Rapid Review

NORTH AMERICAN OBSERVATORY on Health Systems and Policies

Innovations in Service Delivery for Institutional Care in Practically Managing Responsive Behaviours

A Rapid Scoping Review Prepared for Nova Scotia Department of Health and Wellness

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List of Abbreviations

AD	Alzheimer's Disease
ADRD	Alzheimer's Disease and Related Dementias
AMB	Aberrant Motor Behavior
BPSD	Behavioural and Psychological Symptoms of Dementia
CF	Cognitive Function
CG	Control Group
CNAs	Certified Nursing Assistants
CST	Cognitive Stimulation Therapy
DT	Doll Therapy
EF	Executive Function
EG	Experimental Group
IG	Intervention Group
IPPI	Individualized Positive Psychosocial Intervention
LTC	Long-Term Care
LTCF	Long-Term Care Facility
NH	Nursing Home
NPS	Neuropsychiatric Symptoms
PCC	Person-Centred Care
PWD	Persons with Dementia
RT	Reminiscence Therapy
SCU	Special Care Unit
SCF	Special Care Facility

Introduction and Background

Individuals affected by Alzheimer's disease and related disorders tend to experience difficulties with their memory, judgement, attention, mood, communication, and ability to complete the activities of daily living (Alzheimer Society of Canada, 2010). Dementia has historically been framed using *pathologizing* language (Dupuis, Wiersma, & Loiselle, 2012). As such, when an individual living with dementia responds or reacts to an interaction, this response can often be classified as *challenging, violent, disturbing,* and *aggressive* (Dupuis et al., 2012). More recently, there has been a shift from problematizing such behaviours towards understanding them as "responsive behaviours", a term used to describe behavioural and psychological symptoms of dementia (BPSD) (Clifford & Doody, 2018; Schindel Martin et al., 2016). Encompassing the noncognitive symptoms of dementia, responsive behaviours include agitation, aggression, and disturbance in mood, perception, and behaviour (Clifford & Doody, 2018).

In 2016 an estimated 564,000 Canadians were living with dementia. As the disease progresses, and people experience increasing difficulty completing activities of daily living, a change in care setting from home and communities to facility-based long-term care (LTC) may be necessary (Chambers, Bancej, & McDowell, 2016). Approximately one-third of persons younger than 80 who have been diagnosed with dementia, and 42% of those over 80 with a diagnosis of dementia, live in LTC homes (Canadian Institute for Health Information, 2018). In the context of a rapidly changing population, 69% of residents in LTC facilities had dementia in 2015-16 (Canadian Institute for Health Information, 2018). The proportion of those demonstrating responsive behaviours accounted for 50% of this population (Canadian Institute for Health Information, 2018). These numbers are only likely to increase as the population ages (Scott, Ryan, James, & Mitchell, 2011). Those working in LTC settings are often exposed to workplace violence as a result of persons living with dementia expressing responsive behaviours that are physical in nature (Daly, Banerjee, Armstrong, Armstrong, & Szebehely, 2011). For almost 10 per cent of workers (8.4%), violence is a daily occurrence in their LTC facility (Armstrong & Daly, 2004).

Consequently, traditional institutional care settings have developed special care units (SCUs) for older adults with dementia (Reimer, Slaughter, Donaldson, Currie, & Eliasziw, 2004). However, previous studies have shown that SCUs exhibit no strong evidence of benefit compared to traditional care environments in terms of resident cognition, function, or behaviour (Gruneir, Lapane, Miller, & Mor, 2008; Lai, Yeung, Mok, & Chi, 2009). This has led to the construction of special care facilities (SCFs), designed and staffed to meet the needs of individuals with middle-to-advanced dementia (Reimer et al., 2004).

One of the common approaches taken to address responsive behaviours in LTC residents with dementia has been to prescribe antipsychotic drugs (Kirkham et al., 2017). However, the risks and harms associated with the use of antipsychotic medication has led to calls, through targeted policy and educational support strategies, to reduce their use among older adults without a diagnosis of psychosis (Canadian Institute for Health Information, 2018). As a result, there has been a significant downward trend in the use of antipsychotic drugs in LTC between 2011 and 2016 (Canadian Institute for Health Information, 2018), alongside a shift toward non-pharmacological supports to address responsive behaviours (Schindel Martin et al., 2016).

