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The Utility of Music-based Interventions in Dementia Care

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CERTIFICATE OF APPROVAL

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Abstract

While research has investigated the impact of music-based interventions on management of behavioral and psychological symptoms of dementia (BPSD), there is limited discussion of which music-based interventions are most effective for various levels of dementia severity, or of how to determine which music-based interventions are both accessible and feasible for caregivers and nursing staff. This review sought to identify the benefits of music-based interventions in dementia care within various domains of functioning and determine whether music-based interventions are effective for various levels of dementia severity. Peer-reviewed articles and studies that evaluated the effectiveness of various music interventions or demonstrated music's impact on cognitive, behavioral, psychological, or social functioning for individuals with various levels of dementia were examined in this review. Most studies reviewed demonstrated that music-based interventions might yield improvements in various aspects of cognitive, behavioral, psychological, and social functioning across all levels of dementia severities. Due to the heterogeneity of methods and limitations of study designs, research is unable to demonstrate a systematic approach to selecting music interventions based on dementia severity. However, current patterns in the literature support recommendations for caregivers and nursing staff in individualizing music-based interventions for individuals with dementia.

UTILITY OF MUSIC-BASED INTERVENTIONS IN DEMENTIA CARE

DEDICATION

This is for you, MomMom. Loving you, being loved by you, and losing you has been of the most important parts of my life and the reason for this project. Writing this reminded me that through music, I can always find you.

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Thank you, Dr. Kathie Bates, for your unwavering support, your time, and all your guidance in this process. It has been a pleasure and a privilege to learn from you over the past four years. I am so grateful for the role you have had in my personal and clinical development.

Mum, everything I have accomplished in my life is because of your love and sacrifice. I could never thank you enough. In my eyes, you are the epitome of strength and resilience. Rob, thank you for making it possible to live my dream. In so many ways you have been the rock in this family. Thank you for believing in me.

Justin, in regard to the rock band idea, I think you are on to something. I am so grateful for your support throughout this wild ride. I am so grateful for you not only believing in me but knowing without doubt that I was capable of arriving here. However, I may still need help with the TV remote. I love you, endlessly.

Daddis, I have always felt that my love of music was a gift from you. Some of my favorite memories of us involve music. I cherish the bond we share through music. Thank you for living your dream and being an inspiration to live mine.

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CHAPTER I: OVERVIEW OF DEMENTIA

Perspectives of the aging process vary across societies, while the experience of aging largely varies across individuals (Prince et al., 2013). Despite the variation within the aging experience, there are many universal processes of aging, including the inevitable possibility of developing dementia in late life (Prince et al., 2016).

The *Diagnostic and Statistical Manual, Fifth Edition (DSM-5*; American Psychological Association, 2013) refers to dementia as a syndrome that is included within the broader major neurocognitive disorder category, which typically concerns older adults. In the *DSM-5,* general diagnostic criteria encompass concerns regarding significant decline in cognitive functioning, impaired cognitive performance based on quantifiable assessment, and interference with independent performance of basic and complex instrumental activities of daily living. In addition, dementia typically involves decline and deficits in language, memory, orientation, and reasoning, as well as abstract thinking and problem solving (Erber, 2005). However, individuals with dementia typically maintain normal levels of consciousness until later in the disease progression (Erber, 2005).

Potential etiologies for dementia include neurodegenerative diseases such as Alzheimer's disease, vascular disease, frontotemporal lobar degeneration, Parkinson's disease, and Lewy body disease (APA, 2013). The worldwide prevalence of dementia in 2010 for individuals 60+ years of age was 4.7%, and in North America, the prevalence in 2010 was 6.9% (Prince et al., 2013). It was estimated that 35.6 million people lived with dementia worldwide in 2010, with the expectation to double every 20 years, to 65.7 million in 2030 and 115.4 million in 2050 (Prince et al., 2013, 2016).

According to a discussion of U.S. census data provided by the *DSM-5*, it is estimated that between 60% and 90% of dementias are attributable to Alzheimer's disease (APA, 2013). Diagnostic features of neurocognitive disorder (NCD) due to Alzheimer's disease include insidious onset with decline in cognitive domains such as memory and learning, which is likely accompanied by behavioral symptoms associated with agitation, apathy, mood disturbance, or psychosis (APA, 2013). In moderate to severe dementia, individuals will have visuoconstructional/perceptual-motor and language impairments. Typically, social cognition is preserved until later stages (Erber, 2005; APA, 2013). Eventually, individuals become mute and bedbound in later stages. A defining feature of Alzheimer's disease is a gradual progression without extended plateaus (APA, 2013).

Vascular NCD is the second most common cause of dementia following Alzheimer's disease (Erber, 2005; APA, 2013). Vascular NCD may develop as a result of cerebrovascular events and typically manifests in cognitive deficits with a marked decline in attention, processing speed, and executive functions. Presentations of vascular NCD depend on the types, severity, and location of vascular lesions, which yields a variety of clinical presentations across individuals (APA, 2013). While vascular NCD is characterized by heterogeneous onset and progression, it differs from other dementia etiologies in that progression tends to be step-wise and fluctuating (APA, 2013).

The prevalence of frontotemporal NCD accounts for approximately 5% of all dementia cases (APA, 2013) and is not as common as other dementia subtypes. Diagnostic features discussed in the *DSM-5* include insidious onset and gradual progression of marked behavioral disturbances, personality changes, language impairment, or a combination of the three (APA,

2013). Behavioral disturbances are the hallmark of frontotemporal NCD and may include disinhibition and perseverative, compulsive behaviors (APA, 2013). Apathy, inertia, loss of empathy, and prominent decline in social cognition are symptoms that may also be demonstrated (APA, 2013). In addition, language impairment may manifest in difficulties with speech production, object naming, word-finding, or comprehension (APA, 2013). Memory, learning, and perceptual-motor functioning are generally spared, and there is a less prominent cognitive decline (APA, 2013).

According to *DSM-5* prevalence estimates, lesions known as Lewy bodies may be present in 20% to 35% of all individuals with dementia (APA, 2013). An individual with NCD with Lewy bodies may experience recurrent visual hallucinations, fluctuations in cognition impacting alertness or attention, spontaneous Parkinson-like symptoms, or a combination of the three (APA, 2013). Individuals with NCD with Lewy bodies may also exhibit rapid eye movement sleep behavior disorder, severe neuroleptic medication sensitivity, or both (APA, 2013). Rather than learning and memory, decline is usually demonstrated in executive functions and attention early in the disorder's progression (APA, 2013). The development and course of NCD with Lewy bodies may be characterized by its insidious onset and gradual progression with occasional plateaus (APA, 2013).

NCD may also develop as a result of Parkinson's disease. It has been estimated that as many as 75% of individuals diagnosed with Parkinson's disease will develop major NCD (APA, 2013). Onset is insidious and cognitive decline is gradual, while symptoms such as depression, anxiety, apathy, hallucinations, delusions, personality changes, sleep disturbance, and excessive daytime fatigue may also be present (APA, 2013).

Clinical Implications of Dementia

Individuals with dementia exhibit heterogeneity of clinical symptom profiles, as a complex series of events in the brain trigger development and progression of disease, which also interacts with an individual's personality and sociocultural environment (Erber, 2005). As such, there exists significant variability of presentations within dementia subtypes. Further increasing the likelihood of heterogeneity is comorbidity with other psychopathologies as well as co-occurring dementia subtypes (APA, 2013). Understanding and managing the various symptom profiles as well as the overall dementia process requires discussion of the inevitable development and progression of behavioral and psychological symptoms of dementia (APA, 2013).

Behavioral and psychological symptoms of dementia (BPSD), also known as neuropsychiatric symptoms, refer to non-cognitive clinical phenomena that consist of disturbances in emotions, mood, and perception, thoughts, and motor activity, as well as altered personality traits (Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012). Some common BPSD include anxiety, depression, paranoia, anger, violence, and withdraw (Erber, 2005). The frequency of BPSD depends on the type and severity of dementia, as well as the setting in which an individual resides. In community-dwelling subjects with dementia, BPSD are generally less frequent and severe than in patients in hospital or long-term care facilities (Cerejeira et al., 2012). The most prevalent and clinically significant BPSD include apathy, depression, irritability, agitation, and anxiety (Cerejeira et al., 2012). In addition, BPSD appear to be related to the severity of cognitive impairment (Gallo, Schmidt & Libon, 2008; Poletti, Nuti, Cipriani, & Bonuccelli, 2013), with agitation, irritability, and disinhibition occurring more frequently as individuals enter later stages of dementia and exhibit further cognitive decline (Srikanth,

Nagaraja, & Ratnavalli, 2005). In general, the more cognitive impairment that is present in an individual, the more likely that their emotional well-being is compromised (Sole, Mercadel-Brotons, Galati, & Castro, 2014). In the advanced stages of dementia, individuals seem to experience their environment at a sensory level, yet with a progressive inability to integrate sensory experiences and understand the contexts of the environment (Sanchez et al., 2016). BPSD "are as or more distressing than cognitive manifestations and are frequently the reason that health care is sought" (APA, 2013, p. 612).

According to *DSM-5*, approximately 80% of individuals with dementia due to Alzheimer's disease exhibit behavioral and psychological symptomology (APA, 2013). Mild dementia due to Alzheimer's disease often manifests in apathy, depression, or both (APA, 2013). Language may remain intact, but conversational interaction declines as the disease progresses (Erber, 2005). Individuals with moderate to severe dementia due to Alzheimer's disease commonly exhibit irritability, agitation, or aggression, as well as psychotic symptoms and the propensity to wander (APA, 2013). Increased difficulty with recent memory, word-finding, and verbal fluency are also typical (Erber, 2005). In later stages of dementia due to Alzheimer's disease, commonly observed symptoms include gait disturbance, dysphagia, incontinence, seizures, and involuntary muscle contractions that appear as jerking movements or twitching (APA, 2013). Raia (1999) discussed how individuals with Alzheimer's disease maintain their ability to feel and exhibit emotions, but their insight as to what may have triggered an emotion or the ability to control it is progressively lost.

The clinical profile of vascular NCD is even more heterogeneous than other dementia subtypes, as symptomology depends on the location and severity of vascular pathology in the

brain (O'Brien & Thomas, 2015). Commonly exhibited neuropsychiatric symptoms in vascular NCD include personality changes, abulia (inability to act decisively), mood disturbance, and emotional lability (APA, 2013). However, there appears to be somewhat more personality preservation in vascular NCD than in AD (Erber, 2005). In comparison to frontotemporal dementia, neuropsychiatric symptoms such as apathy, depression, and agitation appear to be more frequently exhibited in vascular dementia (Jung et al., 2016; O'Brien & Thomas, 2015).

While variations in pathology produce various manifestations, there is generally faster disease progression in frontotemporal NCD, with common impairments in insight and social functioning as well as poor judgment, social inappropriateness, and marked disinhibition (APA, 2013). In addition, the frequency and severity of disinhibition, aberrant motor behavior, and appetite or eating disturbances appear to differentiate frontotemporal NCD from other dementia subtypes (Jung et al., 2016; Srikanth et al., 2005). With the presence of such symptoms, impaired social and occupational functioning are common and often result in legal and familial problems (APA, 2013).

In NCD due to Lewy bodies (DLB) and NCD due to Parkinson's disease (PD), symptom profiles tend to be similar and include early emergence of Parkinsonism and neuropsychiatric symptoms such as hallucinations and delusions (Ballard, Arsland, Francis, & Corbett, 2013). However, Parkinsonism may not develop in all cases of DLB. When Parkinsonism is present in DLB, it likely develops concurrently with DLB symptomology, while Parkinson's disease alone may be present for at least one year before NCD is present. In terms of hallucinations and delusions, the risk of individuals experiencing such symptoms increases if vision and visual processing are compromised in either NCD. In addition, apathy and depression, as well as

delusions of theft, infidelity, and misidentification frequently occur in Parkinson's disease and DLB (Ballard et al., 2013).

Of the most prevalent neuropsychiatric symptoms, agitation occurs in over 80% of individuals with dementia (Gallagher, 2011). Measures such as the Cohen-Mansfield Agitation Inventory were specifically developed for assessing the level of agitation in individuals with dementia (CMAI; Cohen-Mansfield, Marx, & Rosenthal, 1989). The inventory assesses the frequency of aggressive behaviors, physically nonaggressive behaviors, hoarding objects, and verbal agitation over a 2-week period, and is intended to be completed by a full-time caregiver to ensure careful observation (Cohen-Mansfield et al., 1989). Agitation behaviors may include vocal and behavioral repetitions such as repeating words, sentences, questions, and complaints or demands as well as rising from a chair and sitting again immediately, repetitive manipulation of an object, wandering, trying to break free of chair restraints, pushing, throwing, holding on to people by force, shouting, crying, hurting oneself or others, and harassing other patients (Ziv, Granot, Hai, Dassa, & Haimov, 2007). Agitation behaviors may also include inappropriate dress or disrobing (Vracem, Spruytte, Declercq, & Audenhove, 2016). It has also been recognized that agitation is often a result of confusion and unmet needs that a person with dementia is unable to explain (Livingston, 2014). As such, agitation in dementia is detrimental to the security and safety of the individual and others and compromises emotional wellbeing. Potential consequences include incurred injury, self-harm, harm to others, increased stress for caregivers and staff, and the negative consequences and effects of using restraints and medications (Lou, 2001; Raglio et al., 2015).

While interventions for managing dementia symptoms have evolved over time, treatment of mood and behavioral disturbances often consists of psychotropic medications as well as psychosocial interventions (Erber, 2005). Psychosocial treatments often used include environmental design and sensory retraining, behavioral interventions, reality orientation, reminiscence therapy, pet therapy, and family therapy (Erber, 2005). However, cognitive interventions become increasingly ineffective as verbal impairments become more severe in later stages of dementia (Sanchez et al., 2015). Individuals with advanced dementia are considered "the most difficult population in which to delineate quality of life issues" as a result of cognitive decline and subsequent issues verbalizing difficulties regarding their quality of life (Volicer & Bloom-Charette, 1999, p. 6).

