

Systematic review of evidence underpinning non-pharmacological therapies in dementia

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Objective Dementia is one of the most common illnesses worldwide, and is one of the most important causes of disability in older people. Currently, dementia affects over 35 million people around the globe. It is expected that this number will increase to 65.7 million by 2030. Early detection, diagnosis and treatment to control the principal behaviour symptoms may help reduce these numbers and delay the progression to more advanced and dangerous stages of this disorder with resultant increase quality of life for those affected. The main goal of the present systematic literature review was to examine contemporary evidence relating to non-pharmacological therapy in the treatment of dementia.

Methods To achieve the study goal, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was used.

Results This study identified the five most common behaviours in patients with dementia as aggression, wandering, agitation, apathy and sleep disturbances. Two non-pharmacological therapies were the most studied treatment: music therapy and aromatherapy. Ten other non-pharmacological therapies were also identified, but these lack a sufficient evidence-base.

Conclusion Although all the therapies identified could be used as part of the treatment of behavioural symptoms, there is insufficient evidence relating to the indications, appropriate use and effectiveness of these therapies to apply in each behavioural treatment. Thus, the present study has demonstrated a significant research gap.

What is known about the topic? Despite the widespread use of many different types of therapies, there is limited evidence regarding the efficacy of non-pharmaceutical therapies deployed in the management of behaviours of concern manifested by some people who suffer with dementia in all its forms.

What does this paper add? This systematic review examines contemporary evidence from the literature to determine whether there is an evidence base available that would underpin the use of these therapies. This report on a PRISMA systematic review of the available literature demonstrates that only two therapies have some evidence to underpin the use of these non-pharmaceutical therapies and that a significant research gap exists.

What are the implications for practitioners? The implications for practitioners is that significant research effort is required to determine the efficacy of many of the therapies that are currently deployed, and thus many of the therapies used lack an evidence base at this time.

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The evidence for non-drug therapies in dementia

Introduction

Dementia is a progressive deterioration of cognitive function that affects patients' social behaviour and emotional control (1, 2). This syndrome usually affects memory, thinking, learning capacity, orientation, language and judgment (3, 4). Dementia manifests mainly in older people (>65 years old) where there can be behavioural issues in the course of the illness, and the prospect of disability and dependency (5, 6).

There are 47.6 million people with dementia globally (6, 7) and with approximately 7.7 million new cases each year. It is expected that the global prevalence of dementia will rise dramatically over the next 20 years thus it is a critical public health concern. By 2050 the number of individuals suffering with dementia is expected to exceed 115.4 million people globally (6, 8).

The most common behaviours that patients with dementia show are aggression, agitation, depression, apathy, sleep disturbances and, wandering (2, 3, 9). Dementia has devastating social, economic, and emotional consequences for those affected and their family and caregivers (10, 11) and the management of these behaviours are important for sufferers and their families and carers (2, 12). There are pharmacological and the non-pharmacological options to manage these (2, 4, 9).

Most of the pharmacological treatments for dementia patients are based on mostly antipsychotics and anxiolytic medications, which may have adverse effects to the health of older people (7, 13). However, there are reported adverse effects of them such as sedation, increased confusion, falls, increase of anticholinergic, cardiac problems, and even death (2, 14).

Alternatively, non-pharmacological treatment is based on high levels of patient and caregiver satisfaction, and reduced behavioural symptoms with minimal risk and adverse reactions (14, 15). The most common non-pharmacological therapies are music therapy, aromatherapy and massage, laughter, structured activities, animal-assisted interventions, environmental interventions, simulated presence, dance movement, art, and combination therapies (16, 17).

Methods

This systematic literature review of the literature has been conducted using the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement proposed by Moher, Liberati (18).

Information Resources

At first, health-related data bases were identified. This literature review has been based on relevant articles and papers found in different and high ranked electronic data bases. These were: ProQuest, ScienceDirect, Cochrane, EBSCOhost, PubMed and Scopus.

Selections criteria of the literature

Following the PRISMA statement, selection criteria were used to address the literature. The initial screening was performed by examining the title and then abstract and conclusions to determine if the article reflected the objectives of this research because they contained words in relation to behaviours of patients with dementia, and non-pharmacological treatment of dementia.

Inclusion and Exclusion Criteria

The screening process applied the inclusion and exclusion criteria in order to narrow the number of studies identified. Table 1 illustrates the inclusion and exclusion criteria applied to this study.

Table 1: Inclusion and exclusion criteria. This table illustrates the criteria used to include and exclude the reviewed literature.

Inclusion: literature studied	Exclusion: literature disregarded
- Ranging between 2010 and January 2016	- Studies of pregnant women with dementia
- Had to be written in English	- Studies of dementia patients aged between 30 and 59 years
- Include other systematic reviews, meta-analyses and case reports	- Studies about pharmacological treatment of dementia
- Include non-pharmacological in patients with dementia	- Studies about depression and psychosis behaviours
- Include most common behaviours in patients with dementia	

Results

Figure 1 summarises the number of evidence based articles assessed in each stage of the applied method. In the search process, 216,329 articles were initially identified in six databases related to dementia studies; eight other records were used outside the main databases. After this, a screening process was applied. Screening with Title 1, 'common behaviours in dementia', 28,721 records were identified, while with Title 2, 'behaviour symptoms in dementia treatment', 22,916 records were acknowledged, and 4,296 with Title 3, 'Non-pharmacological treatment'.

