

NON- PHARMACOLOGICAL MANAGEMENT
IN DEMENTIA: MUSIC THERAPY

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ABSTRACT

Background: Behavioural and psychiatric symptoms of dementia (BPSD) represent a significant problem in the aging population. Management is challenging and involves pharmacologic and non-pharmacologic modalities. With the accumulating evidence of the adverse effects associated with the use of psychotropic medication in the elderly population, non-pharmacological interventions have become first-line therapy. This paper will provide an outline of current management of dementia, and review the current literature on music therapy as a non-pharmacological intervention for BPSD.

Method: A literature search was conducted using the online databases Embase, Scopus, and PsycInfo. Articles were chosen using specific inclusion and exclusion criteria. 10 relevant randomized controlled trials were identified and reviewed.

Results: The methods for delivery of music therapy varied between studies. All studies reviewed show a positive effect in one or more psychiatric and behavioural symptoms with individualized or group music therapy. Significant reductions BPSD after music therapy intervention were observed in all but one study.

Conclusion: Due to the methodological limitations and heterogeneity of the studies reviewed in terms of outcome measures and delivery of music therapy, it is not possible to confidently draw conclusions on the effectiveness of music therapy in reducing BPSD. However, the findings are encouraging, and support further evaluation of this non-invasive and inexpensive tool using improved study designs. The overwhelming evidence

of adverse effects associated with pharmacological therapy in dementia makes scientific development of innovative and sustainable approaches to manage BPSD imperative.

INTRODUCTION

In Canada, there are over 745 000 people suffering from dementia (1). Over the next 30 years, it is expected that this number will rise to over 1.1 million; approximately 2.8% of the total population (2). There are nearly 20 000 citizens living with Alzheimer's or a related dementia in Manitoba alone (3). Dementia is a neuro-cognitive disorder characterized by a decline in cognitive functioning from baseline, most commonly recognized by a change in learning and memory (4). This decline causes significant impairment that interferes with the ability to function independently in activities of daily life. One of the major difficulties in the care of patients with dementia is the management of the behavioural and psychological symptoms (BPSD) that accompany the disease, which include agitation, aggression, anxiety, depression, and night-time disturbances (5). At least one of these symptoms is observed in 61-92% of patients with dementia, and this number increases with the progression of the disease (6). These behavioural issues can become very distressing and often lead to an increased need for care, increased caregiver burden, and the need for institutionalization (7). Agitation is one of the most common symptoms, observed in ninety percent of individuals with dementia (8). Agitation can manifest in many ways, including restlessness, repetitive questions, cursing, calling-out (8), likely due to boredom and a need for stimulation (9). Aggression is also commonly seen in this population, and is often a way to communicate needs, avoid discomfort, and protect personal space (9). Currently in long term care homes, behavioural and psychological symptoms of dementia are managed both pharmacologically and non-

pharmacologically (5,7,9,10). Although pharmacologic treatment of BPSD has been associated with numerous adverse effects, it is still widely used in long-term care facilities (11,12). Antipsychotics are one of the most common classes of drugs used for BPSD and have been associated with many adverse side effects in the elderly, including sedation, hypotension, falls, fractures, stroke and death (7,9,13).

Recent evidence suggests that integrated multidisciplinary management that includes non-pharmacological interventions can improve outcomes in this population (7,9,14). Several non-pharmacological therapies have been shown to be useful in reducing the need for pharmacological agents (14). The purpose of this paper is to review the literature on the effects of music therapy in the management of behavioural and psychological symptoms that accompany dementia.

METHODS

A literature search was conducted using Embase, Scopus and PSYCinfo using the search terms “music therapy”, “dementia”, “alzheimer’s disease”, “neuropsychiatric symptoms”. The search was refined by limiting results to English language, human subjects, age over 65, and peer-reviewed journals only. Studies from the years 2006-2016 were reviewed. Embase yielded 48 articles, Scopus yielded 29 articles and PsycInfo yielded 91 articles providing 168 articles in total. The titles from the search were initially screened for duplicates and relevance using inclusion criteria. Following the initial screening, the abstracts of the remaining 58 articles from the search were reviewed and eligibility was determined by applying inclusion and exclusion criteria (Table 1). Articles included in this review are randomized controlled trials from peer-reviewed journals published within the last decade. The studies must have used music therapy as the primary intervention, and address behavioural and psychiatric symptoms of dementia (BPSD) as their primary outcome. The participants in the studies must have been residents of a personal care home with a diagnosis of dementia. Observational and theoretical studies were excluded, as were studies that compared music therapy to multiple other non-pharmacological interventions. Ten studies were identified for review (Figure 1).

LITERATURE REVIEW

Overview of Dementia Treatment: The treatment of dementia involves a multi-faceted approach that aims to slow the progression of the disease while managing the symptoms, maintain daily functioning, and improve quality of life. This includes a combination of pharmacologic and non-pharmacologic treatment.

