1992.

Stewart, R., & King, P. (1946). Tennessee Waltz [sung by Patti Paige] on *Brand new Tennessee Waltz*. [CD]. U.S.: The Gold Label. 2001.

Travis, M. (1946). Sixteen tons [sung by Tennessee Ernie Ford] on *Sixteen tons, the best of Tennessee Ernie Ford*. [CD]. Germany: Bear. 1994.

Wright, R., & Forrest, G. (1953). Stranger in Paradise [sung by Tony Bennett] on *Tony Bennett stranger in Paradise*. [CD]. U.K.: Delta. 2008.

APPENDIX N

Audio recordings of storybooks used in the study

Andersen, H.C. *The Emperor's New Clothes* [narrated by Dave Perry and Jean Perry]. Soundtrax, 2002. CD.

Dickens, C. *David Copperfield* [narrated by Anton Lesser] Naxos Audio Books, 2010. CD.

Stevenson, R.L. *Treasure Island* [narrated by Neil Hunt]. Recorded Books, 1988. CD.

Twain, M. *The Adventures of Huckleberry Finn* [narrated by Garrick Hagon]. Naxos Audio Books, 2011. CD.

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APPENDIX O

Conference presentations arising from the research

Wilkinson, P.C. A study to investigate the relative benefits of different types of ambient music on levels of agitation amongst dementia patients. *Back to the future. Inaugural SolarisCare Conference*, Perth, Western Australia, September 16, 2011

Wilkinson, P.C. Therapeutic benefits of music on agitation in dementia sufferers. *The WA Centre for Evidence Informed Healthcare. Clinical excellence through evidence conference*. Perth, Western Australia, February 10th 2012