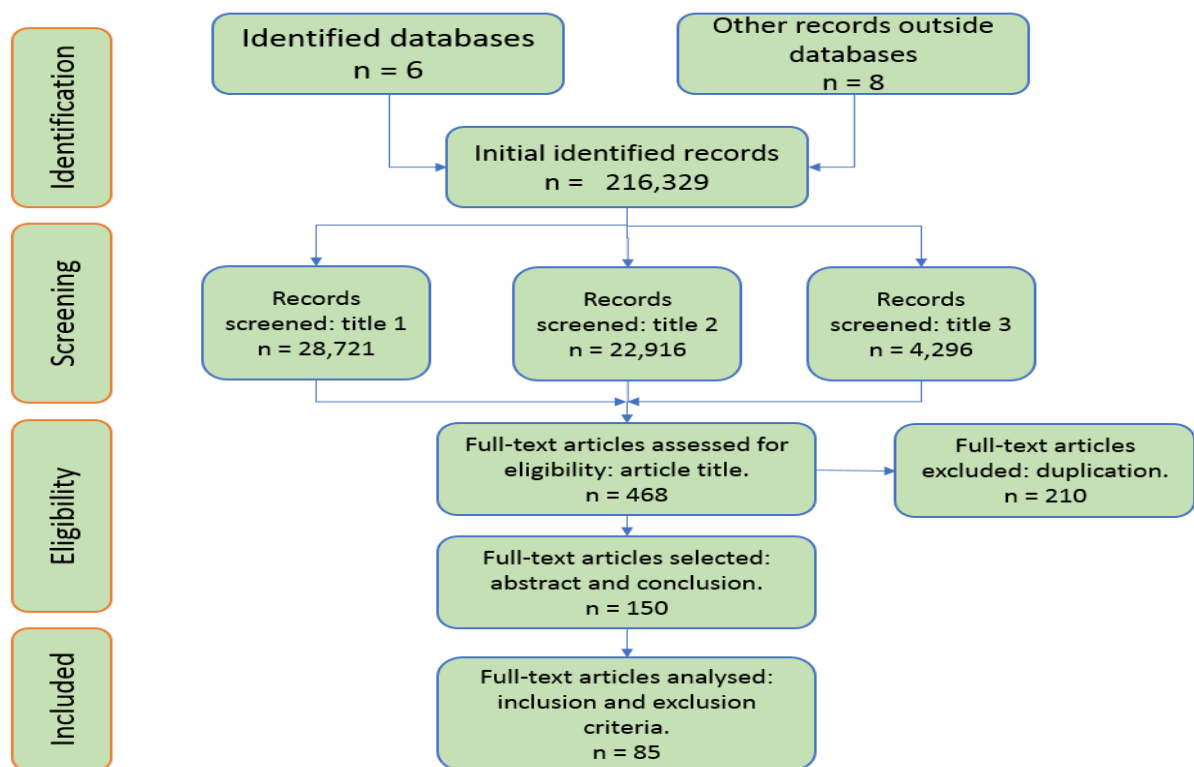


Figure 1: PRISMA diagram, summary of findings in the outcome level.

The inclusion and exclusion process found 468 with titles related to dementia with non-pharmacological treatment or/and common behaviours of patients. 210 articles were removed for duplication. The 468 articles were assessed, and 150 were selected once their abstracts and conclusions were studied. 65 articles did not meet the inclusion criteria as described.

After applying the inclusion and exclusion criteria, 85 peer-reviewed publications were analysed in this systematic literature review. At the same outcome level, Table 2., demonstrates the number of papers assessed in terms of common behaviours in patients with dementia. Overall, identified records of aggression and apathy were slightly higher than those of wandering, agitation and sleep disturbances.

Table 2: Summary of applied methods. This table shows the results of the assessed literature by three different topics and final analysed articles based on the inclusion and exclusion criteria.

Databases	Initial Results: dementia	Topic 1: Common behaviours in dementia	Topic 2: Behaviour symptoms in dementia treatment	Topic 3: non-Pharmacological treatment in dementia	Full-text articles assessed for eligibility based on title	Removed duplicates articles	Full-text articles assessed by abstract and conclusion	Full-text articles analysed, based on criteria of inclusion and exclusion
ProQuest	56,089	16,228	11,362	3,167	223	127	58	26
Science Direct	53,068	9,612	7,443	811	117	46	37	23
Cochrane Library	9,522	5	7	8	7	6	6	6
EBSCOhost	28,803	5	1,296	25	24	18	15	13
PubMed	42,728	707	2,040	238	45	28	15	9
Scopus	26,119	2,164	768	47	52	33	19	8
Summary	216,329	28,721	22,916	4,296	468	258	150	85

Table 3., below summarises the main records of literature found in the six addressed databases. It is clear that ProQuest and Science Direct contained the largest number of studies regarding to the objectives of this research.