While the maintenance and improvement of mental functioning is very important for people with dementia, the neuropsychiatric symptoms that accompany the disease are often the more distressing component that affect the person and their loved ones. In dementia, these symptoms lead to earlier institutionalization, decreased functioning with activities of daily living, and decreased quality of life (15). In the past, behavioural and psychiatric symptoms in dementia (BPSD) were treated mainly with pharmacological methods, including antipsychotics, antidepressants, and anxiolytics (15), however due to the expanding evidence of adverse effects associated with the use of psychotropic drugs in the elderly (16–18), non-pharmacological treatments have become first line treatment (7).

Pharmacological management: Depending on the severity of the disease, certain drugs have been reported to have a modest benefit in improving mental functioning. In Canada, there are four drugs currently approved for this use, including three cholinesterase inhibitors, Donepezil, Galantamine, Rivastigmine, and one NMDA-receptor antagonist, Memantine (19). The first three drugs are typically used in mild to moderate dementia,

while Memantine is reserved for moderate to severe. Recent studies have shown some benefit in using the two classes in combination (19). While somewhat useful for mental functioning, their benefit in managing BPSD is limited.

Antipsychotics remain the most common drug class used for managing BPSD. Although many studies (18,20) have proven their effectiveness in reducing these symptoms, it is well known that antipsychotics in the elderly are associated with, among other problems, increased risk of cardiovascular disease, stroke, and even death (17,21).

These adverse effects often outweigh the advantages of using antipsychotic drugs for the management of BPSD, and are associated with increased all-cause mortality in this age group (22). A meta-analysis of 15 RCTs assessed for mortality from atypical antipsychotic use in dementia patients showed that death occurred more often in those treated with an antipsychotic at 3.5% versus 2.3% in patients on a placebo. The risk difference was reported at 0.01 and was significant at $p=.01$ (17). More specifically, a study showed that patients with dementia treated with Risperidone suffer from cardiovascular adverse events, including stroke and transient ischemic attacks, twice as often as the placebo control group; 4% to 2% in treatment versus control group, respectively (21). Review of international databases outlining cardiovascular adverse events with Risperidone, indicated that 16 of the 37 cases identified were fatal (21).

Irrespective of these severe side effects, these agents are still widely used in long-term care facilities across Canada. In 2014, 39% of seniors in personal care homes were prescribed an antipsychotic at least once that year, with the highest use in residents with severe cognitive impairment (36.5%) and aggression (51%) (13). Nursing home

residents with dementia are prescribed antipsychotics twice as often compared to residents without dementia (12). The two most common antipsychotics used to treat symptoms of dementia in Canada are Risperidone and Quetiapine (13). The latter is commonly used for the short-term treatment of aggression or psychotic symptoms in Alzheimer's disease resistant to non-pharmacologic therapy (7). Risperidone is the second most commonly prescribed antipsychotic for BPSD symptoms, at 14% (13). Quetiapine, which is not approved to treat symptoms of dementia, is the most commonly prescribed antipsychotic with resident use at 19% (13).

Non-pharmacological management: While some cases warrant the need for the use of antipsychotics, there have been many initiatives started in Canada to reduce the unnecessary use of antipsychotics in the elderly. The current guidelines in Canada (7) recommend that the appropriate management of BPSD includes a proper assessment, diagnosis, and identification of the specific symptoms causing distress. Specific treatment can then be tailored with non-pharmacological interventions. If the behaviours are not responsive to said interventions, pharmacotherapy can be considered (7). There are several interventions that have been studied, including music (10,23–30), physical activity (31), multi-sensory rooms (32), and pet therapy (33). Non-pharmacological strategies should be tailored to the patient in order to meet their needs, with special attention to likes, dislikes, religious factors, and life experiences (9).

Music Therapy in the Management of Dementia: For many years, music therapy has been gaining more interest as a means to increase interaction among patients and caregivers, improve patients' moods and provide a vehicle for self-expression, while stimulating speech and most importantly mental functioning (34).

Music therapy is defined as the use of music in a therapeutic relationship with a certified music therapist to promote and restore emotional, mental, physical and spiritual health while fostering interaction, contact, self-expression, communication and self-awareness (34).

It is believed that when used appropriately, music can improve social and emotional skills, reduce behavioural issues, and encourage recall and language skills for those suffering with dementia (35). This coincides not only with a decrease in BPSD, but also with an improved quality of life for the person with dementia and their caregivers (35). This review identified ten randomized controlled studies addressing the treatment of symptoms in dementia with music therapy, discussed in the following paragraphs and summarized in Table 2. The different music interventions used are summarized in Table 3.

A randomized controlled trial conducted by Raglio et al. (25) aimed to assess the effectiveness of music therapy in reducing BPSD in dementia. Thirty nursing home residents with dementia were randomly assigned to the experimental group, and 29 were assigned to the control group, for a total of 59 participants. Participants were excluded if

they had received any prior music therapy or any new psychotropic medications during the previous month.