Many non-invasive interventions have been increasingly utilized as alternatives to pharmacological approaches for managing BPSDs. Outcome studies of aromatherapies, for example, have suggested that various placements of essential oils such as lavender or lemon balm have resulted in reductions in problematic behaviors (Raetz, 2013). In addition, aromatherapies may involve a reminiscence component, as utilizing and maintaining familiar odors associated with an individual's life history (i.e., the smell of coffee, the soap they used, cooking smells) may reduce physically nonaggressive behaviors of agitation (Vracem et al., 2016). Studies have also suggested that providing multisensory environments (Sanchez et al., 2016), and massage therapies, such as providing hand massages, may yield short-term improvements in agitation (Raetz, 2013).

Art has long been recognized for its therapeutic value. Art therapies for individuals with dementia often utilize visual arts such as drawing, painting, or crafting to facilitate creative

expression and communication, and allow individuals to "provide access to connection with friends, family, and extended community and access ways of giving meaning to experiences, feelings, and observations" (Basting, 2006, p. 17). More recently, art therapies such as music therapy have been shown to improve behavioral and psychological symptoms, social and communication skills, and some cognitive functions as well as alleviate caregiver burden for individuals with dementia (Wang & Li, 2016), suggesting that the use of music may yield benefits in multiple domains of functioning and overall quality of life. Music therapy in dementia care has been referred to as the "application of specific music techniques to meet physical, social, emotional, and psychological goals and objectives" (Hanser, 1999, p. 143). Furthermore, research into the effects of music therapy interventions in dementia care emerged in the second half of the 20th century (Schall, Haberstroh, & Pantel, 2015), and a growing body of research has also proposed music therapeutic interventions for reduction in BPSD for individuals with dementia (Choi, Lee, Cheong, & Lee, 2009; Eells, 2014; Gerdner, 1997, 2012; Gerdner & Schoenfelder, 2010; Hanser, 1999; Matthews, 2015; Park, 2013; Raetz, 2013; Raglio et al., 2012; Sung, Chang, & Lee, 2010; Tilly & Reed, 2004). In 2001, Lou reviewed seven studies that utilized music as interventions for managing agitation in individuals with dementia. The state of the science at that time demonstrated music as a promising intervention for decreasing agitation and increasing quality of life. However, Lou (2001) had identified considerable limitations of the seven studies that were reviewed and called for more rigorous research designs that examined the wide array of techniques and collaboration utilized in the application of music as a therapeutic approach or intervention. Lou (2001) also suggested that the immediate and sustained impact of music therapy on agitation and other BPSD should be evaluated. Similarly, a qualitative review

of clinical empirical studies on the effects of music activities on emotional and behavioral responses concluded that these interventions enhanced the potential for engagement in meaningful social activity in addition to observed decreases in behavioral and psychological symptoms (Sherratt, Thornton, & Hatton, 2004). A more recent review of controlled trials and randomized controlled trials maintains that music as a therapeutic approach is beneficial for individuals with dementia by improving behavioral disorders, agitation, and anxiety (Gomez-Romero et al., 2017).

In addition to the massive health care costs of treating and managing neurocognitive disorders (Erber, 2005), dementia-related decline compromises the quality of life and overall well-being of older adults. Management of agitation and other problematic psychological and behavioral symptoms associated with dementia continues to be taxing on caregivers and nursing staff (Matsumoto et al., 2007; Onishi et al., 2005). Pharmacological treatment of dementia is necessary, but it is not sufficient in ameliorating the effects of dementia (Sole et al., 2014).

Statement of the Problem

While research has begun to address non-invasive interventions to decrease agitation and other problematic behavioral and psychological symptoms of dementia (Tible, Riese, Savaskan, & Gunten, 2017), and music-based treatment protocols for dementia have been developed, there is limited discussion of which music-based interventions are most effective in decreasing BPSD with consideration of dementia severity, setting of care, or other factors. There is also limited discussion of a systematic way to select and implement music-based interventions that are easily accessible and feasible for caregivers and nursing staff.

Purpose of the Review

The intention of this literature review is to identify the benefits of music-based interventions in dementia care within various domains of functioning. In addition, a systematic approach to utilize assessment of dementia severity to determine the most appropriate and effective music-based interventions for decreasing behavioral and psychological symptoms and improving quality of life is explored.

Research Questions

This review will address the following research questions:

Do music-based interventions improve cognitive, psychological, behavioral, and social functioning among individuals with dementia?

Are music-based interventions effective for various levels of dementia severity?

Research Procedure

Various databases were utilized to locate psychological and scientific journals containing peer-reviewed articles that address the geropsychology and neuroscience foundations for the therapeutic use of music to address problems related to cognitive, psychological, behavioral, and social functioning associated with dementia. In the interest of conducting an empirically-based review of the literature, non-peer-reviewed studies were excluded from the formal review. However, due to variability of study designs and small sample sizes of selected studies, it may be useful to examine non-peer reviewed studies with potentially larger sample sizes in the future. Nevertheless, peer-reviewed studies that demonstrate the various ways music has and may be implemented to improve cognition, increase positive mood, decrease agitation, and decrease problematic behaviors were examined. As such, articles regarding the use of group and

individual music-based interventions were reviewed with consideration of dementia severity of studies' participants, setting (i.e., in-home or residential), and assessment instruments used to determine mental status, music interventions, cognitive abilities, frequency and intensity of BPSD, and severity of dementia. Based on the findings of this review, recommendations based on feasibility and accessibility for caregivers and staff are also discussed.

CHAPTER II: THE CLINICAL VALUE OF MUSIC

The Broader Power of Music

While music may serve various and differing functions across cultures, universal to human experience is the capacity of music to invoke emotional experience (Juslin et al., 2016). It is also an activity that reflects culture and one's external environment, as well as being a representation of one's interpretation of their external environment (Juslin et al., 2016).

> Like speech (language), music is a symbolic system specific to human beings, but which both underlies and contains more than a shared language meaning system. Music cannot 'mean' in the way that language might 'mean;' music goes beyond the kind of conceptual meaning that could be captured in words, but which may underlie words. Music has a unique quality that enables direct access to an affective and corporal aspect of the human psyche. (Sutton & Backer, 2009, p. 75)

Anecdotally, Hanser (1999) discussed the impact that music may have on individuals by influencing how they interact with their environment through invoking and forming associations to memories and emotional experiences. Chanda and Levitin (2013) further acknowledged the complexity of experiencing musical pleasure in that "listeners often report that the most moving music evokes two or more emotions at once" (p. 180). As such, experiencing music is personal, yet it is also a shared experience with others. In addition, "when listening to music we have available the possibility of experiencing ourselves as both familiar and changed" (Sutton & Backer, 2009, p. 76).

Music has been used for therapeutic value in relaxation, pain management, and personal growth as well as in psychotherapy (Chanda & Levitin, 2013). Dr. Lisa Wong discussed the

common factors of music and medicine as healing arts (Lindau, 2013). Music and medicine require attention to detail, creativity, and empathy, much like what is required of the ability to learn a foundation such as learning to play an instrument or learning about anatomy, as well as adapting to the environment such as when playing in an orchestra or starting to work in a hospital (Lindau, 2013).

The Neuroscience of Music

Chanda and Levitin (2013) reviewed literature focusing on the neurochemistry associated with music that is experienced as pleasurable or moving. Their summary of studies that examined musical pleasure highlighted increased regional cerebral blood flow in areas such as the ventral striatum, nucleus accumbens, insula, medial prefrontal cortex, hippocampus, ventral tegmentum area, and hypothalamus, with deactivations in areas such as the amygdala (Chanda & Levitin, 2013).

The Music and Science Symposium held in 2013 presented new findings in neuroscience, music therapy, music cognition, music technology, and music medicine (Lindau, 2013), and implications for the field of music science were discussed. Lindau (2013), in a report of symposium presentations, described Dr. Concetta Tomaino's conclusion that if it were known how certain aspects of music affect cognitive functions such as memory, attention, or those linked with the sensory system, then impairments in such functions could be treated more effectively.

Neuroimaging studies have demonstrated that music associated with autobiographical memories provokes activation of the medial prefrontal cortex, a brain area that is spared in Alzheimer's Disease for a longer time than other areas associated with memory (Haj, Postal, &

Allain, 2012; Janata, 2009). Thus, the explanation given was that areas of the brain linked with emotional components of music processing might be spared in Alzheimer's disease. Other benefits have also been examined with rhythmical music, which may lead to improved balance and coordination in patients with Parkinson's disease, based on the idea that motor timing and rhythmic processing may be linked (Thaut & Abiru, 2010). In addition, singing familiar songs as well as tapping in rhythm have been shown to improve language production in patients with nonfluent aphasia (Tomaino, 2012). Such demonstrations lend credence to the stance that if aspects of music processing can be connected to different language functions, then neuroscience may have the potential to clarify biological aspects of the therapeutic effects of music on various disorders (Tomaino, 2012).

Lindau (2013) also described Dr. Aniruddah Patel's discussion on the brain's strong reaction to music. Dr. Patel posits that music activates at least six pathways in the brain: brain stem reflexes, implicit associations with emotional events, emotional contagion from voice-like emotional sounds, visual imagery, episodic memory, and musical expectancy. The Absorption in Music Scale (AIMS; Sandstrom & Russo, 2013) measures the ability and willingness to let music elicit strong emotional experiences and has been shown to correlate with emotional responses to music (Lindau, 2013). The AIMS might therefore be a good predictor of the effectiveness of different forms of music therapy for an individual patient and may help ensure that a patient receives the most beneficial intervention.

In a study that evaluated the endocrinology of dementia patients who underwent music therapy, it was found that music decreases stress-related activation of the endocrine and autonomic nervous systems (Suzuki et al., 2004). There is also scientific evidence that music has

the potential to impact motivation through neurochemical systems of reward and pleasure, such as in dopaminergic neurotransmission (Chanda & Levitin, 2013).

Addressing Why Music Works

Chanda and Levitin (2013) conducted a literature review that summarized studies that yielded evidence of music's ability to improve individual health and well-being through engaging neurochemical systems for pleasure, reward, motivation, social affiliation, arousal and stress, and immunity. As found in a qualitative study by McDermott, Orrell, and Ridder (2014), the effects of music appear to go beyond the reduction of behavioral and psychological symptoms, because music is closely linked to personal identity and life history as an individual. Music invokes autobiographical memories and evokes both positive and negative emotions (Peeters, Harbers, & Neerincx, 2016; Sakamoto, Ando, & Tsutou, 2013; Haj et al., 2012). As such, self-selected or preferred music evokes joy and a release of dopamine (Sakamoto et al., 2013).

Studies have also found strong evidence that amongst individuals with Alzheimer's disease or other dementia-related cognitive impairment, music can be used to evoke autobiographical memories (Gerdner, 2010; Haj et al., 2012; Lou, 2001; Park, 2013; Park & Specht, 2009; Sanchez et al., 2016; Tilly & Reed, 2004). Gagnon, Peretz, and Fulop (2011) acknowledged music as a medium for communication that evades the language and semantic deficits of dementia. Further, Gagnon et al. (2011) examined the capacity for emotional judgment of music in 12 individuals with mild dementia of the Alzheimer's type. Results revealed a spared ability to employ structural determinant cues such as tempo and mode for emotional interpretation of music and to discriminate between varying levels of happy and sad

music excerpts (Gagnon et al., 2011). In addition, in a study that aimed to assess emotion recognition in mild dementia due to Alzheimer's disease, three tasks for emotion recognition were given to seven individuals diagnosed with mild dementia due to Alzheimer's disease, and their performance was compared to the performance of 16 healthy older adults (Drapeau, Gosselin, Gagnon, Peretz, & Lorrain, 2009). The task for emotion recognition from face consisted of the selection of the emotion expressed by 60 images of emotional faces from *Pictures of Facial Affect* (Pictures of Facial Affect; Ekman & Freisen, 1976) presented in random order, which evoked emotions such as fear, happiness, sadness, disgust, anger, and surprise. The task for emotion recognition of prosody consisted of rating the extent to which an emotion was expressed in 60 randomly presented sentences read aloud with concordant emotional semantic content that evoked happiness, fear, peacefulness, sadness, anger, disgust, and surprise on a 10-point scale. The task for emotion recognition in music consisted of rating the extent to which an emotion was expressed in 56 randomly presented clips from genres intended to evoke happiness, fear, sadness, and peacefulness on a 10-point scale. Mann-Whitney tests were performed and revealed significantly less accurate ability of the individuals with Alzheimer's disease to recognize sadness ($z = -2.67$, $p < .01$), disgust ($z = -3.11$, $p < .01$), and fear ($z = -1.2$, $p < .05$) in the facial expressions task when compared with the healthy control group. However, no significant differences were demonstrated in the performance of individuals with Alzheimer's disease compared with the healthy control group in the ability to accurately recognize emotion in prosody and music. Given that impairment in performance was only demonstrated in emotion recognition from the face, the authors concluded that their results

suggest the preservation of auditory emotions or at least the preservation of emotion recognition from prosody and music in mild dementia due to Alzheimer's disease (Drapeau et al., 2009).

Types of Music Interventions

Active music interventions involve participation in singing, dancing, or playing a musical instrument (Pedersen, Andersen, Lugo, Andreassen, & Sutterlin, 2017). Music therapy (MT) for example, involves working with a certified music therapist and is intended to facilitate expression and modulation of emotions and attunement to affect (Raglio et al., 2015). Group or individual singing and group or individual instrumental music has been examined by numerous researchers (Lesta & Petocz, 2006; Raglio et al., 2015; Sole et al., 2014), and these studies have demonstrated results that reflect improvement of nonverbal communication (i.e., gesturing, smiling, touching), body engagement (i.e., tapping to rhythm, moving body to rhythm, walking with others), the ability to listen (without playing), and facilitation of verbal and nonverbal behaviors and social interaction.