Table 3: Literature referring to behaviour studies of dementia.

Authors of the related to common behaviours are provided in the following table.

Behaviours	Numbers of papers	Authors
Aggression	12	(Azermi et al., 2012; Bidewell & Chang, 2011; Cankurtaran, 2014; Cerejeira, Cerejeira, Lagarto, & Mukaetova-Ladinska, 2012; Cipriani, Vedovello, Nuti, & Di Fiorino, 2011; Cooke, Moyle, Shum, Harrison, & Murfield, 2010; Corbett, Burns, & Ballard, 2014; Powell, Flynn, Rischbieth, & McKellar, 2014; Vickland et al., 2012a, 2012b, 2012c)
Wandering	9	(Ali N. et al., 2015; Cipriani, Lucetti, Nuti, & Danti, 2014; Futrell, Melillo, Remington, & Butcher, 2014; Gu, 2015; Halek & Bartholomeyczik, 2012; Kwak, Yang, & Koo, 2015; Merims et al., 2013; Wan, Byrne, Ogrady, & Ohare, 2015; White & Montgomery, 2014)
Agitation	7	(Antonsdottir I., Smith J., Keltz M., & Porsteinsson A., 2015; Bidewell & Chang, 2011; Cohen-Mansfield, Thein, & Marx, 2014; Livingston et al., 2014; Man-Hua, Li-Chan, Shiao-Chi, & Jen-Hwey, 2015; Mitchell A. M. et al., 2015; Oppikofer & Geschwindner, 2014)
Apathy	11	(Agüera-Ortiz L. et al., 2015; Brodaty & Burns, 2012; Cipriani G., Lucetti C., Danti S., & Nuti A., 2014; Clarke et al., 2008; Esposito F. et al., 2014; Ferrero-Arias, Goñi-Imizcoz,

Behaviours	Numbers of papers	Authors
		González-Bernal, & Lara-Ortega, 2011; Jao, Algase, Specht, & Williams, 2015; Kales, Gitlin, & Lyketsos, 2015; Merrilees, Dowling, Hubbard, & Mastick, 2013; Mortby, Maercker, & Forstmeier, 2012; Van Almenkerk, Smalbrugge, Depla, & Eefsting, 2015)
Sleep disturbances	9	(Chen Jiu-Chiuan et al., 2016; Cipriani, Lucetti, Danti, & Nuti, 2015; Fabricio Ferreira de Oliveira, Bertolucci, Chen, & Smith, 2014; L. N. Gitlin, 2014; Latreille et al., 2015; Miu & Szeto, 2012; Porter, Buxton, & Avidan, 2015; Rose & Lorenz, 2010; Wilfling et al., 2015)

The number of publications assessed, all referring to studies of non-pharmacological treatment of dementia is shown in Table 4. The major studies focused on music therapy, with 16 published in the last four years. Aromatherapy had the second highest number of articles related to non-pharmacological therapy of dementia, with 9 articles. An additional 6 studies grouped other non-pharmacological therapies other than music and aromatherapy were found. These included structured activities, animal-assisted interventions, environmental interventions, simulated presence therapy for dementia, and combination therapies.

A framework for assessing the quality of primary research reports by Kmet, Lee (19) provides a scoring system for both qualitative and quantitative research has been used in the quality assessment of papers included. The scale was originally developed to assess health technology however the authors found this a useful tool to assess the quality of studies included. A ten-item checklist used by these authors was deployed to score each of the studies listed in table 3. This checklist is reproduced below.

Criteria		YES (2)	PARTIAL (1)	NO (0)
1	Question / objective sufficiently described?			
2	Study design evident and appropriate?			
3	Context for the study clear?			
4	Connection to a theoretical framework / wider body of knowledge?			
5	Sampling strategy described, relevant and justified?			
6	Data collection methods clearly described and systematic?			
7	Data analysis clearly described and systematic?			
8	Use of verification procedure(s) to establish credibility?			
9	Conclusions supported by the results?			
10	Reflexivity of the account?			

Figure 2. Standard Quality Assessment Score - Source: Kmet, Lee (19)

Scores were ascribed using the tool shown in figure 2. The individual scores for yes, partial and no were summed to provide the SQAS score which is recorded in the far-left column of table 4. The possible score range is from 0-20 with 0 being low quality and 20 being high quality.