The experimental group received a total of 16 weeks of treatment, with 3 cycles of 10 therapy sessions lasting 30 minutes each, while the control group received the standard care of educational support or entertainment activities such as playing cards, reading the newspaper. Trained music therapists conducted music sessions using a nonverbal approach, with rhythmical and melodic instruments to encourage communication between subjects. Each music therapy session was videotaped and the participants' behaviours were assessed by two observers who were not directly involved in the study. The behaviours were categorized using the Music Therapy Coding Scheme (MTCS), looking specifically at empathetic behaviours, i.e. if the participant established a relationship with the MT, and non-empathetic behaviours; if the participant played the instruments without establishing a relationship with the therapist. They also observed for the acceptance of the MT approach by measuring the presence of body movements, singing, and smiling. A mixed ANOVA design was used with 1 repeated (at baseline, 8 weeks, 16 weeks, and 4 weeks after treatment) and 1 independent factor (experimental vs control group). The results showed that Neuropsychiatric Inventory (NPI) scores significantly decreased in the experimental group, but not the control group, after 8 and 16 weeks, and the effect lasted 4 weeks after treatment. The biggest improvements in NPI score included agitation, anxiety, delusions, irritability and nighttime behaviour disturbances. The MMSE did not vary in either group. The Barthel Index scores significantly decreased in both the experimental and control groups from baseline to

completion of the experiment. They concluded that music therapy could be used as an affordable and effective treatment for reducing agitation, improve quality of life, and relieve caregiver burden (25).

Following the positive response of their first study, Raglio et al. (23) explored whether delivering music therapy in cycles would still be effective in decreasing BPSD. The model consisted of three cycles of 12 music therapy sessions during a 4 week period, separated by one month of no treatment in between. 60 long-term care residents with moderate to severe dementia were randomly assigned to a treatment or control group. The control group received solely standard care, and the treatment group received music therapy in addition to standard care. Music therapy was delivered by a trained music therapist using a non-verbal model incorporating the use of musical instruments. The results showed a significant improvement in NPI global scores in both groups, with a more prominent reduction in scores in the treatment group at the end of the three cycles. There was a significant decrease in depression, anxiety, and irritability in both groups. Delusions, agitation, and apathy significantly improved in the treatment group only.

In another RCT conducted by Raglio et al (24), the effects of active and individualized music therapy on BPSD were assessed. The main outcomes were an effect on depression, anxiety, agitation, apathy, and overall quality of life. The study included 120 participants from nine Italian institutions with moderate to severe dementia that were randomly assigned to one of three treatment groups. The three treatment groups were classified as standard care with active music, standard care with individualized music, and standard care alone. In the individualized music therapy group, the participants

listened to a preferred playlist without interaction with a music therapist or caregiver. A certified music therapist conducted the active music therapy group, which involved singing and playing musical instruments. Outcomes were assessed using the NPI, MMSE, BI, Cornell Scale for Depression in Dementia, and Cornell-Brown Scale for Quality of Life in Dementia at week 0, week 10, and 2 months after treatment. The Music Therapy Check List – Dementia was used to evaluate behaviours, specifically verbal, nonverbal and musical behaviour. The frequency and quality of interactions between participants and music therapists were assessed as well. At the end of the treatment sessions, all groups showed improvement in depression, behavioural symptoms, and quality of life as demonstrated by their NPI score ($p < .001$), CSDD ($p = .001$) and CBS-QoL ($p = .01$). More specifically the NPI global score was 28% in the MT group, 12% in the individual therapy group, and 21% in the standard care group. The communication and relationships in the active music therapy group showed a positive, but non-significant improvement during treatment. Overall, the authors could not conclude that music therapy had a significant effect on BPSD in dementia in addition to standard care (24).

In a similar randomized case-control study in Iceland, Svansdottir and Snaedal (2006) recruited 38 patients from two nursing homes and two geriatric wards with a formal diagnosis of Alzheimer's disease who scored 5-7 on the GDS. The BPSD in each participant was rated by nursing staff at baseline, 6 weeks, and following the experiment at 10 weeks using the Behaviour Pathology in Alzheimer's Disease Rating Scale (BEHAVE-AD; Reisberg et al 1987). The nurses were blinded to the therapy used, and were not familiar to the patients prior to the study. The experimental group received 30-

minute music therapy sessions 3 times a week for 6 weeks, while the control group received standard care. The music therapy sessions consisted of familiar songs and various instruments that the residents could play with if desired. The patients were also able to play instruments of their choice. After 6 weeks of therapy, a significant reduction ($P < 0.01$) was observed in the aggressiveness, anxiety, and activity disturbance categories of BEHAVE-AD. This was not observed in the control group. The effects of music therapy on these three symptoms were not sustained 4 weeks post treatment. When examining all seven categories as a whole, no significant reduction was observed after 6 weeks in either the treatment or control group.