In passive music interventions, participants listen to live or recorded music rather than actively creating music (Pedersen, et al., 2017). Included in this type of intervention is referred to as Individualized Music Listening (LtM; Raglio et al., 2015) or Individualized Music Interventions (IM; Gerdner, 1997). Individualized music as an intervention is defined as music that has been integrated into a person's life and is based on personal preference, which inherently considers culture and ethnicity (Gerdner, 2010, 2015; Park, 2013). Additional identified benefits for IM are ease in execution and its inherent quality as non-invasive (Park, 2013). Individualized music, passive music, and clinical music therapy have been demonstrated to be cost-effective and alternative methods to reduce BPSDs such as agitation in home-dwelling and

institutionalized individuals with varying levels of dementia (Matthews, 2015; Park, 2013; Park & Specht, 2009; Ziv et al., 2007).

Music's Impact on Functioning

Cognitive functioning. Studies have suggested that music can be utilized to enhance some aspects of cognitive functioning (Gallego & Garcia, 2017; Raglio et al., 2017; Zhang et al., 2017) and specifically in areas such as reality orientation (Gallego & Garcia, 2017; Lou, 2001; Smith-Marchese, 1994) and memory recall (Gallego & Garcia, 2017; Lord & Garner, 1993). A recent review of the literature discussed components of cognition impacted by music therapy, which included music's ability to provoke responses and modulation of emotion, evoke movement or rhythmic patterns, and capture an individual's attention (Gomez-Romero et al., 2017). Group musical activities may facilitate shared attention, communication, and improved spatial orientation (Fischer-Terworth & Probst, 2011) as well as in language and memory (Gallego & Garcia, 2017). However, at least one study has concluded that group music interventions do not appear to impact or prevent the cognitive decline that is inevitable in dementia (Fischer-Terworth & Probst, 2011). Given that these individual studies examined additional components, they are referenced in subsequent sections and are discussed in more detail in the next chapter.

While some studies have demonstrated components of cognitive functioning that are improved as a result of music interventions, a meta-analysis conducted by Ueda, Suzukamo, Sato, and Izumi (2013) indicated insufficient evidence of improved cognitive functioning and activities of daily living in individuals with dementia of varying severities due to Alzheimer's disease, vascular disease, Parkinson's disease, or mixed types of dementia. The 20 studies

included in the meta-analysis utilized music therapy interventions such as singing, playing musical instruments, listening to live performances, or a combination of such interventions. Some studies utilized individualized music listening and a few studies used rhythmic exercising to music. There were 16 studies that included secondary outcome measures of cognitive functioning, and a random effects model of cognition did not reveal statistically significant improvements in cognition as a result of music interventions (Ueda et al., 2013).

Rather than gross cognitive improvements, it seems that music may instead provide an alternative means of communication for individuals with severe dementia who tend to have lost the ability to interpret verbal communication (Gerdner, 1997). Furthermore, some studies have demonstrated that the use of music can aid in retention, suggesting that music may have utility in improving memory for individuals with dementia (Moussard, Bigand, Belleville, & Peretz, 2014). In a within-subject design comparing eight individuals with mild level of AD with seven healthy individuals, Moussard et al. (2014) measured immediate recall, 10-minute delayed recall, and 4-week delayed recall of spoken versus sung lyrics. They examined the influence of familiarity with the music presented and repeated learning sessions on retention.

The results of the study by Moussard et al. (2014) showed that music did not improve immediate recall for individuals with Alzheimer's disease, even when a familiar melody was used to learn new lyrics. However, results also showed that the singing condition benefitted retention of lyrics after a 10-minute delay in Alzheimer's disease participants when compared with retention of spoken lyrics, independent of melody familiarity. Analysis of the pattern of results suggested that the advantage of the singing lyrics in the Alzheimer's disease group may be explained by music's potential capacity to compensate for weak retrieval by facilitating lexical search or other

alternative strategies. However, the authors noted that generalizability is difficult because of the very small sample size in their study. They also indicated that their findings reflecting the benefits of the music condition in delayed recall was relatively small. Larger samples to yield more robust findings as well as insight about the types of patients who would benefit most from singing to aid in retention or improve cognition were acknowledged as needs for future research. Nonetheless, they posited that because musical material appears to be easier for Alzheimer's disease patients to retain, utilizing melodies to aid in retention of lyrics may be very useful in dementia care regarding enhancement of cognition or maintaining activities of daily living (Moussard et al., 2014).

A noteworthy feature of this study was the authors' use of the Montreal Battery of Evaluation of Amusia (MBEMA; Peretz et al., 2013), which assesses an individual's ability to discriminate changes in melodies, recognition of emotions from brief instrumental excerpts, and short-term memory for tones. The use of such measures may be very beneficial for future studies examining the effectiveness of music interventions in order to assess whether music would be an appropriate intervention for an individual, and to have additional inclusion and exclusion criteria for study participants. It may also be useful to examine whether the scores on the MBEMA or other similar measures are influenced by dementia severity.

Behavioral functioning. Hanser (1999) discussed the evidence supporting music therapy's ability to increase responsiveness in individuals with advanced dementia, who are otherwise unresponsive to most external stimuli. They further discuss music therapy as an alternative means of expression for individuals with advanced dementia (Hanser, 1999). Earlier research also examined the use of music to increase behaviors that support food intake

(Ragneskog et al., 1996). A more recent study conducted by Lancioni et al. (2013) demonstrated that 5 to 10-minute sessions of music stimulation interspersed throughout the day, utilizing individuals' preferred music, enhanced positive participation in six individuals with severe dementia due to Alzheimer's disease. Individuals who were typically passive or withdrawn demonstrated an increase in behaviors such as singing; rhythmic movement of hands, feet, or body; positive verbal comments; and smiling. Such behaviors were indicative of increased engagement in their environment, suggesting an improvement in behavioral functioning at least during music stimulation (Lancioni et al., 2013).

Recent meta-analyses reported statistically and clinically robust support for music-based interventions to reduce agitation (Pedersen et al., 2017) and enhance overall behavioral functioning (Zhang et al., 2017). In a study by Ziv, Granot, Hai, Dassa, and Haimov (2007), the use of six popular songs from 1964 were played as background music for 17 minutes in a milieu residential setting to examine the effect of background music on behavior in 28 patients with moderately severe levels of dementia due to Alzheimer's disease. Results showed a significant increase in positive social behaviors including attempts at making contact, laughing, smiling, humming, singing, attempts to calm another patient, drumming hand or foot to the rhythm of the music, rocking the body to the rhythm of the music, caressing, touching, and shaking hands. Results also showed a reduction in negative behaviors related to agitation such as vocal repetitions, repetitive rising from and sitting in a chair, repetitive manipulation of objects, wandering, attempting to break free from chair restraints, pushing, throwing objects, shouting, crying, aggression toward self or others, or harassing others. Further, nine of the patients'

repetitive agitated behaviors disappeared completely while background music was playing (Ziv et al., 2007).

However, some studies suggest that music interventions may not be as effective for reduction of some of the specific behaviors associated with agitation such as wandering (Robinson et al., 2006). In addition, a study that aimed to examine the impact of a live music program on agitation and anxiety in dementia found no significant reductions, with some increase in verbal agitation behaviors (Cooke, Moyle, Shum, Harrison, & Murfield, 2010). Overall, mixed results appear to be the result of variations in the types of music interventions in combination with the target behaviors and dementia severity.

Social functioning. Music interventions have the potential to stimulate social engagement and facilitate social bonds (Chanda & Levitin, 2014; Peeters et al., 2016; Sakamoto et al., 2013; Sherratt et al., 2004). Group musical activities may facilitate an increase in overall engagement with an individual's environment and activities that are within an individual's capabilities (Fischer-Terworth & Probst, 2011).

Peeters et al. (2016) conducted an observational study using a prototype of the Music ePartner, which is a music platform program designed to be used on an electronic tablet device. The baseline requirements of the Music ePartner were constructed to include organization of music based on personal life events, the creation of new music albums annotated by personal life events, the ability to search for music online and add to music collections, and the ability to add pictures or graphics to the music collections. Five individuals with dementia that ranged from mild to severe levels of severity were recruited from two Pieter van Foreest care facilities in Holland. Each individual participated with a close relative (i.e., wife, significant other, daughter),

and were observed as a pair. For each pair, when the Music ePartner played the individualized music lists, the individual with dementia was observed humming, singing, smiling, or all three, with their relative. A sense of safety and familiarity appeared to be yielded as participants recalled old memories and told stories, which evoked positive mood and positive shared experience with their relative. The Music ePartner provided a platform for the use of personalized music in dementia care and may be indicated in supporting and improving social functioning by engaging relatives, friends, and caregivers in customizing the content with the individual, as well as by facilitating potential for shared experiences with others in their social environment (Peeters et al., 2016).

In a study that examined the effect of generationally familiar background music on behavior in 28 patients with Alzheimer's disease within the moderately severe range, the most pronounced results were the increase in positive social behaviors (p = .001) such as smiling, conversing, or moving to the rhythm (Ziv et al., 2007). There was also a significant decrease in negative behaviors (p = .001) such as wandering, fidgeting, and aggression towards others. Such results provide implications for utilizing familiar background music in milieu settings to improve social functioning for individuals with advancing dementia (Ziv et al., 2007).

However, in a study that explored the impact of participation in a weekly group therapy music program on quality of life, changes in affect, and social engagement for 16 institutionalized individuals with mild, moderate, or severe dementia, Sole et al. (2014) found no improvement in interpersonal relations as a domain within quality of life or in social engagement after 12 weeks. Participants in this study included individuals with dementia due to Alzheimer's disease, vascular disease, Parkinson's disease, and other or mixed etiology. Quality of life was

measured at pre and posttest using the GENCAT for Quality of Life (GENCAT; Verdugo, 2008). Changes in affect and social engagement were measured using five behavior categories defined by Brotons and Pickett-Cooper (1996), which included verbalization, physical contact, visual contact, active participation in music activities, and facial affect and body expressions. Two music therapists assessed changes in affect and social engagement by observing video recordings of participants, and an interrater reliability rate of 91% was established. Results indicated no significant improvement in overall quality of life from pre to posttest. Results also demonstrated that while high levels of participation were maintained throughout the music program, no significant changes in affect were observed, and overall expression of emotions remained limited. The authors acknowledged the methodological limitations of their study, which included a very small sample size as well as individuals who fell within varying levels of dementia. In addition, they acknowledged the potential inappropriateness of the scale they used to measure quality of life, in terms of whether the domains of their measure were realistic or applicable to the quality of life for an individual with dementia. They further discussed the need for future studies that reconsider the meaning of quality of life for individuals who present with dementias of differing severities and suggested the selection or development of scales that are relevant to this population to more effectively conduct outcome research for interventions (Sole et al., 2014).

Psychological functioning. The study of music has long demonstrated its impact on psychological functioning in terms of stress reduction and improving social interaction as well as strengthening the immune system (Campbell, 1988). A 6-month study that utilized group music therapy interventions in conjunction with cognitive behavioral and environmental interventions

for 26 individuals with mild and moderate dementia found reductions in neuropsychiatric symptoms such as anxiety, depression, agitation, and aggression in addition to an improvement in social communication, emotional expression, and activity levels when compared to 23 individuals in the control group who received non-specific occupational therapy (Fischer-Terworth & Probst, 2011). A pre-post design was used to evaluate outcomes. Neuropsychiatric symptoms were assessed using the Neuropsychiatric Inventory (NPI; Cummings et al., 1994) and the Geriatric Depression Scale (GDS; Shiekh & Yesavage, 1986) was also used as an additional measure of depression. The Inventory to Assess Communication, Emotional Expression and Activity in Dementia (ICEA-D; Fischer-Terworth, 2010) was used to assess general ability to communicate with others, quality of communicative response to the environment, social interaction with professional caregivers, social interactions with other patients, activity level, and ability to express emotions. While improvements in some neuropsychiatric symptoms were demonstrated, pre and post comparison on NPI scores did not reach statistical significance (Fischer-Terworth & Probst, 2011). NPI results also indicated that group music therapy did not have a significant impact on psychotic symptoms. However, improvements in social communication, emotional expression, and activity levels as measured by ICEA-D were statistically significant.

A number of other studies have demonstrated evidence of reduced anxiety in response to music interventions (Ing-Randolph, Phillips, & Williams, 2015; Ueda et al., 2013; Zhang et al., 2017), and there is some promising research that supports the use of music interventions to address depressive symptoms (Ueda et al., 2013; Zhang et al., 2017). A study conducted by Gallego and Garcia (2017) evaluated the use of group music therapy for 42 individuals with mild

and moderate levels of dementia. In this study, music preference was assessed, and music selections were played on a stereo system for 45 minutes at a frequency of twice per week. Sessions were led by two certified music therapists. Activities in each session included a welcome song where patients greeted each other and introduced themselves, engagement in rhythmic hand-clapping or use of musical instruments (i.e., a tambourine, maracas, or triangle), engagement in rhythmic movement of arms and legs with background music, music with dance therapy using balls and hoops, and guessing song activities such as naming a tune or music bingo. Sessions concluded with a farewell song. The study assessed levels of neuropsychiatric symptoms using the NPI (Cummings et al., 1994) and the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) at baseline, follow-up at 3 weeks, and at the conclusion of the 6-week study. Results demonstrated a significant decrease in neuropsychiatric symptoms ($p <$ .001) across all participants, with the most notable reductions in anxiety, agitation, delusions, irritability, and hallucinations. However, the analysis of scores by dementia severity revealed significant reductions in anxiety symptoms for individuals within the mild dementia group, but not for the moderate dementia group. Mean baseline anxiety scores were higher in the mild dementia group compared to the moderate dementia group, but mean anxiety scores were the same at the end of the study for both mild and moderate dementia groups. In addition, significant reductions in delusions, hallucinations, agitation, and irritability were indicated for the moderate dementia group, but not for the mild dementia group. However, it is worth noting that mean baseline scores for these symptoms were significantly higher in the moderate dementia group than in the mild dementia group, which explains the statistically significant improvements indicated for the moderate dementia group when such symptoms appear to be more relevant and

problematic (Gallego & Garcia, 2017). Further, as previously stated, given that this study addresses multiple components relevant to this review, it will be discussed further in the following chapter.