Given these adaptations and ideological shifts, we have seen a change in the way dementia care is being provided in facility-based LTC settings, and increased efforts to minimize physical and chemical restraints,

and offer non-pharmacological approaches to care (Livingston et al., 2014). Despite these changes in how we support persons living with dementia in facility-based LTC, little is known about the overall effectiveness of various non-pharmacological approaches. This review offers a synthesis of these non-pharmacological approaches to highlight treatment interventions that should be considered when designing a program to best manage responsive behaviours.

Methods

We followed the steps outlined by the methodological framework for scoping reviews originally articulated by Arksey and O'Malley (2005) and later expanded by Levac, Colquhoun, and O'Brien (2010). After developing our research question (step 1), we identified the relevant studies using a rigorous electronic database search strategy (step 2), performed study selection against the eligibility criteria (step 3), charted the data (step 4), and collated, summarized, and reported the results (step 5), as discussed below.

Search Strategy

We searched Medline (Ovid), Embase (Ovid), CINAHL-Plus (EBSCO), and PsychINFO (Ovid) for the overlap between the following concepts: (1) dementia or cognitive impairment, (2) responsive behaviours, and (3) institutional care, using a combination of subject headings and text words (see Appendix A for the full electronic database search strategy). The following limits were applied to the search strings: publication year 2014-2019, English-language, human subjects, and older adults. Sources indexed in Medline were excluded through CINAHL to minimize duplicates. The database search was first developed in Medline and subsequently translated into other database-specific syntax. All final electronic database searches were conducted and exported on July 6, 2019.

Study Selection and Data Extraction

Electronic database records were imported into a reference management software (Mendeley Desktop v1.19.5) where duplicates were removed. To pilot the selection criteria and assess the degree to which each reviewer's decisions were consistent, the titles and abstracts of the first 100 records were screened for eligibility by four independent reviewers (DB, MK, MP, MS). The remaining titles and abstracts were split evenly between the same set of reviewers for screening. A similar procedure was employed for full-text screening. The full-text articles of the first 14 records (5% sample) were screened for eligibility by five independent reviewers (AK, DB, MK, MP, MS) to establish agreement, and the remaining full-text articles were split evenly between the five reviewers. The full texts of studies whose eligibility was uncertain (rated "maybe") were reviewed by a senior team member (AP).

The inclusion criteria for screening were developed using the population, concept, and context as a framework for scoping reviews, as suggested by Levac et al. (2010) and the Joanna Briggs Institute:

- Population: persons demonstrating behavioural or psychological symptoms of dementia (e.g., depression, agitation, aggression, wandering, etc.)
- Concept: concept of interest related to a non-pharmacological intervention (i.e., medication was not the primary method for managing behavioural or psychological symptoms)
- Context: intervention context involved an institutional setting (e.g., nursing home, long-term care, or other residential setting)

No restrictions were placed on study designs, meaning that qualitative, quantitative, and mixed methods studies were eligible, provided they met the criteria above. In addition to original studies, we also included any literature reviews that met the above selection criteria. We excluded unpublished or non peer-reviewed sources (e.g., conference proceedings, thesis dissertations, and study protocols), or sources that could not be accessed through University of Toronto library services or online searches.

Inter-rater reliability was assessed using Krippendorff's alpha statistic, an alternative to Cohen's kappa for determining agreement between more than two reviewers. Alpha values range between 0 and 1 to establish agreement beyond that attributable to chance (Krippendorff, 2004, 2017). The calculated alpha for sections screened by multiple reviewers was 0.80 at the full-text screening stage (for 5% of the citations), reflecting an acceptable level of agreement (Krippendorff, 2004).

The data extraction form was first piloted between four team members (AP, MK, MP, MS) and any disagreements were resolved through discussion. Full data extraction was completed by three reviewers (MK, MP, MS).