1 **Table 4: Literature referring to studies on non-pharmacological treatment of dementia.**

2 This table shows the most common studied non-pharmacological treatments with scores from the Standard Quality Assessment Criteria (SQAS) for

3 Evaluating Primary Papers from a Variety of Fields from Kmet, Lee (19).

Authors	Contribution to the Literature	SQAS
<i>MUSIC THERAPY (15)</i>		
Baker, Grocke (20)	This study examined the use of music therapy in maintaining meaningful relationships in ageing couples where one spouse has dementia may lead to improved wellbeing in the caregiving spouses and increase the probability that caregivers will be able to maintain the care of their partners.	12
Cohen-Mansfield (2)	These authors examined Non-pharmacologic interventions, including music therapy individually tailored to the person with dementia a superior response to behavioral disorders and should be at the frontline of treatment of these disorders. The investigators admitted that rigor of the investigations varied greatly depending on factors related to the behavioral disorder, setting, and resource limitations.	18
Cohen-Mansfield, Thein (21)	Examined the influence of personal characteristics (demographic, medical, and functional variables) and possible barriers (eg, staff or family barriers) on the efficacy of non-pharmacological interventions including music therapy in reducing agitation. The study provided a set of characteristics of those who respond to “Treatment Rules for Exploring Agitation” (TREA) subscribing to matching the unmet need with appropriate interventions. Makes a strong case for changes in staff-related barriers.	14
Cooke, Moyle (22)	Investigated the effect that participation in a 40-min live group music programme, involving facilitated engagement with song-singing and listening, three times a week for eight weeks, had on agitation and anxiety in older people with dementia. This study found that participation in the music programme did not significantly affect agitation and anxiety in older people with dementia. Agitation was found to be predicted by a number of background factors (namely level of cognitive impairment, length of time in the facility and gender). Recommendations were made for future studies.	20
Gitlin, Kales (14)	These authors used a case-study approach to characterize common behavioral symptoms of dementia and describe an assessment strategy for selecting evidence-based nonpharmacologic treatments including music therapy. The very important role of primary care clinicians facilitating collaboration with specialists and other health care professionals to implement nonpharmacological treatment plans. The authors cite substantial evidence shows thatnonpharmacologic approaches can yield high levels of patient and caregiver satisfaction, quality of life improvements, and reductions in behavioral symptoms and make strong representations that access to nonpharmacologic approaches should be a standard part of care for those with dementia.	10
(23)	This literature review discusses contemporary literature and used it to underpin an approach to integrate non-pharmacologic treatment with pharmacologic treatments including music therapy and recommends a paradigm shift for taloring treatments for eople and families dealing with the suymptoms of dementia.	14
Konno, Kang (24)	This paper is stated as a best-evidence review of the literature investigating non-pharmacological interventions for resistance-to-care beahviours of nursing home residents with dementia. The authors found evidence level is low and recommend more randomized controlled trials to confirm the effects of non-pharmacological interventions.	16
McLaren, Lamantia (12)	This is a systematic review of the literature identifying controlled clinical tials that report on the impact of non-pharmacologic interventions on any measure of fucntional impariment or disability in a community/home care envrionment. The outcomes of the review was that clinical trial evidence did exist that non-pharmacological interventions including music therapy can delay the progression of functional disability in this people living with dementia in the community.	18

Authors	Contribution to the Literature	SQAS
Mitchell, Chiappetta (17)	This article presents results from a quality improvement pilot project that examined the usefulness of a specially designed, multisensory room intervention which included music for inpatients in a psycho-geriatric treatment facility who had mild to moderate agitation. They found that using the multi-sensory room decreased agitation as measured by the Pittsburgh Agitation Scale (PAS) for up to an hour in all sub-scales with the exception the aggression subscale.	14
de Oliveira, Radanovic (25)	This systematic review of the literature found 20 studies published in the ten years prior to 2015 including forms of music therapy in a heterogenous sample that underpin non-pharmacological interventions are able to reduce behavioural and psychological symptoms of dementia. The review of music therapy required more specificity.	12
Raglio, Bellelli (26)	This study examined clinical and randomized control trials of the use of music and music therapy in the management of dementia and related issues from 2000-2011. The review found that some limitations, the results of these studies are consistent with the efficacy of music therapy and emphasising the criticality of direct interaction between the music therapist and the client.	18
Ray and Mittelman (27)	This study examined the use of music therapy to treat residents of aged care facilities with moderate to severe dementia (n=132). Participants were evaluated for depressive symptoms, agitation, and wandering to determine their predominant behavior. Participants were assessed two weeks pre-post the intervention for depression, agitation and wandering. Whilst there was no change for wandering, depression and agitation were reduced significantly.	20
Ridder (28)	This case study investigated music therapy and specifically the method attributed to Tony Wigram, with a person with dementia and aphasia in order to understand how music therapy may facilitate communication and dialogue. The case study demonstrated that Extemporizing can assist with communicative dialogues and help address psychosocial needs for people with dementia.	14
Tuckett, Hodgkinson (29)	This study specifically evaluates the efficacy of music therapy on people with dementia who exhibit behaviours of concern by using semi structured focus groups amongst staff and families. This has some application for those who wish to investigate this further however findings were non-specific.	12
Ueda, Suzukamo (30)	This systematic review of the literature and meta-analysis investigated the effects of music therapy on behavioural and psychological symptoms of dementia associated with activities of daily living for the person living with dementia. There was evidence that music therapy is effective for the managing the symptoms described.	18
AROMATHERAPY (9)		
Cohen-Mansfield (2)	These authors examined Non-pharmacologic interventions, including aroma therapy individually tailored to the person with dementia a superior response to behavioral disorders and should be at the frontline of treatment of these disorders. The investigators admitted that rigor of the investigations varied greatly depending on factors related to the behavioral disorder, setting, and resource limitations.	14
Forrester, Maayan (31)	The objective of this study was to assess the efficacy of aromatherapy as an intervention for people with dementia by a qualitative review of the available literature and found equivocal evidence that aroma therapy was effective from the seven trials included in this review.	18
Fung, Tsang (32)	This study undertook a systematic review of the available literature on randomized control trials of aromatherapy in older adults with dementia from 1995-2011. The 11 RCT showed that aromatherapy had positive effects on reduction of behavioural and psychological symptoms of dementia as well as improvements in cognitive functions, increasing quality of life, and independence in activities of daily living. The authors recommended that these trials need to be repeated with a better designed RCTs.	18