CHAPTER III: MUSIC-BASED INTERVENTIONS CONSIDERING DEMENTIA SEVERITY

In the interest of initiating a discussion about informed selection, appropriateness, and feasibility of music-based interventions for nursing staff and caregivers to administer to individuals with dementia, the results of several studies aimed at reduction of BPSD were reviewed or examined in further detail in the context of dementia severity.

Participants with Mild to Moderate Dementia

A study conducted by Choi et al. (2009) investigated the effects of a group music intervention program on behavioral and psychological symptoms in individuals with moderate levels of dementia and their caregivers. The study took place for 5 weeks at a dementia daycare unit in South Korea and 20 participants were recruited, with 10 participants in the intervention group and 10 in the usual care control group. Participants were nonrandomly allocated to the treatment group or the control group, but the factors that determined allocation were not discussed or identified. The group music intervention was administered by three certified music therapists and consisted of singing songs, analysis of libretto, making musical instruments, playing music instruments, song drawing, and songwriting. The group music intervention was administered for 50 minutes, three times per week for 5 weeks, resulting in a total of 15 sessions (Choi et al., 2009).

Cognitive functioning was assessed utilizing the MMSE (Folstein, Folstein, & McHugh, 1975). While dementia severity was not an inclusion or exclusion criteria, the average MMSE score fell within the moderate range of impairment (Choi et al., 2009). Psychological and behavioral functioning was assessed at pre and post-intervention utilizing the Geriatric

Depression Scale (GDS; Yesavage et al., 1983), the Geriatric Quality of Life Inventory (GQoL; Lee et al., 2003), and the Neuropsychiatric Inventory-Questionnaire (NPI-Q; Kaufer et al., 2000). An additional feature of the NPI-Q includes assessment of caregiver distress, in which the level of distress experienced as a result of each behavior is ranked on a scale of 1 to 5 by the caregiver. Following the 15 sessions, results demonstrated significant improvements in depression and the quality of life in the individuals with dementia who received the group music intervention as well as significant improvements in neuropsychiatric symptoms including hallucinations, agitation, disinhibition, and irritability in the music therapy group when comparing pretest and posttest scores (Choi et al., 2009). When compared with the control group, results of paired *t*-tests showed significant improvement in the overall NPI-Q scores ($p = .004$) in the group music intervention, which was primarily attributed to significant improvement in agitation ($p = .02$), as no other subcategories of NPI-Q reached statistical significance. In addition, results showed significant improvement in caregiver distress ($p = .003$) as a result of improvement in observed agitation ($p = .05$) when compared with caregivers of individuals who received usual care. Thus, the study demonstrated that a 5-week active group music program significantly improved agitation severity for individuals with moderate levels of dementia and reduced caregiver distress associated with agitation in comparison to those who received usual care. The authors acknowledged the limitations of their study as a result of having a small sample and a lack of randomization, which may have resulted in selection bias or Type II error. The authors also acknowledged that because results were based on caregiver assessment of symptoms, they not being blinded to group allocation may have resulted in bias or expectation effects. They further

acknowledged the need for studies to measure outcomes at multiple time points in the study and to assess residual outcomes post-intervention (Choi et al., 2009).

A study was conducted to examine the impact of a 40-minute live group music program on agitated behaviors and anxiety in individuals with dementia (Cooke et al., 2010). A cross-over research design was used with a sample of 47 participants with mild to moderate dementia from two long-term care facilities. Cognitive functioning was measured utilizing the Mini Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975). A live music program was administered by two musicians for 40 minutes, three mornings per week for 8 weeks (Cooke et al., 2010). Each session involved 30 minutes of familiar song-singing led by the musicians and 10 minutes of listening to pre-recorded instrumental music. Following 8 weeks of the intervention condition, a washout period of 5 weeks was included before administering the next 8 weeks of the control intervention condition, in which participants were engaged in interactive reading activities led by a trained facilitator. Agitation levels were measured using the Cohen-Mansfield Agitation Inventory-Short Form (CMAI-SF; Werner, Cohen-Mansfield, Koroknay, & Braun, 1994) and anxiety levels were measured using the Rating Anxiety in Dementia (RAID; Shankar, Walker, Frost, & Orrell, 1999). Anxiety and agitation were measured at baseline, mid-point (8 weeks), and post-intervention (another 8 weeks) of both control intervention and music intervention groups. The comparison between conditions were examined using one-way ANOVAs and repeated measures ANOVAs.

Results showed that a live music program failed to demonstrate any significant impact on symptoms of agitation or anxiety (Cooke et al., 2010). Despite these results, it is worth noting that a series of multiple regressions suggested that a shorter length of time living in a facility as

well as gender may have been a predictor of agitation, and greater cognitive impairment as measured by the MMSE was associated with a higher level of agitation. Further explanation of results acknowledged the potential for different results had the music program condition utilized individuals' music preferences. Suggestions for future outcome studies examining the effectiveness of music interventions included a larger sample size and dissemination of interventions when it is most relevant for the individual, as in when symptoms are most prevalent for an individual (Cooke et al., 2010).

A study conducted in Germany examined the effectiveness of a group music therapy model on neuropsychiatric symptoms and social communication in individuals with mild to moderate levels of dementia (Fischer-Terworth & Probst, 2011). The group music therapy intervention was utilized within the context of a TEACCH approach (Treatment and Education of Autistic and related Communication handicapped Children; Schopler, Mesibov, & Hearsey,1995), which was adapted for individuals with dementia given the overlap of behavioral and psychological difficulties that arise for autism or dementia (Fischer-Terworth & Probst, 2011). The TEACCH approach provides guidelines for the music therapy intervention to be designed in such a way that targets an individual's capacity to regulate reactions to social environments by providing visual structuring of the living or intervention space; time-related structuring in terms of schedule, frequency, and duration of interventions; and structuring activities included in the intervention according to cognitive skills (Fischer-Terworth & Probst, 2011). The music therapy intervention included playing musical instruments, singing together with piano accompaniments, and listening to familiar music, as well as reading song lyrics, recognition of songs, and instruction and application of techniques to engage in musical

behaviors. In addition, psychoeducational counseling was provided to caregivers and at least one family member of every individual in the experimental group.

The sample consisted of 49 individuals with mild to moderate levels of dementia of varying or unknown etiologies who resided in a specialized dementia care unit. Study duration was 6 months between pretest and posttest, and a two-group pre-post design was utilized with 26 participants in the intervention group and 23 patients in the control group. In order to achieve sufficient parallelization of demographic features, dementia diagnosis, comorbidity, and neuropsychiatric features, participants were not allocated to the treatment group and control group randomly. The group intervention consisted of six to 10 participants at a time, once per week. Individuals in the control group received nonspecific, occupational interventions and standard care.

The MMSE (Folstein, Folstein, & McHugh, 1975) as well as the Global Deterioration Scale (GDS; Reisberg, Ferris, DeLeon, & Crook, 1982) was used to assess cognitive functioning and level of dementia severity. The impact of the intervention on depression symptoms was assessed using the Geriatric Depression Scale (GDS; Yesavage et al., 1983), and the impact on overall neuropsychiatric symptomology was examined by the Neuropsychiatric Inventory (NPI; Cummings et al., 1994). The impact of the intervention on social communication, emotional expression, and activity was assessed using the Inventory to Assess Communication, Emotional Expression, and Activity in Dementia (ICEA-D: Fischer-Terworth, 2010). A two-way analysis of variance (ANOVA) was used to examine outcomes. Results showed a significant improvement in social communication, emotional expression, and activity level ($p < .01$), and nearly significant improvement in overall neuropsychiatric symptoms ($p = .06$) at post-test in the

intervention group. More specifically, there were significant reductions in apathy ($p < .01$), irritability ($p < .01$), and agitation or aggressive behaviors ($p < .05$) in the intervention group but not the control group. In addition, depression decreased in the intervention group similarly to the control group ($p > .05$), which was attributed to the tendency for depression to decline as dementia progresses. Furthermore, interviews with staff revealed observations of improvements in mood, spatial orientation, and motor control improvements as well as decreased impulsivity and agitation and improved facilitation of communication (Fischer-Terworth & Probst, 2011).

Overall, the study demonstrated that a group music intervention informed by TEACCH may improve the overall mental well-being of individuals with dementia by improving their interactions with their social environment and their engagement in activities that are within their cognitive capabilities. The group music intervention also demonstrated its effectiveness in the improvement of several neuropsychiatric symptoms including apathy, irritability, and agitation or aggression. A limitation of the study was acknowledged as having a relatively small sample size. However, many other studies had significantly fewer participants compared to this study. Another limitation discussed in the previous chapter was the nonrandomization of allocating participants to groups to establish sufficient parallelization, which likely resulted in limited validity. An additional limitation may have been not examining the impact of the type of dementia on the intervention's effectiveness, which would have been relevant given that the study duration was 6 months and that dementia types have different courses and progressions of decline (Fischer-Terworth & Probst, 2011). Further, the lack of assessment between pre and post-test spanning 6 months is a limitation given the increased potential for confounding variables influencing results during that wide time frame. It would have been beneficial to the

integrity of the results if additional follow-up measures were given during the 6 months between pre and post-test.

In the aforementioned study by Gallego and Garcia (2017), the impact of group music therapy sessions on cognitive, psychological, and behavioral functioning was examined. The sample consisted of 42 patients with mild to moderate dementia due to Alzheimer's disease from two geriatric residences in the Region of Murcia, Spain. At each residence participants were divided into two groups to reach a consensus on preference using the Questionnaire of Musical Preferences (Mercadal-Brotons & Auge, 2008). Groups were then engaged in 45-minute active group music therapy sessions at twice per week for 6 weeks, which were led by two music therapists who facilitated activities such as singing, clapping, playing musical instruments, moving to the rhythm of background music, guessing songs, and dancing. Cognitive, psychological, and behavioral symptoms were assessed using the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975), the Neuropsychiatric Inventory (NPI; Cummings et al., 1994), the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), and the Barthel Index (BI; Mahoney & Barthel, 1965). Participants were assessed at baseline, 3 weeks into the intervention phase, and at 6 weeks, marking the time of the concluding outcome assessment. Repeated measures ANOVA was used to evaluate outcome variables throughout the 6-week intervention period.

Overall outcomes in addition to the separate outcomes for mild and moderate dementia were examined. For the 25 individuals with a mild level of dementia, MMSE results showed significant improvements in orientation (p = .012) and memory (p = .012) in comparison to baseline, yet no significant improvements in language. The NPI also showed significant

improvements in anxiety (p = .012) and disinhibition (p = .024), but only slight improvement in depression (p = .087) when compared with baseline. However, the HADS indicated significant improvement for both anxiety (p = .024) and depression (p = .013).

For the 17 participants falling in the moderate level of dementia, MMSE results showed significant improvements in all domains (p = .000), including orientation (p = .002), language (p = .011), and memory (p = .003). Language improvements were indicated in the group with moderate dementia when pre and posttest were compared. However, the difference in language results between pre and post-test were not significant in the mild dementia group. In addition, as was mentioned in the previous chapter, the NPI showed significant improvement in delusions (p = .024), hallucinations (p =.031), irritability (p = .037), disinhibition (p = .017), and agitation (p = .028) in comparison to baseline for individuals with moderate dementia. Of note, there were no significant improvements in depression on the NPI for those who fell in the moderate level of dementia. However, as was seen with the mild levels of dementia, HADS results indicated significant improvements in both anxiety (p = .007) and depression (p = .018). The difference between the results of the NPI and the HADS in both groups was attributed to the different aspects of depression assessed by each measure (Gallego & Garcia, 2017).

Overall, results demonstrated that group music therapy yielded significant cognitive, psychological, and behavioral improvements, including an impact on anxiety and some aspects of depression. The effectiveness of music therapy in this study was attributed to the music being individualized to participants' preferences. The authors acknowledge that future studies are needed to examine the long-term residual impact of music interventions (Gallego & Garcia, 2017).

The studies reviewed that included participants with mild to moderate dementia examined the effectiveness of group music interventions on behavioral and psychological symptoms of dementia. Individuals were all recruited from nursing home facilities, and samples consisted of between 20 and 49 participants. Trial periods lasted between 5 weeks and 6 months, and the group music sessions lasted between 40 and 50 minutes and were typically led by music therapists. The music interventions typically consisted of preferred music or music based on autobiographical or sociocultural content. The reported effects of group music interventions included decreased agitation, hallucinations, apathy, aggression, disinhibition, irritability, anxiety, depression, and caregiver distress as well as increased social communication, emotion expression, and activity level. One of the four studies examined in this section discussed results that revealed no impact on agitation or anxiety following a 40-minute live group music program. However, the authors of this study acknowledged that their findings may have been due to methodological flaws and because the music was not autobiographically relevant or based on individual preferences (Cooke et al., 2010). In addition, not all studies were randomized controlled trials, which presented limitations of generalizability. Additional limitations of the studies reviewed in this section included methodological issues such as having small sample sizes, and some studies did not include control conditions, which presented further limitations in generalizability for most of the studies reviewed in this section. However, the study that utilized a randomized controlled trial and individualized music preferences demonstrated that 6 weeks of group music interventions may significantly increase orientation, memory, anxiety and decrease disinhibition for individuals with mild dementia (Gallego & Garcia 2017). This study also demonstrated that group music interventions may significantly increase orientation, language,

and memory and decrease disinhibition, delusions, hallucinations, irritability, and agitation for individuals with moderate dementia (Gallego & Garcia, 2017). While methodological issues produce limitations in generalizability and doubts about the effectiveness of group music interventions, results of the reviewed randomized controlled trial provide promise for future studies evaluating the efficacy of music interventions for individuals with mild to moderate levels of dementia.