Using a quasi-experimental pretest and posttest design, Sung et al. (27) conducted a study using the preferred music intervention method, where the music is selected based on personal preferences (27). The participants involved were long term care home residents of at least 65 years of age, diagnosed with dementia and had moderate to severe cognitive decline, as indicated by a score of 4-6 on the Global Deterioration Scale. Each participant had been noted to show symptoms of anxiety as reported by nursing staff. After being randomly assigned to a control or experimental group, specially trained nursing staff provided the participants in the experimental group their preferred music on a CD player for 30 minutes twice a week for six weeks. Each participant was observed and evaluated for anxiety at baseline and following the experiment at 6 weeks using the Rating Anxiety in Dementia (RAID) tool, specifically designed to measure anxiety in people with dementia. The results showed a significant reduction in the mean anxiety score in the experimental group ($t = 5.64, p < .001$). The control group also demonstrated a

reduction in anxiety, though it was not significant ($t = 0.68$, $p=.51$). ANCOVA was then used to evaluate the efficacy of preferred music listening on anxiety after completion of the experiment, controlling for pre-test anxiety, age, and marital status. The results showed that those that received the intervention had a significantly reduced anxiety score at six weeks in comparison to those who received standard care without music ($F=12.15$, $p = .001$).

In contrast to the individual music therapy approach in their first study, Sung et al. (26) conducted another RCT to examine the effect group music therapy using percussion instruments on anxiety and agitation in nursing home residents with dementia. Over a period of six weeks, the treatment group received two 30-minute sessions per week, which encouraged active participation with familiar music played on percussion instruments as directed by a music therapist. The control group continued with standard care without music intervention. The participants were evaluated using the RAID scale for anxiety, and CMAI for agitation. After the 12 sessions, there was a significant decrease in the anxiety score in the music group compared to the control group, but no significant difference in the decrease in agitation between the two groups.

In a similar study, Lin et al. (42) used a randomized, controlled, pretest-posttest design to evaluate group music therapy in the management of agitation in institutionalized patients with dementia. Following 12 group music therapy sessions over the period of six weeks, the CMAI was used to assess for change in agitated behaviours in the treatment and control groups at the 6th and 12th sessions, and 1 month after the intervention. Statistically significant improvements in agitation scores were seen in the

experimental group at the 6th session, with 0.47 points less than the control group ($p < 0.001$), at the 12th session, with 0.44 points less ($p < 0.001$), and 1 month post-intervention, at 0.47 points less ($p < 0.001$).

Ridder et al. (29) used a cross over, exploratory, randomized control trial with 42 participants with dementia to assess individualized music therapy and its affect on agitation, quality of life, and medication use (29). Again, the participants were randomly assigned to a music therapy group, or standard care and subsequently switched midway through the study. The participants were nursing home residents with moderate to severe dementia with symptoms of agitation. Individualized music therapy sessions were held biweekly for 6 weeks by trained music therapists. The session involved singing, instrumental or vocal improvising, dancing or moving, and simply listening to live or pre-recorded music. Agitation was measured with CMAI and ADRQL at week 0, week 7, and week 14. The use of psychotropic medication was registered at baseline and at week 14, and was monitored for changes at these times. After the 14-week experiment, results showed that agitation and disruptiveness decreased during music therapy, and increased during standard care, which was significant at ($p=0.027$) with a medium effect size (0.50). Repeated measures ANCOVA indicated that the treatment group had a significantly lower anxiety score than the control group when controlling for pre-test score and cognitive level ($F=8.98$, $P=0.004$). Of the participants in the study, 71% were prescribed at least one psychotropic medication. 36% were on an antipsychotic. During the course of the study, 17% of participants received an increase in their psychotropic medication during standard care. No adjustments to medication were made during the

music therapy phase. At week 14, the prescription of psychotropic drugs was significantly higher during the standard care period than the music therapy period ($p=0.02$) (29).

Another study by Guetin et al. (30), utilized a single-centered, comparative, randomized control trial to evaluate the effects of individualized receptive music therapy on anxiety and depression in nursing home residents with mild to moderate dementia (30). All of the participants had been on long term anticholinergic therapy for at least six months, and psychotropic medications were allowed, as long as they were no changes in doses recently or during the study. Thirty participants were randomly assigned to a music therapy group or control group (no music). The control group participated in a “rest and reading” in their own rooms. In the treatment group, the participants listened to the music of their choice on headphones once a week for 16 weeks, under the same conditions as the control group. The “U Sequence method” was used, which is a technique that adjusts the music for frequency, volume, rhythm and orchestral format in such a way that guides the relaxation of the listener. An independent neuropsychologist assessor measured the outcomes of the study at day 0, then weeks 4, 8, 16, and 24 using the Hamilton Scale for anxiety, and the Geriatric Depression Scale. Significant improvements were noted in anxiety ($p=0.01$) and depression ($p<0.01$) from week 4 to week 16. These effects persisted 8 weeks after treatment ($p=0.0001$).

Lastly, Cooke et al. (43), explored the effectiveness of live group music in the reduction of anxiety and agitation in dementia. Using a randomized, controlled crossover design, 47 long-term care and assisted living residents with a confirmed diagnosis of dementia were randomly assigned to a group music program or a reading group. The

music therapy group met three times a week for 8 weeks, and involved both singing and listening to familiar live music. The control group attended an interactive reading session, which was selected as the activity to determine if any significant effects in regards to agitation and anxiety were specifically due to music therapy, or due the effects of group therapy. The participants “crossed over” following a 5 week wash-out period to reduce carry over effects. In the end, the effects of group live music therapy on agitation and anxiety were not significant. However, analysis of aggression in participants who attended greater than 50% of music sessions showed a significant increase in the frequency of verbal aggression in both groups ($F(2,46)=3.534, p<0.05$).