Authors	Contribution to the Literature	SQAS
Johannessen (33)	This study examined the experiences of nurses who provided planned care including aroma therapy to residential aged care service residents with dementia, anxiety and disturbed sleep patterns (n=24). There was some evidence suggestive that aroma therapy using lavender oil may be effective however the evidence is slim.	12
Gitlin, Kales (14)	These authors used a case-study approach to characterize common behavioral symptoms of dementia and describe an assessment strategy for selecting evidence-based nonpharmacologic treatments including music therapy. The very important role of primary care clinicians facilitating collaboration with specialists and other health care professionals to implement nonpharmacological treatment plans. The authors cite substantial evidence shows that nonpharmacologic approaches including aroma therapy can yield high levels of patient and caregiver satisfaction, quality of life improvements, and reductions in behavioral symptoms and make strong representations that access to nonpharmacologic approaches should be a standard part of care for those with dementia.	10
Lee, Choi (34)	This literature review evaluated the effectiveness of aroma therapy and 201 records with 10 meeting selection criteria. The authors did not find convincing evidence to support the efficacy of aroma therapy.	18
de Oliveira, Radanovic (25)	This systematic review of the literature found 20 studies published in the ten years prior to 2015 including aroma therapy in a heterogenous sample that underpin non-pharmacological interventions are able to reduce behavioural and psychological symptoms of dementia. The review of music therapy required more specificity.	12
Yang, Lin (35)	This comparative study examined agitation in a group of people living with dementia (n=130) and compared the effects of aroma-acupressure on one group (n=73) and aromatherapy group (n=57). These investigators found aroma-acupressure to have a greater effect than aromatherapy on agitation in the study group but there was evidence of improvement in the level of agitation in both groups.	12
Yoshiyama, Arita (36)	This was a very small randomised crossover pilot (n=14) conducted in Japan. One group provided with control therapy and the other group provided with clinical aromatherapy three times per week over four weeks. The results did not reveal any improvement in behavioural and psychological symptoms of dementia however the therapy is clinically safe.	12
Other therapies (6)		
Abraha, Rimland (37)	This paper proposes a cochrane protocol to further investigate simulated presence therapy as a intervention to behavioural and psychological symptoms of dementia.	14
Cohen-Mansfield (2)	These authors examined a number of non-pharmacologic interventions individually tailored to the person with dementia a superior response to behavioral disorders and should be at the frontline of treatment of these disorders. The investigators admitted that rigor of the investigations varied greatly depending on factors related to the behavioral disorder, setting, and resource limitations.	14
Forbes, Thiessen (38)	This paper report on an update of a 2008 review of exercise programs for people with dementia. 16 trials met the inclusion criteria for the update on a previous review however the authors caution to about certain aspects of the heterogeneity of the sample. They conclude that there is evidence to support exercise programs having a significantly positive effect in improving cognition in people with dementia however no effect for depression or challenging behaviours.	20
Moyle, Cooke (39)	This articles reports on a randomized control trial comparing foot massage and a control activity of quiet presence and their effects on vital signs in people living in long term care facilities who also have moderate-to-severe dementia.. Both interventions were found to be effective however it was concluded that it could be just the close presence of another person.	18

Authors	Contribution to the Literature	SQAS
Nordgren and Engstrom (40)	This pilot evaluated the effect of animal-assisted intervention on the quality of life for people who live with dementia. The population (n=20; F=12 M=8) and came from four Swedish residential aged care facilities. A pre-test post test design was used and the intervention used was a training program of 10 sessions with a certified therapy dog team. The results demonstrated immediately improved quality of life in the expected direction after the intervention.	<i>16</i>
Takeda, Hashimoto (41)	These investigators examined the applicability of laughter and humor therapy for people living with dementia. They concluded that humor both may be beneficial for dementia when applied with care and skill. The authors acknowledge that the individuality of the person who is living with dementia and the physiological effects of laughter are still to be fully investigated.	<i>14</i>

Table 5 shows the main characteristics of other less studied therapies. Whilst there is some evidence in found in some of these publications, it was insufficient to to include the therapy in its own group as has been done for music therapy and aromatherapy.