Participants with Moderate to Severe Dementia

A study in Taiwan evaluated the effects of a group music intervention with movement on the frequency of agitated behaviors for 36 individuals with moderate to severe dementia living in a nursing home facility (Sung, Chang, Lee, & Lee, 2006). The frequency of participants' agitated behaviors was assessed by caregivers at the facility using the modified Cohen-Mansfield Inventory (modified CMAI; Cohen-Mansfield et al., 1989) at baseline, 2 weeks, and 4 weeks. A diagnosis of dementia classified as moderate to severe was measured by the Global Deterioration Scale (GDS; Reisberg, Ferris, DeLeon, & Crook, 1982) and was set as inclusion criteria. The sample consisted of 18 in the control group and 18 in the intervention group, and a randomized controlled design was used.

The experimental group was administered the music with movement intervention by a trained nursing researcher and two research assistants for 30 minutes from 3:00 to 3:30 p.m., twice per week for 4 weeks, for a total of eight sessions. Music was selected according to the preference of participants, and participants were instructed to move their body or extremities with the rhythm of the music. The control condition consisted of usual care without music intervention. When compared to baseline frequency of agitated behaviors, results indicated a

significant reduction of agitated behaviors in the experimental group as measured by the CMAI at 2 weeks and 4 weeks ($p < .001$) of exposure, whereas the control group did not show significant reductions in agitation. Results indicated that an active music intervention using group music with movement demonstrated a decrease in the frequency of agitated behaviors after 4 weeks of exposure (Sung et al., 2006).

Sung et al. (2006) acknowledged the limitations of their study including its small sample size and the fact that they did not examine the effects of the intervention beyond the conclusion of the study at 4 weeks. They also acknowledged the limitation of recruiting from one residential facility, including the observer bias that may have been present in using the facility's nursing staff as raters who were not blinded to those in the control versus the experimental group. Furthermore, it was unclear as to when agitation behaviors were being observed, and it was not specified whether behavioral observations took place during the intervention, immediately following the intervention, or at intermittent time periods in between intervention sessions. It would have also been helpful to have specified the types of dementia present in the sample used in order to determine the impact that dementia type may have had on results.

In the study by Ziv et al. (2007), the effect of background music on both positive social behaviors and negative behaviors related to agitation in residential individuals with moderate to severe dementia was examined. A sample of 28 participants with moderate to severe Alzheimer's disease was recruited from a residential institution in Israel. Their MMSE scores were less than 11/30. A playlist of very popular songs from 1964 was selected by a music therapist and were played for 17 minutes (the duration of the playlist) one day per week for 3 weeks. For 4 consecutive weeks the participants were observed during a one-hour period following lunch, as

this was a time identified by staff when the most agitation was noted amongst residents. A list of behaviors noted were organized into 3 categories: positive, negative, and neutral. The study was then conducted one day per week for 3 weeks, and positive, negative, and neutral behaviors were observed in milieu after lunchtime for the duration of the music intervention and were recorded using the momentary time sampling technique (MTS; Lord & Garner, 1993). Positive behaviors included laughing, smiling, talking, attempts to make contact with or to calm others, humming, drumming, rocking the body in rhythm with the music, singing, caressing, and touching (Ziv et al., 2007). Negative behaviors included repetitive vocalizations and manipulation of objects, wandering, rising and immediately sitting, throwing objects pushing, shouting, crying, trying to break free of chair restraints, harassing others, and hurting oneself or others (Ziv et al., 2007). Neutral behaviors were considered any behavior that was not considered as fitting in the positive or negative category (e.g., sleeping, dozing off, staring).

Results indicated significant differences between the frequency of occurrence of behaviors with background music versus no background music. Positive behaviors increased significantly ($p = .001$) while negative behaviors decreased ($p = .001$) while the background music was playing. No significant differences were noted in neutral behaviors between the two conditions. Background music yielded a reduction in negative behaviors related to agitation and enhanced positive social behaviors, with the reduction of repetitive agitated behavior most notable. Further examination of results revealed four participants whose negative repetitive behaviors were unaffected by music, and two participants who showed repetitive behavior only in the presence of music. However, none of the patients exhibited more positive behaviors without the music intervention than when it was playing. The authors conjectured that for the

two patients who became more agitated, the upbeat music may have stimulated them differently than the others, so they were considered exceptions to the majority positive effect. A possibility that went unconsidered is that perhaps the two patients may have had more negative associations with the music played or were stimulated in a way that was experienced as negative.

Nevertheless, the overall study provided novel parameters for examining the impact of music on individuals with dementia by examining both positive and negative behaviors, selecting music that aimed to enhance healthy behaviors rather than simply to eliminate problematic behaviors, and timing the study to take place after lunch, which was a time period most relevant for intervening with residents (Ziv et al., 2007). Additionally, the authors recognized that in comparison with similar studies at that time, their sample was larger than many other studies (Ziv et al., 2007). Suggestions for further research or limitations of their study were not identified or discussed, which calls into question the reliability and quality of the article. However, observed limitations include still having a relatively small sample size and not having utilized a randomized controlled trial design. Generalizability is also limited due to convenience sampling from one institution and a lack of a control group or conditions for comparison.

Park and Specht (2009) conducted a pilot study in Taiwan that investigated the effect of individualized music on agitation in individuals with moderate to severe levels of dementia who lived at home. Leaders of caregiver support groups recruited participants at the local Alzheimer's Association as well as by assisted living facility directors. The sample consisted of 15 individuals with dementia who scored less than 25 on the MMSE (MMSE; Folstein, Folstein, & McHugh, 1975), exhibited symptoms of agitation as measured by the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield et al., 1989), had the ability to hear a speaking voice at 1.5

feet, and were living at home or in an assisted living facility. Additional inclusion criteria included the ability to express or have a family member able to communicate participants' music preference, as well as an available caregiver who could play CDs for the individual with dementia. Exclusion criteria included psychiatric disorders or severe pain (Park & Specht, 2009). However, the authors did not specify which psychiatric disorders were excluded, or how psychiatric disorders or severe pain were determined. The reader is left to assume that such criteria may have been determined by participants' health records; the way in which a diagnosis of dementia was established as an inclusion criterion. Following an assessment of participants' music preferences, evaluations of individuals' peak agitation time were conducted for one week, the results of which determined at what time of day music interventions would be delivered to each individual. Music interventions were delivered 30 minutes before peak agitation time for each individual. Participants listened to their playlist of preferred music for 30 minutes twice per week for 2 weeks, followed by a period of 2 weeks without music intervention. This music intervention sequence of 2 weeks with the music intervention and 2 weeks without the music intervention was repeated once more. Family caregivers assessed agitation at 30 minutes before, during, and after music intervention (Park & Specht, 2009).

Data were analyzed using the one-factor repeated-measures analysis of variance (ANOVA). Findings indicated a significant decrease in agitation levels while listening to music as compared with levels prior to listening to music ($p < .05$). In addition, levels of agitation were significantly lower after listening to music than before listening to music ($p < .05$). The results of this study speak to the impact of music interventions on agitation in individuals with dementia who live at home as well as the necessity of investigating the effectiveness of music-based

interventions for individuals with dementia residing in various settings (Park & Specht, 2009). It is also worth noting the limitations of this study's generalizability when considering the impact of cultural differences between caregiving for older adults in Taiwan versus western society, where individuals with moderate and severe levels of dementia typically reside in nursing facilities. There may have also been bias in outcome ratings as a result of not being able to control or monitor whether caregivers followed intervention protocol or reported outcomes accurately.

Another study examined the effect of individual music therapy on agitation in nursing home residents with moderate to severe dementia (Ridder, Stige, Qvale, & Gold, 2013). Participants were recruited from various nursing homes in Denmark and Norway, and 42 participants were randomized to either standard care or music therapy initially. Demographic data specified that the majority of participants had lived in their nursing homes for several years. In addition, the sample consisted of 40% with AD, 38% with an unspecified dementia type, and 22% with other specified dementia types including vascular, alcohol-induced, Lewy body, frontotemporal, or mixed dementia.

The study utilized a pragmatic, two-armed, cross-over, exploratory, randomized controlled study design. Individual music therapy was administered to participants by university-trained, experienced music therapists for an average of 34 minutes twice per week over 6 weeks, completing a total of 12 sessions. Conditions were switched to standard care at the halfway point of data collection. Music therapy interventions included improvising with instruments (guitar or drum), singing, dancing or moving to pre-recorded music, and listening to live or prerecorded music. Of note, the authors specified that the music therapy intervention was not aimed at

reducing agitation per se. Rather the goal was to observe the impact on agitation when providing music interventions designed to capture attention, create a safe setting, regulate arousal, facilitate self-regulation, and promote engagement in social interaction as a means to communicate and fulfill psychosocial needs. More specifically, given that individual music therapy increases one-on-one engagement and communication with the music therapist, individual music therapy creates a relationship by providing and sharing musical experiences. Thus, sessions are aimed at facilitating participant initiative, engagement, self-expression, and mutual understanding with the music therapist through musical activities (i.e., improvising, singing, dancing, moving in rhythm, and listening). The authors theorized that agitation occurs in individuals with dementia as a result of unmet psychosocial needs and that if such needs can be met utilizing individual music therapy, then agitation may decrease as a measurable side effect.

Cognitive functioning was assessed utilizing the mini-mental state examination (MMSE; Folstein, Folstein, & McHugh, 1975) and the Global Deterioration Scale (GDS; Reisberg, Ferris, DeLeon, & Crook, 1982). Agitation was assessed utilizing the CMAI (Cohen-Mansfield et al., 1989) at baseline, week 7, and week 14. Quality of life was evaluated using the Alzheimer's Disease Related Quality of Life (ADQRL; Rabins, Kasper, Kleinman, & Black, 1999), which assesses social interaction, self-awareness, feelings and mood, enjoyment of activities, and response to surroundings. The ADQRL is administered by an interviewer to a proxy caregiver of the individual with dementia who responds by indicating whether they ‘agree’ or ‘disagree’ to items. In addition to the use of these outcome measures, the need for psychotropic medication prescriptions was also monitored for all participants.

Paired *t*-tests were used to analyze the difference in results between the intervention and control conditions in outcome measures from baseline to 7 weeks, and then to 14 weeks. For the participants who received standard care from baseline to 7 weeks, there was an increase in agitation frequency and disruptiveness as measured by the CMAI. With the introduction of music therapy at week 7, results showed a decrease in agitation frequency at week 14, yet there was not a statistically significant difference in CMAI scores in terms of frequency of agitated behaviors. However, results showed a significant decrease in agitation disruptiveness ($p = .027$) with a medium effect size (0.50) from 7 weeks to 14 weeks. Interestingly, the participants who received the music intervention from baseline to 7 weeks did not exhibit statistically significant changes in frequency or disruptiveness of agitated behaviors. In addition, quality of life did not change from baseline to 7 weeks for participants who received the music condition first as well as for those who received the standard care condition first. While the quality of life increased with music therapy from 7 weeks to 14 weeks, the difference in scores on the ADQRL was not significant. The authors explained that these outcomes were a result of the collaborative procedures between caregiver staff and the music therapist during the individual music treatment having been more effectively established at 7 weeks through 14 weeks. However, results showed a significant increase in psychotropic medication prescription during the standard care condition with a significant decrease in psychotropic medication prescription during music therapy. Further, during the 6 weeks of music therapy, no increases in psychotropic medications were registered. Overall, the study demonstrated that 6 weeks of individual music therapy significantly decreased the disruptiveness of agitation and may eliminate the need for increasing psychotropic medications for individuals with dementia. The authors acknowledged the limitations in that

proxy caregivers who provided responses on outcome measures and the interviewers who administered the outcome measures were not blinded to treatment allocation. Thus, observer bias may have also been present in data collection for CMAI and ADQRL outcome measures.

A randomized controlled trial was conducted in Italy that compared the effectiveness of active music therapy (MT) with passive music listening (LtM) in the reduction of BPSD for individuals with moderate to severe levels of dementia (Raglio et al., 2015). Participants were recruited from nine Italian institutions. The sample consisted of 120 individuals with dementia who resided in their respective institutional facilities for longer than 2 months. Participants were randomized into one of three groups, standard care alone, standard care with active music therapy, or standard care with passive music listening (Raglio et al., 2015).

MT was conducted by a certified music therapist, and active music therapy consisted of individual production of music and improvisation using instruments (Raglio et al., 2015). The music therapist followed the rhythm set by the participant to create nonverbal communication, rapport, and moments of affective attunement. Sessions were administered for 30 minutes twice per week for 10 weeks. Passive music listening was administered for 30 minutes twice per week for 10 weeks as well and consisted of listening to a playlist of preferred music that was created based on interviews with participants or with their caregivers (Raglio et al., 2015).

Participants were assessed prior to treatment, after treatment, and 2 months following treatment. The MMSE was used to assess cognitive functioning, and BPSD were assessed using the Neuropsychiatric Inventory (NPI; Cummings et al., 1994), Barthel Index (BI; Mahoney & Barthel, 1965), Cornell Brown Scale - Quality of Life (CBS-QoL; Ready et al., 2002), and the Cornell Scale Depression in Dementia (CSDD; Alexopoulos et al., 1988). Of note, all evaluators

were blind to all treatments participants received. Further, dependent on the nature of the variables, results were compared using a one-way analysis of variance (ANOVA), Kruskal-Wallis, chi-square tests, or repeated-measures ANOVA (Raglio et al., 2015).

Unlike other studies, results showed no significant differences in the impact on BPSDs between active, passive or standard care groups. However, all treatment groups showed improvement in BPSDs. The authors discussed that using the global NPI score as the primary outcome measure may have been too stringent of a measure to use, suggesting that not analyzing the results of the subscales of the NPI may have caused potential effects of the music therapy intervention to have been unrecognized. Further, the authors acknowledged that there was no control of what standard care participants received at their residential institutions, as approaches to and definitions of standard care varied across institutions. Therefore, some forms of standard care may have consisted of therapeutic activities that may have influenced the results of the study by reducing the impact of the music interventions (Raglio et al., 2015).