PERSONAL OBSERVATIONS

My interest in music therapy for the management of behavioural and psychiatric symptoms in dementia began while working at a long-term care facility. The facility offers many non-pharmacological interventions on a daily basis through the help of recreation facilitators, students, and volunteers. These interventions include art therapy, exercise programs, group music sessions, and various games including table bowling and bingo. However, due to observations by staff that some residents had been agitated, anxious, calling out, or isolating themselves, it became evident that individualized therapy programs were also needed.

For the past three years, I have worked with the recreation department to bring personalized, individualized music therapy to residents with dementia that have been identified by staff as socially isolated, disengaged, anxious, agitated, or would simply enjoy the individualized sessions. In this program, personalized playlists are developed for the resident based on their specific music interests as expressed by themselves or their family members. The residents listen to their playlist with headphones either with a recreation facilitator, or independently, depending on how they are most comfortable. During these sessions, the resident gets a chance to sing, converse and reminisce with the facilitator, often resulting in an improvement in interaction with their environment. The aim of these sessions is to introduce an element of familiarity back into their routine, and provide a stimulus to relate beyond their isolation. An interest in life seems to return when they listen to the music that they were so fond of prior to the onset of illness.

An additional benefit of having a personalized playlist, on their own music player with their own headphones is that it can be used as a simple tool by caregivers, including nursing staff, health care aids, and family and friends if the resident is anxious or agitated. This can be a vehicle for better communication, and to improve relationships between the resident, staff and family.

A case study illustrating one of the experiences I have had with individualized music therapy during my work at the care home is presented in Figure 2.

DISCUSSION

In summary, ten studies were identified that provided a reasonable level of evidence relative to the efficacy of music therapy as a non-pharmacological adjunct for the treatment of dementia. All ten studies (24,25,26,27–30,42,43) were randomized controlled trials involving institutionalized elderly over the age of 65 with Alzheimer's disease or a related dementia. Two studies included a crossover period (29,43). The number of participants ranged from 30 to 100, with the largest group allocation being 52 (42). The length of the studies varied from six (27) to 20 weeks (25), as did the number of sessions given. The number of sessions ranged from twelve (27,29) to thirty (25) sessions. The studies were conducted in various personal care homes in France (30), Iceland (28), Denmark (29), Norway (29), Taiwan (26,27,42), and Italy (23,24,25). All studies tested the effects of music therapy against a control group. Of the six studies, eight studies compared the treatment to the facility's standard care, and two (30,43) compared treatment to reading and relaxing.

In terms of treatment, three papers (27,29,30) focused on individualized music therapy, seven (23,25,26,28,42,43) looked at group music therapy and one compared both group and individualized therapy to standard care (24). A trained music therapist led all group therapy sessions. Both live and pre-recorded music were used in the studies.

Each study reviewed focused on behavioural and psychiatric symptoms in dementia as their primary outcome. Three studies (23,24,25) focused on all of the symptoms outlined in the Neuropsychiatric Inventory (NPI), and quality of life (24). Agitation (26,

42,43), aggression (42), anxiety (26, 27, 30, 43), depression (24, 30) and apathy (24) were also studied.

In order to measure these outcomes, several scales were used. Raglio et al. (24,25) used a combination of the NPI, CSDD and CBS-QoL. Svansdottir and Snaedal (2006) evaluated their outcomes using BEHAVE-AD (28). Four studies (26,29, 42, 43) used the CMAI to evaluate agitation. The RAID and Hamilton scales were used to assess anxiety (26,27,30). All scales had been published to be valid and reliable by previous studies prior to use, apart from the BEHAVE-AD scale. Four (25,28,30,42) of the ten studies reviewed long-term outcomes using these scales as well.

Three (25,29,30) of the ten studies monitored for changes in medications throughout the study. Each study required that there were no significant changes in psychotropic medications prior to starting the trial. Ridder et al. (2013) included psychotropic medication use as a secondary measure (29). They found that there was no increase in the prescription of psychotropic drugs in the music therapy group, but there were increases for seven participants during the standard care phase. However, it should be noted that this study was a crossover trial, and it was not specified if the increase in medication occurred before or after they participated in the music group.

Although eight of the ten studies reported significant positive outcomes for the effects of music on BPSD, there were many limitations to take into account. Firstly, comparison of each study was difficult due to differences of sample sizes, outcome measures, number of sessions, length of treatment, and the way in which music therapy was delivered.