Table 5: Other non-pharmacological therapies for dementia treatment.

Other Therapies	Characteristics	Authors
Massage	<ul style="list-style-type: none"> - Promotes higher level of mental and emotional satisfaction - Decreases aggressiveness, anxiety, agitation and wandering - Most used are ear and foot massage 	Cohen-Mansfield (2013), Moyle et al. (2014) and Rodríguez-Mansilla et al. (2014)
Laughter therapy	<ul style="list-style-type: none"> - Although dementia patients have lost the ability to laugh for social communication, laughter in response to the release of tension is preserved until the advanced stages of the disease, so this therapy is likely to be used - It is cheap and effective - Improves immunological and endocrinological responses; smiling is sign of well fed, good sleep and achieve self-set goals - Decreases the sleep disturbance problems and anxiety symptoms 	Takeda et al. (2010)
Structured activities	<ul style="list-style-type: none"> - Activities that were important for the patients - Most common are arranging flowers or arts - Helps to decrease disorders such as agitation 	Cohen-Mansfield (2013)
Animal-assisted interventions	<ul style="list-style-type: none"> - Increases social engagement and communication - Dogs are most commonly used - Reduces behavioural disorders - Decreases agitated behaviour 	Cohen-Mansfield (2013), and Nordgren and Engström (2013)
Environmental interventions	<ul style="list-style-type: none"> - It is focused on enhanced environments - Simulates natural conditions (pictures of outdoors, bird sounds) or a home environment - Decreases behavioural disorders. 	Cohen-Mansfield (2013), and Kwak et al. (2015).
Simulated presence therapy	<ul style="list-style-type: none"> - Video or audiotape recordings of family members - Recordings include conversations or memories - Reduces behavioural problems (verbal aggression and agitation) and increases positive behaviours (proper verbalisation, smiling and singing) 	Abraha et al. (2015)
Dance movement therapy	<ul style="list-style-type: none"> - Psychotherapeutic use of movement and dance to creatively improve emotional, cognitive, physical and social integration. - Reduces behavioural symptoms, stimulating language skills. 	Karkou and Meekums (2014), Cohen-Mansfield (2013)
Art therapy	<ul style="list-style-type: none"> - Psychotherapy that uses art as a mode of communication with no need of previous experience or skills in art - Reduces problem behaviour 	Deshmukh et al. (2014), and Cohen-Mansfield (2013)
Combination therapies	<ul style="list-style-type: none"> - The combination varies for each patient - The most practiced combination therapy is dance and music therapy. However, social interaction, and sensory stimulation significantly decreased verbal agitation 	Karkou and Meekums (2014), and Forbes et al. (2015)

Discussion

The most common behaviours in patients with dementia are aggression, wandering, agitation, apathy and sleep disturbances (13), (42), (43) (23). Some studies argue that non-pharmacological treatments are part of the first step to treating symptoms behaviours in this illness (2, 9, 26, 27, 30, 44, 45) are the most significant studies of using music therapy in dementia treatment. Similarly, (31, 35) (32, 33, 46) support the use of aromatherapy as part of the treatment of dementia.

Ten other different therapies were identified as being used in dementia treatment as shown in Table 5. However, these therapies lack supporting research. Massage, laughter therapy, simulated presence therapy, dance movement therapy, art therapy, structured activities, animal-assisted interventions, environmental interventions, simulated presence therapy and combination therapies (2, 37-41, 47-50) have some evidence and it is important to continue further research in these specific therapy options to determine efficacy of the therapy.

Conclusion

This systematic review has identified the five most common behaviours in patients with dementia as aggression, wandering, agitation, apathy and sleep disturbances. These behavioural symptoms are a major source of disability. The use of non-pharmacological treatments is an important step in addressing these behavioural issues and they have very few adverse events or contraindications with some demonstrating positive effects in the treatments of behavioural symptoms.

Music therapy and aromatherapy have more evidence of their effectiveness in the treatment of behavioural symptoms of dementia. Other non-pharmacological treatments such as massage, laughter therapy, simulated presence therapy, dance movement therapy, art therapy, structured activities, animal-assisted interventions, environmental interventions, simulated presence therapy and combination therapies have insufficient research to demonstrate their effectiveness.

On balance, there is a lack of evidence based literature available on non-pharmacological treatment of behaviours associated with dementia. We found that no single therapy can address all behaviours and there is insufficient evidence to determine which non-pharmacological interventions should be included among best practice recommendations. A significant research gap exists to determine the efficacy of non-pharmacologically based interventions in to assist people living with dementia and their carers to assist with the behavioural and psychological symptoms commonly experienced.