Another study in Germany was conducted to investigate the effects of music therapy on communication behavior and emotional well-being during and across sessions in people with advanced dementia over a 6-month period (Schall et al., 2015). Nine home-dwelling individuals with advanced dementia due to Alzheimer's disease or vascular disease participated in the study and fell within the moderate to severe range of dementia severity. Cognitive functioning was assessed using the MMSE (Folstein, Folstein, & McHugh, 1975), the Clinical Dementia Rating (CDR; Morris 1993), and the Global Deterioration Scale (GDS; Reisberg, Ferris, DeLeon, & Crook, 1998). Behavioral and psychological functioning was assessed utilizing the Neuropsychiatric Inventory (NPI; Cummings et al., 1994). Quality of life was assessed using the

Quality of Life in Alzheimer's Disease (QOL; Logsdon, Gibbons, McCurry, & Teri, 1999), and activities of daily living were assessed using the Activities of Daily Living Scale (IADL; Lawton & Brody, 1969).

Music therapy was conducted by a trained music therapist and included a combination of active and passive music interventions such as singing, instrumental improvisation, and listening to biographically relevant music (Schall et al., 2015). Interventions were administered weekly for sessions ranging from 23 to 39 minutes over a 6-month period, and participants completed 20 sessions total. Outcome measures used in the time series-based evaluation utilized the CODEM instrument (Kuemmel, Haberstroh, & Pantel, 2014) to assess communication behavior, the Positive Response Schedule for Severe Dementia (PRS; Perrin, 1997) to assess well-being, and the Observed Emotion Rating Scale (OERS; Lawton, van Haitsma, & Klapper, 1996) to evaluate the expression of positive and negative emotions. Of note, the authors indicated that the time-series analysis was utilized in the current study for the first time in research evaluating music therapy for individuals with dementia, which provided an alternative to randomized controlled study given the small sample size (Schall et al., 2015).

A Wilcoxon-Test was used to analyze results of pre and posttest comparisons for outcome measures MMSE, CDR, GDS, NPI, IADL, and QoL-AD, which revealed no significant differences in scores. Thus, no improvement or worsening of cognitive impairment, neuropsychiatric symptoms, instrumental activities of daily living, or quality of life was indicated. However, the results that were based on aggregated time-series data showed significant effects of individual music therapy, which included increased communication behavior ($p < .01$), situational well-being ($p < .01$), and the expression of positive emotions ($p <$

.01) in people with advanced dementia. The authors posited that the observed effects of music therapy were situational rather than cumulative, which they explained as a result of variances of the dependent variables at baseline and during intervention phases. Nevertheless, it appeared that the time series analysis method was more sensitive to the effects of music therapy in comparison to results yielded solely from a pre/post design. The limitations of the study, however, were identified as small sample size and a lack of control group. In terms of future studies and the need for longitudinal evaluations, time series analyses and other approaches that allow for examination of complex, dynamic situations such as is present in music therapy, may be warranted (Schall et al., 2015).

The studies reviewed with participants who had moderate to severe dementia utilized various forms of individual music interventions and two studies utilized group music interventions, one of which took place in a milieu setting. The participants resided in institutions, and one study was conducted with participants who resided at home. One of the studies that utilized group music interventions yielded decreased agitated behaviors and improved social behaviors after 3 weeks of playing popular music from 1964 once per week as background music in the milieu of a nursing home (Ziv et al., 2007). In the other group music study, decreased agitation was demonstrated after 4 weeks of a group music with movement intervention at twice per week (Sung et al., 2006). Individuals with moderate to severe dementia who reside at home may also begin to exhibit decreased agitation from 2 weeks of passive individualized music listening at twice per week when the music chosen is based on an assessment of music preferences and autobiographical content (Park & Specht, 2009). However, when this intervention integrated active components and occurred once per week, improvements in

psychiatric symptoms or quality of life were not apparent. At the same time, these less frequent but active interventions may significantly increase the initiation of communication and expression of positive emotions (Schall et al., 2015). In addition, 6 weeks of active individual music therapy at twice per week may decrease the level of agitation disruptiveness even though agitation frequency and increased quality of life for individuals who reside in a nursing institution may not be impacted (Ridder et al., 2013). Furthermore, 10 weeks of active music therapy or passive individualized music listening at twice per week may not yield differences in improvement of BPSD and may not yield significant differences in improvement in BPSD when active or passive music interventions are compared to standard care within a nursing institution (Raglio et al., 2015). Limitations of generalizability across most of the reviewed studies for participants with moderate to severe dementia included having small sample sizes and the utilization of one instrument to measure each variable. In addition, only three of the studies conducted randomized controlled trials, which produced mixed results.

Participants with Severe Dementia

A 4-week quasi-experimental study conducted in Canada sought to examine the relationship between relaxing music and agitation during mealtime for nursing home residents with advanced dementia (Hicks-Moore, 2005). A convenience sample of 30 participants was recruited from a low-stimulus Specialized Care Unit designed for individuals with severe cognitive impairment. Given the setting from which participants were recruited, measures of cognitive functioning were not administered. The occurrence of agitation behaviors exhibited during mealtime was measured by the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield et al., 1989) at baseline and for each week of intervention.

The music intervention was composed to be quiet, melodic, and peaceful, without sudden changes in tempo or volume, yet with sufficient variation (Hicks-Moore, 2005). The music was played during evening mealtimes on a daily basis for the duration of mealtime throughout Week 2 and Week 4, and agitation was assessed using the CMAI. Of note, the duration of mealtime was not specified by the authors. Baseline CMAI scores were obtained at Week 1 before the introduction of the music intervention in Week 2. CMAI scores were also obtained for Week 3, during which the music intervention was removed.

During the 2 weeks (Week 2 and Week 4) of music intervention, the number of agitated behaviors exhibited during mealtime as measured by the CMAI decreased in comparison to the weeks (Week 1 and Week 3) when music was not played during the evening mealtime. Incidences of agitated behaviors were assessed, and means were calculated for all 4 weeks. However, tests of statistical significance were not conducted in this study. The most notable decreases during the weeks of the music intervention were in incidences of verbally agitated and physically non-aggressive behaviors. Overall, the authors suggest that their study indicated that relaxing music played during evening meals may reduce levels of agitated behaviors among nursing home residents with severe dementia (Hicks-Moore, 2005). The limitations of this study were not described in the article reviewed. However, despite the promising results presented at face value by observing notable changes in mean behaviors, the study's reliability becomes limited given the use of a convenience sample and the lack of formal statistical analyses. This study would have been strengthened if significance tests were able to be performed and were reported.

In Japan, a study was conducted to compare outcomes for active versus passive music interventions in reducing BPSDs (Sakamoto et al., 2013). A sample of 39 participants with severe dementia due to Alzheimer's disease was recruited from four group homes and a specialized dementia unit in Kobe City, and randomly and blindly assigned to the non-intervention control group, the passive music intervention group, or the active music intervention group. Dementia severity was assessed utilizing the Clinical Dementia Rating Scale (CDRS; Morris, 1993). Cognitive functioning was assessed using the Mini-Mental State Examination (MMSE; Folstein et al., 1975).

The passive music intervention consisted of passively listening to selected music on a CD player, while a caregiver and music provider observed the participant from a distance without direct interaction with them (Sakamoto et al., 2013). Music selections were established through analysis of participant behavior and through interviews with each participant and their families to determine the period of the participants' lives that was recalled most frequently. Music selections were therefore individualized for each patient according to special memories that would most likely evoke positive emotions. The active music intervention consisted of individualized music selection in addition to the facilitation of clapping, singing, and dancing by a music therapist. In each condition, the music intervention was administered for 30 minutes once per week for 10 weeks, completing 10 sessions in total. The control group consisted of participants spending time in their rooms per usual without any music stimulation (Sakamoto et al., 2013).

BPSDs were assessed using the Behavioral Pathology in Alzheimer's Disease Rating Scale (BEHAVE-AD; Reisberg et al., 1987), with symptomatic categories classified into paranoid or delusion ideations, hallucinations, activity disturbances, aggression, affective

disturbances, diurnal rhythm disturbances, anxieties and phobias, and a global rating scale. The BEHAVE-AD evaluations were conducted at baseline, after the final music intervention, and at 3 weeks following the music intervention (Sakamoto et al., 2013). Because the BEHAVE-AD is an ordinal ranking scale, intra-group comparisons were made using the Wilcoxon signed-rank tests. The authors also noted that for all the participants, no changes were made to medication regimens for the duration of the study.

Results demonstrated that both active and passive interventions significantly reduced BPSD after 10 sessions (Sakamoto et al., 2013). More specifically, two subscales within the BEHAVE-AD showed significant reductions from baseline to 10 weeks in affective disturbance ($p < .025$) and anxieties and phobias ($p < .025$) in the passive music intervention group. However, the active music intervention group demonstrated significant reductions in five subscales, which included affective disturbance ($p < .025$), anxieties and phobias ($p < .025$), paranoid and delusional ideation ($p < .025$), aggressiveness ($p < .025$), and activity disturbance ($p < .025$). In addition, the global rating subscale, which indicated the level of caregiver burden was reduced in the active intervention group ($p < .025$). Results yielded by the control group demonstrated significant increases in affective disturbance ($p < .025$) and activity disturbance ($p < .025$). In contrast, BPSD assessed at 3 weeks following the last music intervention session indicated significant increases in BPSD for both passive and active music intervention groups ($p < .025$), whereas the control group exhibited no changes at 3 weeks ($p = .025$).

Results therefore suggest that active music interventions demonstrated superior beneficial outcomes by reducing a wider range of BPSD in comparison to the improvement shown with passive music interventions (Sakamoto et al., 2013). The authors suggested that the additional

benefits produced by active music interventions may be the result of emotionally and cognitively stimulating functions that maximize residual cognitive reserves even in severe levels of dementia (Sakamoto et al., 2013). However, results also suggest that utilizing passive or active music interventions to improve BPSD may be superior to no-music conditions. Further, the disappearance of changes yielded by music interventions after 3 weeks suggests that regularly administered music interventions may continue to produce beneficial effects for individuals with severe dementia, but that the interventions must be continued to maintain these benefits. The authors discussed the limitations of their study which included a small sample size and not determining the optimal duration of music intervention sessions, as well as not including a comparison of effectiveness between individual and group interventions. An additional limitation may have been the use of one measure of BPSD. Reliability may have been strengthened by using an additional measure of BPSD to compare results, or at least by providing data on the reliability of BEHAVE-AD. However, despite the identified limitations, this study is a strong representation of quantitative evidence for the utility of music interventions in reducing BPSD for individuals with severe dementia (Sakamoto et al., 2013).

A study conducted in the United States by Park (2013) examined the effect of individualized music on agitation for home-dwelling patients diagnosed with dementia. A sample of 26 home-dwelling participants with severe dementia as determined by the MMSE was recruited from the Alzheimer's Association, the Alzheimer's project, and the Administration on Aging in Iowa and Florida, which resulted in the use of a probability convenience sample. Individuals with psychiatric disease or severe pain were excluded from the study. However, how these criteria were determined was not described in the article under review. It may be assumed

that the exclusion of psychiatric disorders and pain was to eliminate the influence that pain and psychiatric symptoms due to etiology other than dementia may have had on the music intervention's effectiveness on agitation (Park, 2013).

Peak agitation time was assessed using the Cohen-Mansfield Agitation Inventory (CMAI; Cohen-Mansfield et al., 1986) and the participants' individual music preferences were assessed using the Assessment of Personal Music Preference (APMP; Gerdner, 1998) at baseline. A one-group post-test design was used to assess outcomes. Agitation levels were measured by the Cohen-Mansfield Agitation Inventory (modified CMAI; Cohen-Mansfield et al., 1989) at 30 minutes prior to intervention, 30 minutes during the intervention, and at 30 minutes following withdrawal of the music intervention (Park, 2013).

The music intervention consisted of participants listening to two CDs containing individualized music for 30 minutes before peak agitation time, at 30 minutes per session (Park, 2013). The music was played on a CD player used by the participants' families or by a research assistant if a relative was not available. The music intervention was administered twice per week for 2 weeks, completing a total of four sessions. The 30-minute parameter was informed by the limited attention span of individuals with severe dementia (Gerdner, 2007). Of note, if participants requested to listen to the music more often than twice per week, they were allowed (Park, 2013).

Results demonstrated that agitation levels decreased significantly while participants listened to 30 minutes of music when compared to the 30 minutes prior to the introduction of the music intervention ($p = .002$), whereas agitation levels during the 30 minutes of music listening did not change significantly when compared to 30 minutes following the withdrawal of the music

intervention (Park, 2013). Agitation levels at 30 minutes after the music intervention demonstrated a significant decrease (p = .032) from agitation levels at 30 minutes prior to the music intervention. Overall, the results of this study support the use of individualized music as a meaningful intervention for home-dwelling individuals with severe dementia. Limitations of this study were discussed in the context of home-dwelling patients and families having limited knowledge of physical and mental health. In addition, the author did not consult hospital data that would have provided pertinent information about participants' characteristics that may have influenced the effectiveness of the music intervention. Additional limitations included a small sample size, a lack of control group for comparison, and allowing participants to listen to music more than twice per week if they requested, which may have confounded the results. Additional examination of variables such as the influence of dementia type on music's effectiveness in reducing agitation may have also been beneficial to the study. While the limitations of this study were apparent, its strength lay in the meaningfulness of being the first study to examine the effect of an individualized music intervention on agitation levels for individuals with severe dementia that reside at home (Park, 2013).

A randomized controlled trial was conducted in Spain to compare the effectiveness of a multisensory stimulation environment (MSSE) with individualized music (IM) on agitation for institutionalized individuals with severe dementia (Sanchez et al., 2016). Participants were recruited from a specialized dementia center, and the final sample consisted of 18 individuals with severe to very severe dementia as measured by the Global Deterioration Scale (GDS; Reisberg, Ferris, DeLeon, & Crook, 1988) and also as noted in their medical history records that were provided by a neurologist. Exclusion criteria included individuals with hearing impairment

or sensory disorder that would impede or interfere with engagement in multisensory stimulation or individualized music interventions (Sanchez et al., 2016).