The studies were set in various different countries, which likely run their PCHs differently than in North America by virtue of cultural differences. This may also have an effect on the results of the study, as treatment for dementia and the overall care for elderly may differ from country to country. The length of the studies may also hinder the results. Each study was done in a very short time period, and only four of the ten studies examined the long-term benefit. The music therapy sessions were held one to three times weekly, and the long-term benefit was examined 6 to 8 weeks later. With the timing of the sessions and the timeline of assessing outcomes, it is difficult to conclude whether the improvement in BPSD is solely due to music therapy, or if there are confounding variables present. Due to the nature of the personal care home environment, there are undoubtedly many outside variables that can contribute to the increase and decrease of these symptoms, such as visits from family members or friends, passes to leave the facility, other activities (painting, exercise programs). Furthermore, the control groups that continued on with standard care may have been exposed to music by a variety of methods, depending on whether or not the care home provided music as one of its usual activities. Only one study implicitly stated that standard care did not involve music exposure (29).

The studies did not focus on one particular type of dementia, therefore specific conclusions regarding the benefits for any specific type of dementia cannot be drawn. In addition, the studies varied on the stages of dementia from mild to moderate, and moderate to severe. This could have an effect of the efficacy of music therapy in terms of its potential impact and long-term outcome. However, the samples were representative of

that in a typical personal care home, which could add to the generalizability of results. In a future study, it would be interesting to see the benefits of starting music therapy earlier rather than later in diagnosis and see if it contributes to the trajectory of the disease.

The most evident factor affecting the generalizability of results would be the small sample sizes included in each study with the number of participants ranging from as few as 30 to 100. With such a small sample size, it is difficult to assume that these samples are representative of the general population of persons with dementia in nursing homes. It is also important to note that, because of the small sample sizes, three of the studies collected data with intention to treat, regardless if music therapy was actually received so as not to decrease the effect size needed to compute significant results (24,29,43).

The positive outcome of music therapy identified in the studies reviewed is consistent with my own uncontrolled observations. Although persons with dementia have great difficulty with new learning and episodic memories, there is evidence that their musical long-term memories remain intact (36,37). Studies have shown that musical memories and associated emotions can be easily evoked, even in the cognitively impaired. Cuddy, Sikka, and Vanstone (2015) compared the efficacy of instrumental music on evoking autobiographical memories in healthy individuals of all ages to those with mild to moderate Alzheimer's disease, and both groups showed positive results (36). Janata et al (2009) studied the spontaneous activation of autobiographical memories in the medial prefrontal cortex, which has the slowest rate of cortical atrophy in comparison to the rest of the brain in Alzheimer's disease (38). There is a close relationship between music-evoked autobiographical memories and familiarity, pleasantness, and emotion

(36). Gerdner et al (2005) showed that individualized music implemented by trained staff and family correlated with a significant reduction in agitation, and helped foster meaningful interaction between the resident and others (39). Progression of the disease is inevitable, and along with that comes a loss of self-identity, hindering meaningful relationships with family members (36). Music helps promote engagement, specifically in one-on-one communication (8). It can also be used to introduce or maximize a sense of familiarity into a new or existing environment, resulting in the improvement of functional abilities of persons with dementia (40). Due to the promising effects of music on this population, care homes have started to implement it during stressful periods for the residents, such as meal time or bath time (41,44).

With music being such a simple intervention for a potentially distressing range of symptoms, it would be reasonable to educate families and caregivers on the possible benefits of implementing it into their care plans. When properly trained, nurses and family members can deliver music therapy with similar reductions in BPSD that are seen with trained music therapist (39).

SUMMARY

Most investigators came to the conclusion that music therapy is effective in reducing at least one behavioural and psychiatric symptom that accompanies dementia. While each study had some methodological limitations, the reductions in BPSD were evident. Music is an affordable and simple intervention that can provide a person with comfort, familiarity and a spark of identity. This review included studies with different ways of providing music therapy, with individual and group therapy, and both live and recorded music. Music therapy is flexible; it can be delivered in a variety of ways that suits the individual and the caregivers. The overwhelming evidence of adverse effects associated with pharmacological therapy in dementia, makes scientific development of innovative and sustainable approaches to manage BPSD imperative. Due to the methodological limitations and heterogeneity of the studies reviewed in terms of outcome measures and delivery of music therapy, it is not possible to confidently draw conclusions on the effectiveness of music therapy in reducing BPSD. However, the findings are encouraging, and support further evaluation of this non-invasive and inexpensive tool using improved study designs.

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TABLES

INCLUSION CRITERIA	EXCLUSION CRITERIA
Music therapy as primary intervention	Comparison of music therapy to multiple nonpharmacological interventions
Diagnosis of Alzheimer's disease or related dementia	No mention of music therapy, dementia, or a neuropsychiatric symptom in article title.
Institutionalized elderly	Involved participants in the community
Primary outcome includes at least one neuropsychiatric symptom of dementia	Focus on caregiver or environmental outcomes
English language	Observational or theoretical papers
Human subjects	Case study papers
Randomized Controlled Trials	Abstract only
Peer-reviewed Journals published between 2006-2016	

Table 1. Inclusion and exclusion criteria applied in literature review.