References

1. Ali N, Luther SL, Volicer L, Algase D, Beattie E, Brown LM, et al. Risk assessment of wandering behavior in mild dementia. *Int J Geriatr Psychiatry*. 2016;31(4):367-74.
2. Cohen-Mansfield J. Nonpharmacologic treatment of behavioral disorders in dementia. *Curr Treat Options Neurol*. 2013;15(6):765-85.
3. Burke A, Hall G, Tariot PN. The clinical problem of neuropsychiatric signs and symptoms in dementia. *Continuum (Minneapolis, Minn)*. 2013;19(2 Dementia):382-96.
4. Gauthier S, Cummings J, Ballard C, Brodaty H, Grossberg G, Robert P, et al. Management of behavioral problems in Alzheimer's disease. *Int Psychogeriatr*. 2010;22(3):346-72.
5. Moyle W, Murfield J, O'Dwyer S, Van Wyk S. The effect of massage on agitated behaviours in older people with dementia: a literature review. *J Clin Nurs*. 2013;22(5-6):601-10.
6. WHO. Mental Health Action Plan 2013–2020. 2013 2015 [Available from: <http://scholar.google.com/scholar>. .
7. Cooper C, Mukadam N, Katona C, Lyketsos CG, Ames D, Rabins P, et al. Systematic review of the effectiveness of non-pharmacological interventions to improve quality of life of people with dementia. *Int Psychogeriatr*. 2012;24(6):856-70.
8. Chen H, Tsai L, Chao S, Clark M. Report on the Effects of Individualized Learning Therapy on Cognitive Function and Behavioral and Psychological Symptoms of Dementia in the Institutionalized Older Adults. *J Nurs Res*. 2015:1.
9. Cabrera E, Sutcliffe C, Verbeek H, Saks K, Soto-Martin M, Meyer G, et al. Non-pharmacological interventions as a best practice strategy in people with dementia living in nursing homes. A systematic review. *European Geriatric Medicine*. 2015;6(2):134-50.
10. Ghosh A, Dutt A, Bhargava P, Snowden J. Environmental dependency behaviours in frontotemporal dementia: have we been underrating them? *J Neurol*. 2013;260(3):861-8.
11. WHO. Investing in mental health: evidence for action 2013 [Available from: http://apps.who.int/iris/bitstream/10665/87232/1/9789241564618_eng.pdf.
12. McLaren A, Lamantia M, Callahan C. Systematic review of non-pharmacologic interventions to delay functional decline in community-dwelling patients with dementia. *Aging Ment Health*. 2013;17(6):655-66.
13. Cipriani G, Vedovello M, Nuti A, Di Fiorino M. Aggressive behavior in patients with dementia: correlates and management. *Geriatr Gerontol Int*. 2011;11(4):408-13.
14. Gitlin LN, Kales HC, Lyketsos CG. Nonpharmacologic management of behavioral symptoms in dementia. *JAMA*. 2012;308(19):2020-9.
15. Vickland V, Chilko N, Draper B, Low LF, O'Connor D, Brodaty H. Individualized guidelines for the management of aggression in dementia - Part 1: key concepts. *Int Psychogeriatr*. 2012;24(7):1112-24.
16. Livingston G, Kelly L, Lewis-Holmes E, Baio G, Morris S, Patel N, et al. Non-pharmacological interventions for agitation in dementia: systematic review of randomised controlled trials. *Br J Psychiatry*. 2014;205(6):436-42.
17. Mitchell A, Chiappetta L, Boucek L, Cain M, Patterson G, Owens K, et al. Nonpharmacological therapeutic techniques to decrease agitation in geriatric psychiatric patients with dementia. *J Gerontol Nurs*. 2015;41(2):53-9.
18. Moher D, Liberati A, Tetzlaff J, Altman D. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *J Clin Epidemiol*. 2009;62(10):1006-12.
19. Kmet L, Lee R, Cook L. Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields. In: (AHFMR) TAHFfMR, editor. HTA Initiative. Calgary2004. p. 10.
20. Baker FA, Grocke D, Pachana NA. Connecting through music: A study of a spousal caregiver-directed music intervention designed to prolong fulfilling relationships in couples where one person has dementia. *Australian Journal of Music Therapy*. 2012;23(2012):4-21.