MSSE consisted of multisensory sessions in a Snoezelen room (Baker et al., 2001), which included alternating-color fiber-optic cables, water bubble columns within two mirrors, a water bed, a rotating mirror ball with a color light projector, a video, an interactive projecting system, musical selections, aromatherapy equipment, and a tactile board with various textures. Participants were encouraged by the therapist to interact with sensory stimuli of their choice (Sanchez et al., 2016). IM involved music preference that was determined utilizing the Assessment of Personal Music Preference (APMPQ; Gerdner, Hartsock, & Buckwalter, 2000) administered to caregivers. Individualized music sessions were conducted in accordance with their preferences. Both conditions consisted of two weekly sessions at 30 minutes for a period of 16 weeks, completing a total of 32 sessions.

Mood, anxiety, agitation, cognitive functioning, and dementia severity were measured at baseline, at week 8, at the end of the intervention trials at week 16, and 8 weeks following the completion of the intervention trials. Mood was assessed utilizing the Cornell Scale for Depression in Dementia (CSDD; Alexopoulous et al., 1988). Anxiety was assessed using the Rating Anxiety in Dementia (RAID; Shankar et al., 1999). Agitation was assessed utilizing the CMAI (Cohen-Mansfield et al., 1989). Cognitive functioning was measured by the Severe Mini Mental State Examination (SMMSE; Harrell, Marson, Chatterjee, & Parrish, 2000) and dementia severity was measured by the Bedford Alzheimer Nursing Severity Scale (BANS-S; Volicer, Hurley, Lathi, & Kowall, 1994). Of note, the authors indicated that the BANS-S exhibits discriminant validity that is superior to the Neuropsychiatric Inventory in its sensitivity to detect

disease progression (Sanchez et al., 2016). Results were analyzed utilizing a repeated-measures two-way mixed ANOVA in order to assess performance differences in mood, anxiety, agitation, cognitive functioning, and dementia severity over baseline, the 8-week, and 16-week assessment points, in addition to performance differences between the 16-week assessment point at post-test and the follow up evaluation at 8 weeks post-trials.

Results showed significant improvement in agitation as measured by the CMAI for both IM and MSSE groups (p = .031) between baseline, 8 weeks, and 16 weeks (Sanchez et al., 2016). In addition, from the post-trial assessment at 16 weeks to the 8-week follow-up period, agitation significantly improved (p = .032). However, no significant different differences were found in agitation levels between IM and MSSE groups at any of the assessment periods. Regarding mood, scores on the CSDD remained stable for the MSSE group from baseline to post-trial. Mood appeared to worsen for the IM group from baseline to post-trial, yet this result did not reach significance. However, a significant improvement in mood was demonstrated in both IM and MSSE groups (p = < .01) between post-trial at 16 weeks and the follow-up evaluation at 8 weeks post trials. Regarding anxiety, scores on the RAID demonstrated a significant difference between the IM and MSSE groups from baseline to post-trial, having shown improvement in anxiety in the MSSE group and no improvement in the IM group (p = .013). However, anxiety levels significantly improved from the post-trial assessment at 16 weeks to the follow-up evaluation at 8 weeks post-trial (p = .021), with no significant differences found between IM and MSSE groups at this evaluation point. Regarding cognitive functioning, scores on the SMMSE demonstrated a similar decline in both IM and MSSE throughout the trial; however, time effects or intergroup differences did not reach statistical significance. Regarding

dementia severity, scores on the BANS-S demonstrated a significant difference between IM and MSSE groups from baseline to post-trial assessment ($p < .01$), as the MSSE group showed improvement in dementia severity while the IM group did not show improvement. Dementia severity appeared to worsen in both groups from the post-trial assessment at 16 weeks to follow-up evaluation at 8 weeks post-trials; however, this result did not reach statistical significance (Sanchez et al., 2016).

Both interventions were effective in the reduction of agitation after 16 weeks without significant differences between IM and MSSE, which suggests that both interventions may be effective in the reduction of agitation for individuals with dementia (Sanchez et al., 2016). However, results did not demonstrate significant changes in mood or cognitive functioning during the intervention trials, but rather found significant improvements in mood 8 weeks following the intervention period. The authors explained this finding as a result of accessory effects due to disease progression, as mood symptoms decrease in the later stage of dementia. The authors also explained that the seasonal impact of the follow-up period taking place during the summer might have produced the improved scores on the CSDD rather than the interventions examined, as greater light exposure is associated with improved mood in individuals with advanced dementia. Further, MSSE was significantly more effective than IM in the reduction of anxiety and dementia severity during the 16 weeks of intervention trials. These findings suggested that the ability to modify level of sensory stimulation in the MSSE condition may have been the advantage over individualized music as MSSE permits greater sensory environmental control. Additional explanations of results suggested that IM may not be appropriate for all participants, specifically those who may not have had an appreciation for music prior to the onset

of dementia. The authors further suggested that active music interventions may have produced stronger benefits for individuals with advanced dementia rather than the passive IM utilized in their study (Sanchez et al., 2016).

Limitations of the study by Sanchez et al. (2016) included a small sample size, which may have produced non-significant results in some of the outcome measures. Additional limitations of generalizability are likely present given the lack of a usual care control group and the use of a convenience sample from one institution. The authors also acknowledged that future studies are needed that utilize other instruments that specifically measure anxiety, mood, agitation, and other BPSD to provide stronger evidence for the differences in effectiveness of MSSE and IM on anxiety for individuals with advanced dementia. Regarding cognitive status and dementia severity when determining the efficacy of interventions, the authors proposed the use of BANS-S when SMSEE reaches its scoring floor, as the BANS-S is an observer-based tool that does not require language skills and can be used for all participants regardless of impairment severity to assess intervention effects.

The studies reviewed utilized various forms of individual music interventions for participants with severe dementia who resided in institutions or at home. Results of the studies consistently demonstrated that at least once per week of at least 30-minute individual music interventions yielded reductions in agitation or other BPSD in as little as 2 weeks (Hicks-Moore, 2005) and as many as 16 weeks (Sanchez et al., 2016), which suggests that music interventions may continue to be meaningful and appropriate interventions for individuals with severe dementia over time. More specifically, passive individualized music interventions demonstrated reductions in verbally agitated and physically non-aggressive behaviors (Hicks-Moore, 2005),

affective disturbance and anxiety (Sakamoto et al., 2013), and overall agitation (Park, 2013; Sanchez et al., 2016). Of note, when passive individualized music was compared with a multisensory stimulation environment, results showed that MSSE was superior in reducing anxiety an agitation (Sanchez et al., 2016). However, when passive individualized music was compared with active music therapy, active music therapy yielded additional benefits including reductions in paranoid and delusional ideations, aggressiveness, activity disturbance, and caregiver burden (Sakamoto et al., 2013), which overall suggests that active individual music therapy may be superior to passive music interventions and comparable to the benefits of a multisensory stimulation environment. Despite findings, limitations of generalizability across the reviewed studies for participants with severe dementia included having small sample sizes and the utilization of one instrument to measure each variable. While two of the reviewed studies in this section were randomized controlled trials, the other two studies were quasi-experimental, relied on convenience sampling, or both. In addition, while all four studies demonstrated short-term benefits of music interventions, not all studies conducted follow-up evaluations or examined long-term benefits of music-based interventions for individuals with severe dementia. The studies that did conduct follow-up evaluations showed mixed results (Sakamoto et al., 2013; Sanchez et al., 2016).

CHAPTER IV: DISCUSSION

Summary of Findings

The aim of this review was to examine the utility of music-based interventions in dementia, and to determine the impacts of researched music interventions on cognitive, behavioral, social, and psychological functioning. In addition, the aim of this review was to determine whether music-based interventions are effective for various levels of dementia severity, and if current research has made it possible to deduce what interventions appear to be most effective or appropriate contingent on dementia severity.

Cognitive implications considering dementia severity. Cognitive functioning was mainly a secondary measure in both individual studies and reviews that examined the impact of music-based interventions on various BPSD for individuals with dementia. The studies have consistently suggested that music interventions may not significantly improve overall cognition due to the inevitable progression of all dementia types (Ueda et al., 2013). However, studies contained a wide variety of music interventions as well as differing methodology in which they were implemented. Further, it appears that to better understand the impact of music interventions on cognitive functioning, it is useful to acknowledge that cognitive decline cannot be prevented (Fischer-Terworth & Probst, 2011).

The studies examined in this review utilized the MMSE (Folstein et al., 1975), the Global Deterioration Scale (GDS Reisberg et al. 1982), the SMMSE (Harrell et al., 2000), the BANS-S (Volicer et al., 1994), or a combination to measure cognitive functioning and severity of dementia and demonstrated at least short-term improvements in some aspects of cognitive functioning rather than in overall cognition (Gallego & Garcia, 2017; Gerdner, 1997).

Improvements were demonstrated in spatial orientation (Fischer-Terworth & Probst, 2011) and delayed recall of sung lyrics (Moussard et al., 2014) in individuals with mild to moderate dementia. More specifically, it was found that 6 weeks of weekly active group music therapy may significantly improve orientation and memory in individuals with mild dementia and may improve language in addition to orientation and memory in individuals with moderate dementia (Gallego & Garcia, 2017). However, other studies demonstrated that 4 months of weekly passive individualized music interventions (Sanchez et al., 2016) or 6 months of weekly active individual music therapy (Schall et al., 2015) may neither worsen nor improve cognitive impairment in individuals with moderate to severe dementia. At this point, it is worth noting that some of the studies reviewed here used overall scores of outcome measures to draw conclusions, while others reported the impact on various domains in addition to the overall score. Thus, the differences across studies in the extent of which outcome measures were analyzed may have contributed to mixed results and differing conclusions about the impact music may have on cognitive functioning.

The demonstrated impacts of active music therapy conducted individually or in a group format on various aspects of cognition likely relate to music's ability to facilitate shared attention and communication (Gallego & Garcia, 2017; Fischer-Terworth & Probst, 2011), as well as modulation of emotion and evoking of movement or rhythmic patterns (Gomez-Romero et al., 2017). In line with this theory are the findings that some areas of the brain associated with memory, such as the medial prefrontal cortex, are spared for a longer period of time through the progression of dementia and are activated by familiar music that is associated with autobiographical memories (Haj et al., 2012; Janata, 2009). As discussed at the beginning of this

review, music itself is considered a medium for communication and appears to have the potential to compensate for the increasing language and semantic deficits that are present in dementia (Gagnon et al., 2011). The significance of this theoretical perspective was stated: "An improvement in communicational skills is crucial to the patients in order to stay in touch with their environment and maintain a certain degree of self-directed participation in life" (Fischer-Terworth & Probst, 2011, p. 100).

When comparing types of music interventions that may be implemented, it appears that active music interventions may provide additional benefits by stimulation of emotions and cognition in a way that enhances remaining cognitive reserves in individuals with various levels of dementia, including severe dementia (Sakamoto et al., 2013). If more knowledge was available regarding how aspects of music processing were connected to domains of cognition, Tomaino (2012) alleged that neuroscience would then be able to clarify biological elements that may or may not yield cognitive benefits of music-based interventions in dementia care. This type of clarification would be very useful in future studies examining the therapeutic impacts of music for individuals with dementia.

Behavioral implications considering dementia severity. Given that management of behavioral problems associated with agitation continue to be burdensome on caregivers at home or in nursing facilities (Matsumoto et al., 2007; Onishi et al., 2005), and that agitation occurs in over 80% of individuals with dementia (Gallagher, 2011), interventions that improve behavioral functioning become increasingly important. As such, previous reviews have consistently concluded that music-based interventions remain beneficial to individuals with dementia that

exhibit agitation or other disordered behavioral functioning (Gomez-Romero et al., 2017; Lou, 2001; Pedersen et al., 2017; Sherratt et al., 2004; Zhang et al., 2017).

The studies examined in this review utilized the NPI-Q (Kaufer et al., 2000) or the NPI (Cummings et al., 1994) in part to assess behavioral functioning and associated caregiver distress, the CMAI-SF (Werner et al., 1994) or the CMAI (Cohen-Mansfield et al., 1989) to assess agitation, or the BEHAVE-AD (Reisberg et al., 1987) to assess behavior pathology. In line with previous reviews, the studies included in this review demonstrated consistent evidence for the use of group music interventions (Choi et al., 2009; Gallego & Garcia, 2017; Fischer-Terworth & Probst, 2011; Hicks-Moore, 2005; Sung et al., 2006; Ziv et al., 2007) and individual music interventions (Lancioni et al., 2013; Park, 2013; Park & Specht, 2009; Ridder et al., 2013; Sakamoto et al., 2013; Sanchez et al., 2016) in decreasing agitation in terms of frequency, intensity, or both in individuals with varying levels of dementia.

More specifically, it appears that for individuals with mild to moderate dementia active group music therapy may be effective in significantly reducing agitation, aggression, impulsivity, or a combination of the three (Choi et al., 2009; Gallego & Garcia, 2017; Fischer-Terworth & Probst, 2011) For individuals with moderate to severe dementia active or passive group interventions may be effective in reducing agitation (Sung et al., 2006) or improving overall behavioral functioning (Ziv et al., 2007). In addition, individual active music therapy or passive individualized music interventions may be effective in significantly reducing agitation (Park & Specht, 2009; Ridder et al., 2013) or in improving other behavioral problems in individuals with moderate to severe dementia (Raglio et al., 2015). For individuals with severe dementia, passive group music interventions may be effective in reducing agitation (Hicks-Moore, 2005). Further,

passive or active individual music interventions may be effective in reducing activity disturbance, affective disturbance, and aggression (Sakamoto et al., 2013) in addition to reducing agitation (Sanchez et al., 2016; Park, 2013).

Considering the idea that agitation is likely a result of confusion and unmet needs when significant language deficits are present (Livingston, 2014), music's ability to provide a medium for communication (Gagnon et al., 2011) is likely one of the components that reinforce effectiveness of music interventions for individuals that exhibit agitation. This ability of music may also facilitate increased responsiveness in individuals with advancing dementia that would typically be unresponsive to most external stimuli (Hanser, 1999).