Study	Age/ (Dementia Severity)	Intervention (Weeks/ Sessions)	Behavioural/ Psychiatric Parameters	Outcome Measures	Results
Raglio et al. (2015) n=98	Mean 81.7/ (MMSE:11.3)	RCT MT, LtM (10/20)	Depression, Anxiety, Apathy	NPI CBS-QoL CSDD	Significant improvement in BPSD in both treatment and control groups; NPI ($p \leq 0.001$), CSDD ($P = 0.001$), CBS-QoL ($P = 0.01$) No significant difference in behaviour between groups.
Raglio et al. (2008) n=59	Mean 84.4/ (MMSE:11.1)	RCT GMT (20/30)	All	NPI MMSE BI	Significant improvement in NPI score in experimental group vs control group ($F_{3,165} = 5.06$, $P = 0.002$). The effect persisted 4 weeks after treatment ($F_{1,57} = 12.65$; $P = 0.0007$). No significant change in MMSE over the course of the study. Significant decrease in Barthel Index scores in both groups ($F_{3,165} = 8.91$, $P < 0.0001$)
Raglio et al. (2010) n=60	Mean: IG: 85.4 +/- 6.5 CG: 84.6 +/- 6.8 (MMSE: IG:8+/-4.8 CG:8.6+/-2.5)	RCT GMT (4/12) x 3	All	NPI	Significant improvement in global NPI scores were observed in both treatment and control groups ($F_{7,357} = 9.06$, $p < 0.001$). There was a significantly higher reduction in NPI scores in the experimental group than the control group towards at the end of the three cycles ($t = 2.58$; $p < 0.001$) Significant reduction in delusions ($p = 0.002$), agitation ($p = 0.003$), and apathy ($p = 0.036$) were seen only in the treatment group
Guetin et al. (2009) n=30	Mean 86.1/ (MMSE:20.3)	RCT IMT (16/16)	Anxiety Depression	Hamilton scale, GDS	Significant improvement in anxiety ($p < 0.01$) and depression ($p < 0.01$). The effects persisted 8 weeks after sessions ended ($p < 0.01$)
Svansdottir and Snaedal (2006) n=38	Age Range 71-87/ (GDS:5-7)	Case Control GMT (6/18)	Activity Disturbances, Aggression Anxiety	BEHAVE-AD scale	Significant decrease in activity disturbances, aggressiveness, and anxiety in the music therapy group ($p < 0.01$). The effects did not persist 6 weeks post treatment
Ridder et al. (2013) n=42	Mean 81/ (GDS:5.8 MT:5.4)	Cross Over Trial IMT (12/12)	Agitation Quality of Life Medication	CMAI ADRQL Prescription of medication	Significant reduction in agitation disruptiveness during music therapy, and a significant increase in same during standard care ($p = 0.027$) Frequency of prescription of antipsychotic medication was significantly higher during standard care than during music therapy ($p = 0.02$)
Sung et al. (2006) n=52	Mean 80.2 (GDS: 4-6)	Quasi- experimental Pretest – posttest IMT (6/12)	Anxiety	RAID	Significant reduction in the mean anxiety in treatment group from pretest to posttest ($t = 5.64$, $p < 0.001$). ANCOVA of reduction of anxiety in treatment group vs experimental group was significant at ($F = 12.15$, $p = 0.001$)

Sung et al. (2012) n=60	Mean IG: 81.37 CG: 79.5 /(SPMSQ: IG: 6.56 TG: 4.43)	RCT GMT (6/12)	Anxiety Agitation	RAID CMAI	Significant reduction in anxiety level in the treatment group compared to control group (F=8.98, p=0.004) Reduction of agitation between groups was not significant. (F=.003, p=0.95)
Lin et al. (2011) n=100	Mean 82/ (MMSE: IG 12.8, CG: 13.8)	RCT GMT (6/12)	Agitation Aggression	CMAI	Significant reduction in agitated behaviour scores in treatment group compared to control group at the 6th session, 12th session, and 1 month post-treatment (p<.001). Significant reduction in physically aggressive behaviours in treatment group compared to control occurred at the 6th session (p=0.028), at the 12th session (p=0.025) and 1 month post-treatment (p=0.018) A significant reduction in verbally aggressive behaviours in treatment group compared to control group observed at the 6th session (p=0.0764), but not at session 12 or 1 month post-treatment.
Cooke et al. (2010) n = 47	Age Range 65-95+/ (MMSE: 16.51)	RCT, Crossover design GMT (8/24)	Agitation Anxiety	CMAI RAID	Significant increase in frequency of verbally aggressive behaviours was observed in those who attended >50% of music sessions in both groups (F(2,46)=3.534, p<0.05). No significant reduction in agitation and anxiety was observed in either group.

*NPI = Neuropsychiatric Inventory, CBS-QoL = Cornell Brown Scale – Quality of Life, CSDD = Cornell Brown Scale Depression in Dementia, MMSE = Mini Mental Status Exam, BI = Barthel Index, GDS = Geriatric depression scale, RAID = Rating Anxiety in Dementia, ADRQL = Alzheimer's Disease Related Quality of Life, CMAI = Cohen Mansfield Agitation Inventory, SPMSQ = Short Portable Mental Status Questionnaire GMT = Group music therapy, IMT = Individualized music therapy

Table 2. Summary of randomized studies selected for review.