21. Cohen-Mansfield J, Thein K, Marx M. Predictors of the impact of nonpharmacologic interventions for agitation in nursing home residents with advanced dementia. *J Clin Psychiatry*. 2014;75(7):e666-71.
22. Cooke M, Moyle W, Shum D, Harrison S, Murfield J. A randomized controlled trial exploring the effect of music on agitated behaviours and anxiety in older people with dementia. *Aging Ment Health*. 2010;14(8):905-16.
23. Kales H, Gitlin L, Lyketsos C. Assessment and management of behavioral and psychological symptoms of dementia. *BMJ*. 2015;350(mar02 7):h369.
24. Konno R, Kang H, Makimoto K. A best-evidence review of intervention studies for minimizing resistance-to-care behaviours for older adults with dementia in nursing homes. *J Adv Nurs*. 2014;70(10):2167-80.
25. de Oliveira A, Radanovic M, de Mello P, Buchain P, Vizzotto A, Celestino D, et al. Nonpharmacological Interventions to Reduce Behavioral and Psychological Symptoms of Dementia: A Systematic Review. *Biomed Res Int*. 2015;2015:218980.
26. Raglio A, Bellelli G, Mazzola P, Bellandi D, Giovagnoli AR, Farina E, et al. Music, music therapy and dementia: a review of literature and the recommendations of the Italian Psychogeriatric Association. *Maturitas*. 2012;72(4):305-10.
27. Ray KD, Mittelman MS. Music therapy: A nonpharmacological approach to the care of agitation and depressive symptoms for nursing home residents with dementia. *Dementia (London)*. 2015.
28. Ridder H. The use of extemporizing in music therapy to facilitate communication in a person with dementia: An explorative case study. *The Australian Journal of Music Therapy*. 2015;26:3-25.
29. Tuckett A, Hodgkinson B, Rouillon L, Balil-Lozoya T, Parker D. What carers and family said about music therapy on behaviours of older people with dementia in residential aged care. *Int J Older People Nurs*. 2015;10(2):146-57.
30. Ueda T, Suzukamo Y, Sato M, Izumi S. Effects of music therapy on behavioral and psychological symptoms of dementia: a systematic review and meta-analysis. *Ageing Res Rev*. 2013;12(2):628-41.
31. Forrester LT, Maayan N, Orrell M, Spector AE, Buchan LD, Soares-Weiser K. Aromatherapy for dementia. *Cochrane Database Syst Rev*. 2014(2):CD003150.
32. Fung J, Tsang H, Chung R. A systematic review of the use of aromatherapy in treatment of behavioral problems in dementia. *Geriatr Gerontol Int*. 2012;12(3):372-82.
33. Johannessen B. Nurses experience of aromatherapy use with dementia patients experiencing disturbed sleep patterns. An action research project. *Complement Ther Clin Pract*. 2013;19(4):209-13.
34. Lee MS, Choi J, Posadzki P, Ernst E. Aromatherapy for health care: an overview of systematic reviews. *Maturitas*. 2012;71(3):257-60.
35. Yang M, Lin L, Wu S, Chiu J, Wang P, Lin J. Comparison of the efficacy of aroma-acupressure and aromatherapy for the treatment of dementia-associated agitation. *BMC Complement Altern Med*. 2015;15:93.
36. Yoshiyama K, Arita H, Suzuki J. The Effect of Aroma Hand Massage Therapy for People with Dementia. *J Altern Complement Med*. 2015;21(12):759-65.
37. Abraha I, Rimland JM, Lozano-Montoya I, Dell'Aquila G, Velez-Diaz-Pallares M, Trotta FM, et al. Simulated presence therapy for dementia: a systematic review protocol. *BMJ Open*. 2016;6(5):e011007.
38. Forbes D, Thiessen E, Blake C, Forbes S, Forbes S. Exercise programs for people with dementia. *Cochrane Database Syst Rev*. 2013(12):CD006489.
39. Moyle W, Cooke M, Beattie E, Shum D, O'Dwyer S, Barrett S, et al. Foot massage and physiological stress in people with dementia: a randomized controlled trial. *J Altern Complement Med*. 2014;20(4):305-11.

40. Nordgren L, Engstrom G. Animal-assisted intervention in dementia: effects on quality of life. *Clin Nurs Res*. 2014;23(1):7-19.
41. Takeda M, Hashimoto R, Kudo T, Okochi M, Tagami S, Morihara T, et al. Laughter and humor as complementary and alternative medicines for dementia patients. *BMC Complement Altern Med*. 2010;10(1):28.
42. Cipriani G, Lucetti C, Nuti A, Danti S. Wandering and dementia. *Psychogeriatrics*. 2014;14(2):135-42.
43. Cipriani G, Lucetti C, Danti S, Nuti A. Sleep disturbances and dementia. *Psychogeriatrics*. 2015;15(1):65-74.
44. Brodaty H, Burns K. Nonpharmacological management of apathy in dementia: a systematic review. *Am J Geriatr Psychiatry*. 2012;20(7):549-64.
45. Blackburn R, Bradshaw T. Music therapy for service users with dementia: a critical review of the literature. *J Psychiatr Ment Health Nurs*. 2014;21(10):879-88.
46. Myeong S, Choi J, Posadzki P, Ernst E. Aromatherapy for health care: An overview of systematic reviews. *Maturitas*. 2012;71(3):257-60.
47. Deshmukh S, Holmes J, Cardno A. Art therapy for people with dementia. *The Cochrane Library*. 2014.
48. Karkou V, Meekums B. Dance movement therapy for dementia. *The Cochrane Library*. 2014.
49. Kwak Y, Yang Y, Koo M. Wandering in Dementia. *Dementia and Neurocognitive Disorders*. 2015;14(3):99.
50. Rodriguez-Mansilla J, Gonzalez Lopez-Arza M, Varela-Donoso E, Montanero-Fernandez J, Gonzalez Sanchez B, Garrido-Ardila E. The effects of ear acupressure, massage therapy and no therapy on symptoms of dementia: a randomized controlled trial. *Clin Rehabil*. 2015;29(7):683-93.