Regarding the studies in this review that failed to demonstrate significant reductions in agitation or improvement in behavioral functioning, it is worth noting that live music that is not based on preference or autobiographical content may not produce reductions in agitated behaviors in some cases (Cook et al., 2010). In addition, having limited control of conditions in standard care comparison groups (Raglio et al., 2015), a lack of control group, or a very small overall sample size may together influence outcomes, potentially rendering the benefits of music interventions unrecognized (Schall et al., 2015). However, overall it appears that music-based interventions may improve many aspects of behavioral functioning in varying levels of dementia severity.

Psychological implications considering dementia severity. As neurocognitive disorders progress, disturbances in mood, emotions, thoughts, and perceptions become more apparent and commonly manifest in apathy, depression, anxiety, and irritability (Cerejeira et al., 2012). Psychotic symptoms may also be present (Ballard et al., 2013). Previous reviews have identified

evidence of music's ability to yield reductions in psychological symptoms of dementia such as in depression and anxiety (Ing-Randolph et al., 2015; Ueda et al., 2013; Zhang et al., 2017). The studies in this review that examined the impact of music interventions on various aspects of psychological functioning utilized outcome measures such as the NPI (Cummings et al., 1994) to measure several neuropsychiatric symptoms; the GDS (Yesavage et al., 1983) to measure geriatric-relevant depression; the RAID (Shankar et al., 1999) to measure anxiety; the HADS (Zigmond & Snaith, 1983) to measure anxiety and depression; the ADQRL (Rabins et al., 1999) to measure quality of life, which includes measures of feelings, mood, and enjoyment of activities; the CSDD (Alexopoulos et al.,1988) to measure depression; and the BEHAVE-AD (Reisberg et al., 1987) to measure symptomatic categories such as delusions, hallucinations, and anxiety, and phobias.

The studies included in this review that examined the impact of music interventions on psychological symptoms of dementia demonstrated that group music interventions may significantly improve depression (Choi et al., 2009; Gallego & Garcia, 2017) , anxiety (Gallego & Garcia, 2017), irritability (Choi et al., 2009; Gallego & Garcia, 2017; Fischer-Terworth & Probst, 2011), and apathy (Fischer-Terworth & Probst, 2011) as well as delusions and hallucinations (Choi et al., 2009; Gallego & Garcia, 2017) in individuals with mild to moderate dementia. Further, it appears that active group music therapy may be superior to passive group music interventions in the improvement of psychological symptoms such as anxiety for individuals with mild to moderate dementia (Cooke et al., 2010). Studies under review also demonstrated that for individuals with moderate to severe dementia, music-based interventions may yield some improvement in depression (Raglio et al., 2015) and significant reductions in

anxiety or phobias (Sakamoto et al., 2013; Sanchez et al., 2016) and delusions and hallucinations (Sanchez et al., 2016). The impact of music on psychological functioning that has been demonstrated in this review may be explained by music's ability to invoke memories and emotional experiences (Erber, 2005), as emotion recognition from prosody and tone in music appears to be a residual ability in progressing dementia (Drapeau et al., 2009).

Social implications considering dementia severity. As impairments in cognitive, behavioral, and psychological functioning continue to progress in dementia, the resulting BPSD inevitably create disruptions in social functioning, as it becomes more challenging to communicate and relate effectively to others (Erber, 2005; Volicer & Bloom Charette, 1999). In the increasing evolvement of psychosocial interventions, music interventions have demonstrated the potential to impact the quality of life through facilitation of social engagement and social bonding (Chanda & Levitin, 2014; Peeters et al., 2016; Sakamoto et al., 2013; Sherratt et al., 2004). The recent development of the Music ePartner provided a technological platform that engages individuals with dementia with their families, friends, and caregiver by facilitating a shared social environment (Peeters et al., 2016). Of note, a study conducted by Sole et al. (2014) that examined a group music therapy program for individuals with varying levels of dementia severity failed to demonstrate improvements in quality of life via changes in affect and social engagement. However, it was acknowledged that some assessment tools that measure quality of life may not be realistically applicable to the quality of life for individuals with dementia, as was acknowledged by Sole et al. (2014).

The studies examined in this review that included measures of social functioning demonstrated that group music interventions may significantly improve social engagement and

social communication in individuals with mild to moderate dementia (Choi et al., 2009; Fischer-Terworth & Probst, 2011). Findings have also suggested that active or passive music interventions utilized in a group or individual context may significantly increase positive social behaviors (Ziv et al., 2007) and communication behaviors (Schall et al., 2015). Ridder et al. (2013) further acknowledged that music therapy by nature uses musical activities to facilitate initiative, engagement, self-expression, and mutual understanding with a music therapist or caregiver, which may at least partially explain the cognitive, behavioral, and psychological benefits of music-based interventions discussed throughout this review.

Limitations

Overall, quantitative research that evaluates the influence of music therapy interventions for individuals with dementia is limited in quantity as well as quality (Schall et al., 2015), which was observed in this review. Consistent limitations of studies reviewed included small sample sizes, one with as few as nine participants, as well as methodological issues that placed limitations on generalizability across many of the studies. The study with the largest sample that conducted a randomized controlled trial across several institutions failed to control for differences in standard care conditions between institutions, which likely influenced results by reducing the impact of music interventions (Raglio et al., 2015). In addition, not all of the studies reviewed conducted randomized controlled trials, and some lacked a control group, used convenience sampling, non-random assignment to experimental groups, or used one assessment tool to measure a dependent variable. There was also limited standardization of how music therapy interventions were defined and implemented across studies. In addition, randomization procedures continue to be complicated to carry out due to the close interaction between the

participants, caregivers, and therapists (Ridder et al., 2013) Such limitations result in concerns about generalizability. The fact that studies reviewed utilized a wide variety of experimental designs and assessed various dependent variables using different assessment tools makes it difficult to derive overall conclusions about generalizability based on the methodology of the studies reviewed here. In addition, studies took place in Denmark, Norway, Japan, Italy Taiwan, Israel, Spain, South Korea, Germany, and the United States, which introduces significant cultural implications that likely impact generalizability. Different countries may have different relationships with music or even different outlooks on aging that may influence the quality of care, both of which may be potential mediating factors in the effectiveness of music interventions.

Many factors that may influence results went unconsidered across most studies. Despite the longstanding literature that discusses and describes the differing disease progressions of the various dementia types, most studies reviewed here did not include dementia type in their descriptions of demographic data, nor were the potential impacts of dementia type included in their analyses. Ridder et al. (2013) also acknowledged that the impact of length of time an individual with dementia has been residing in a nursing facility ought to be considered as a potential covariate when conducting studies in residential facilities (Ridder et al., 2013), yet most studies did not acknowledge this factor. In addition, regarding assessment tools that were utilized in most studies and are based on observer responses, most studies did not take into account the potential observer bias even when assessors were not blind to group allocation.

Recommendations for Future Research

Assessment tools and inclusion criteria. To strengthen the reliability and generalizability of research conducted regarding the effectiveness of music in dementia care, it is recommended that future studies use multiple measures of each dependent variable. In addition, when assessing the impact on various domains of functioning utilizing measures that offer scores in multiple domains that make up the overall score, it is highly recommended that analysis of domains within a measure take place in order to facilitate a more thorough investigation of the impact of music interventions on functioning.

Fischer-Terworth and Probst's (2001) study more specifically acknowledged the need for developing diagnostic tools for dementia-related depression and anxiety, and discussed how levels might differ in accordance with dementia severity. In the interest of improving the quality of life for individuals with dementia and managing BPSD, the development and use of dementia-specific instruments are recommended for more effective assessment of needs and development of treatment plans.

In future studies it may be helpful to include assessments such as the Montreal Battery of Evaluation of Amusia (MBEMA; Peretz et al., 2013) or the Absorption in Music Scale (AIMS; Sandstrom & Russo, 2013). These particular measures would provide information to researchers and caregivers considering music-based interventions about whether an individual with dementia has the ability to discriminate changes in melodies and recognize emotions in music, and whether an individual has short term memory for tones (Peretz et al., 2013). Information about an individual's ability to allow music to elicit an emotional experience would also be provided (Sandstrom & Russo, 2013). These measures may also identify individuals who may have

aversive reactions to music (Ziv et al., 2007). In addition, utilizing the Assessment of Music Preference (APMP; Gerdner, 1998) would be useful in determining types of music that would elicit the most favorable responses from individuals. Cumulatively, having such information may have significant implications for the effectiveness of music as an intervention. Thus, utilizing such measures in future research to aid in inclusion and exclusion criteria would be valuable in determining appropriateness of music interventions for individuals with dementia.

Additional inclusion criteria that would aid in determining appropriateness of music as an intervention would be to assess whether an individual is able to hear a speaking voice at 1.5 feet, which was a useful parameter that was established in the study reviewed here by Park and Specht (2009), yet was not present in the inclusion criteria in any other study in this review. For individuals with BPSD and severe hearing impairments that would thus be excluded, it appears that providing a multisensory stimulation environment may also result in mood improvement and reductions in anxiety and agitation for individuals who have progressed to severe dementia (Sanchez et al., 2016).

Environmental factors may also be necessarily considered for inclusion criteria when recruiting from multiple settings. Being aware of standard care practices when recruiting from multiple nursing home facilities may be an essential consideration as differences in quality of standard care may influence results. Given that sample sizes in individual institutions may be small, and that multi-site studies would enhance generalizability, the quality of standard care as well as other systemic factors will need to be considered and assessed.

Methods. It is recommended that future studies include longitudinal evaluations of the impact of music interventions on dementia. Studies that include follow-up evaluations may

conduct assessments weekly for a period of time to determine at which point in time do the benefits of the music interventions begin to fade. In addition, same-day measures as well as measuring for a period of time after the intervention has been administered may be helpful to consider together. Given that one study found no increases in psychotropic medications as a result of music therapy (Ridder et al., 2013), future studies might also monitor prescription medication changes. More double-blind studies conducted that compare music interventions to a placebo condition considering the aforementioned factors may strengthen the results of future studies (Ridder et al., 2013)

Other considerations. While most studies acknowledged the importance of examining the impact of dementia severity on results, not many consider the potential impact of different settings. When the frequency of BPSD is contingent on the type and severity of dementia and the setting where someone resides is acknowledged (Erber, 2005), the necessity of such factors being included in future studies becomes apparent. Other factors worth considering that may influence the effectiveness of music interventions on BPSD may be interpersonal dynamics with family or caregivers, or longstanding comorbid psychiatric disorders such as bipolar disorder or some personality disorders.

Future literature reviews may also benefit from the selection and examination of studies that exhibit more homogeneity regarding methods, music interventions, and assessment instruments used in order to conduct more effective comparisons of results across studies and strengthen conclusions regarding the effectiveness of music interventions in dementia care. It may also be helpful to identify studies that include dementia type in the description of demographic characteristics.

Clinical Implications and Recommendations for Use

Music-based interventions may be largely beneficial for enhancing an individual's functioning regardless of dementia severity by improving a myriad of behavioral and psychological symptoms of dementia. Additional benefits appear to consistently include decreased caregiver burden and distress, as well as the potential elimination of the need to increase prescriptions of psychotropic medications when attempting to manage BPSD. However, it remains important to acknowledge that regardless of what types of interventions are used, the aim should not be "to restitute lost neuropsychological functions; rather, they should enable the patient to maintain an acceptable quality of life despite all restrictions" (Fischer-Terworth & Probst, 2011, p. 100). As such, music interventions may be utilized for all levels of ability, except for someone who is severely hearing impaired or deaf, in order to enhance quality of life.

An individual with dementia who still resides at home or in an assisted living community may benefit from both passive and active music therapy. However, given that hiring a music therapist to conduct active individual or group music therapy may be costly or unrealistic in these circumstances, caregivers may more easily administer passive music interventions to the individual with dementia. The literature supports the use of music playlists that are based on an assessment of music preferences or associated positive autobiographical memories. Passive music interventions still allow for creativity, such as in the circumstance that an individual with dementia has access to a musician from their personal life who would be able and willing to play preferred music on an instrument they find pleasurable to hear. Nevertheless, it is recommended that music be played for 30 minutes at a frequency of once or twice weekly, given the limited attention span of individuals with dementia (Gerdner, 2012). Also, for music to remain an

effective intervention it is important to not saturate its use by playing music for too long or too often, so as not to desensitize the individual from experiencing musical pleasure. However, it is also important to assess individual needs and not deprive an individual of additional music interventions if these interventions continue to be beneficial for managing BPSD. For the individual who exhibits agitation, considering peak agitation time may be helpful in timing when music interventions are administered. Based on studies examined in this review, it appears that playing music approximately 30 minutes prior to peak agitation time may yield reductions in agitation symptoms. In general, given that the burden is high for a caregiver attempting to manage BPSD for their family member or relative in the home, music may help to reduce this burden by providing an additional psychosocial intervention that does not require certification or extensive training, and that may easily be administered. Recent advances in technology may also be utilized for passive music interventions as multiple music applications allow for ease of constructing playlists and playing music with minimal instruction needed to operate such applications (Peeters et al., 2016).

Regarding individuals with dementia who reside in nursing home facilities, both passive and active music interventions may be feasible in an individual and group format, as trained music therapists may be hired as part of recreational therapy programs. For passive individual music interventions, the aforementioned recommendations provided regarding individuals that reside at home may still apply to individuals who live in nursing home settings. Families and relatives may collaborate with healthcare providers to assess music preferences and develop ways to provide music interventions based on what is available and what may be acquired. As individuals progress into more advanced dementia, individual music interventions albeit passive

or active may become more appropriate as an individual may find a group music therapy environment overstimulating, which may increase the frequency and intensity of behavioral and psychological symptoms of dementia. As such, individual music interventions may be beneficial for all severities of dementia, especially for more advanced levels of dementia. However, it must be understood at this point that the extent to which an individual may benefit from music is not universal, even within the level of severity. Given that music invokes both a personal and shared experience that is difficult to operationalize concretely, it is vital that individuals undergo an assessment of appropriateness for music interventions as well as ongoing assessment of needs in order to maintain an individualized approach to treatment. Further, music is not to be regarded as a sole intervention to manage BPSD without other interventions in dementia care, but rather as a potentially vital component to dementia care in addition to other effective multisensory and psychosocial interventions.

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