Study	Delivery of Music Intervention
Raglio et al. (2015) n=98	Group music therapy conducted by a certified music therapist using various musical instruments. Participants were encouraged to actively participate by singing and playing the instruments provided.
Raglio et al. (2008) n=59	Group music therapy conducted by a certified music therapist using various musical instruments. A nonverbal approach was used by the music therapist. Participants gathered to listen to rhythmical and melodic music.
Raglio et al. (2010) n=60	Group music therapy conducted by a certified music therapist using various musical instruments. A nonverbal approach was used by the music therapist. Participants gathered to listen to rhythmical and melodic music.
Guetin et al. (2009) n=30	Individual receptive music therapy with a specific sequence of music chosen based on the participant's interests. Participants listened to music individually with headphones as directed by the researchers.
Svansdottir and Snaedal (2006) n=38	Group music therapy sessions with sing-a-longs of familiar Icelandic songs lead by a certified music therapist. The music therapist used a guitar to accompany the sing-a-longs, and the participants were encouraged to use various instruments during the sessions.
Ridder et al. (2013) n=42	Individual music therapy lead by a certified music therapist using pre-recorded music and live instruments. Vocal and instrumental improvising, singing, and dancing were encouraged.
Sung et al. (2006) n=52	Individual music therapy with music chosen based on participant's preferences. Music therapy sessions were led by trained nursing staff, and involved listening to preferred music on a CD player.
Sung et al. (2012) n=60	Group music therapy directed by a research assistant encouraging active participation with percussion instruments.

Lin et al. (2011) n=100	Group music therapy delivered by a music therapist which involved various activities including rhythmical music, therapeutic singing, listening to specially chosen music, glockenspiel, and traditional music.
Cooke et al. (2010) n = 47	Group music therapy with live music delivered by two musicians. The musicians played guitar and sang familiar music while encouraging active participation. 10 minutes of pre-recorded instrumental music was also used to promote active listening.

Table 3. Summary of music interventions used

FIGURES

Figure 1.

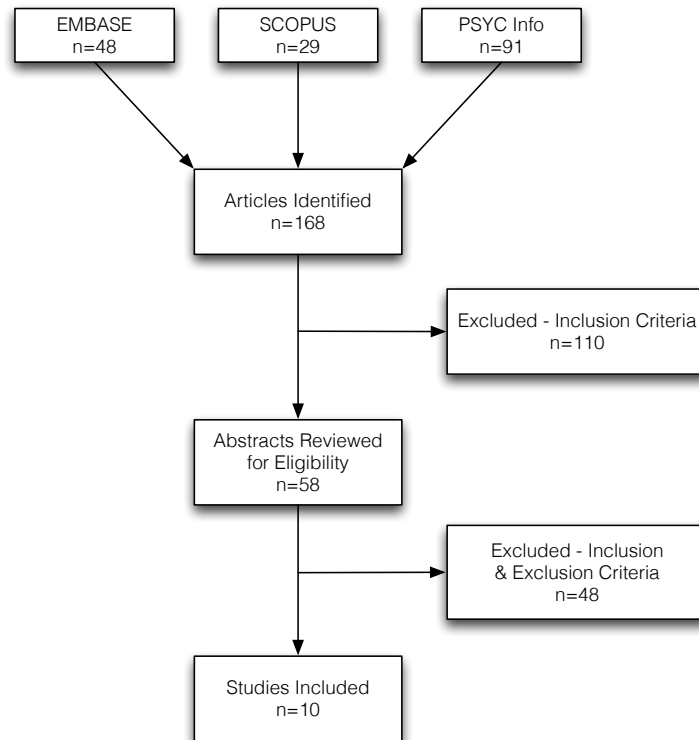


Figure 2.

Mrs. E, a 94 year old woman with dementia and a resident of a long term care facility for over 5 years, was often found slouched over in her wheelchair sitting beside other residents in the common room, quiet and disengaged from her surroundings. Early on in her first session with individualized music therapy, she identified her favourite songs, which included *Tennessee Waltz*, by Patti Page, *Five foot two Eyes of blue*, by Guy Lombardo, and *Who's Sorry Now*, by Connie Francis. Her eyes immediately lit up when these songs started, and to my surprise she began singing every lyric to the songs without error. These sessions continued weekly with the same positive response. She would often clap, tap her feet, and tell me stories of growing up with her siblings. She would reminisce about the band she had with her sisters and the performances they had in her hometown. On more than one occasion, another resident would come into the room join the sing-a-long as directed by Mrs E. Following each session, Mrs. E. would thank me and ask when our next "chat" would be. According to the house staff, Mrs. E. would continue to hum and sing the songs in the common room. They noticed a significant change in her overall affect as she seemed genuinely happy and more involved with others in the facility.

LEGEND FOR ILLUSTRATIONS

Figure 1. Flow diagram showing inclusion and exclusion process in selecting studies for review.

Figure 2. Case study. (Age and patient's initials have been modified to protect identity).