Limitations

While no restrictions were placed on the types of non-pharmacological interventions retrieved, our search was limited to individuals with dementia or cognitive impairment. We only included studies published in the past five years (2014-2019); as such, studies (on the design or evaluation of non-pharmacological interventions) published prior to 2014 would not be captured in our search. Similarly, we could not capture very recent interventions that have not yet undergone evaluation. Although a variety of jurisdictions were captured in our review, it should also be noted that our search was limited to studies written in English. However, according to a comprehensive review by evidence synthesis experts, the use of language restrictions is unlikely to result in systematic biases that would meaningfully alter the interpretation of the findings (Morrison et al., 2012). Finally, since our review did not exclude non-randomized study designs, caution is warranted about inferring causality between the described non-pharmacological interventions and the reported study outcomes. Any observed changes in outcomes may be attributed to other contemporaneous policy changes (historical bias), natural changes over time (maturation bias) and confounding by other unmeasured contextual and population-related factors.

Analytic Overview

The electronic database search retrieved 1,737 unique records. Following selection procedures, we included 105 in the present review (see Appendix B for a detailed PRISMA flowchart depicting the selection process and reasons for exclusion). To account for the volume of data across the 105 papers, we familiarized ourselves with the findings and proceeded to categorize studies by non-pharmacological treatment of responsive behaviours. We relied on a Cohen-Mansfield (2004) framework to divide intervention types into nine categories (see Table 1). Authors categorized studies, which included comparison of multiple intervention types (i.e., systematic reviews), into the appropriate intervention type category. An additional section titled "Caring for BPSD: The Value of Specialized Care Settings" describes literature on providing care to persons with dementia and associated behavioural problems within specialized units and facilities.

Table 1. Included articles by intervention type

Intervention Type	Count
Sensory	27
Combination therapies	17
Social contact	15
Behaviour therapies	12
Structured activities	11
Staff training and education	11
Multiple modalities	6
Environmental modifications	3
Nursing and medical care	3

Types of Interventions

Sensory interventions

We found a total of 27 articles evaluating the effectiveness of sensory-based therapies on responsive behaviours. The majority of these sensory-based studies looked to understand the impact of music-related therapies and programming (n=13), followed by multi-sensory stimulation (i.e., Snoezelen) (n=3), media presentations (n=3), muscle relaxation and acupressure (n=5), massage therapy (n=3), and scent or aroma-based therapies (n=1).

Sensory stimulation demonstrated positive outcomes in six studies (Bauer et al., 2015; Berkheimer, Qian, & Malmstrom, 2017; Livingston et al., 2014; Maseda et al., 2014; Onega, Pierce, & Epperly, 2016; Wong & Leland, 2016); however, these study results did not demonstrate long-lasting effects (Bauer et al., 2015; Berkheimer et al., 2017; Blackburn & Bradshaw, 2014; Cox, Nowak, & Buettner, 2014; Rick Y.C. Kwan, Leung, & Lai, 2016; Rick Yiu Cho Kwan, Leung, & Lai, 2017; Nishiura, Hoshiyama, & Konagaya, 2018). In fact, in one study, post-intervention follow-up behaviours worsened (Maseda et al., 2014). Authors

Maseda et al. (2014) identified one-on-one attention or therapy as a mechanism of action responsible for the benefits of the sensory programming interventions (Maseda et al., 2014). Receptive music therapy that is part of a daily routine for persons with moderate dementia may be the most effective in reducing responsive behaviours and improving quality of life (Maseda et al., 2014; Ray & Mittelman, 2017; Särkämö et al., 2015; Tsoi et al., 2018; Wang, Yu, & Chang, 2017). While the use of essential oils, massage and touch, and acupressure resulted in positive effects on behaviours in five studies (Ikemata & Momose, 2017; Keshavarz, Mirzaei, & Ravari, 2017; Watson, Hatcher, & Good, 2019; Wu, Wang, & Wang, 2017; Yoshiyama, Arita, & Suzuki, 2015), two systematic reviews found aromatherapy to have no immediate or long-term effects on managing agitation (Livingston et al., 2014; Millan-Calenti et al., 2016). However, a systemic review conducted by Yang, Lee, Chao, Hsu, and Wang (2016) found aroma-massage therapy to be more effective than reminiscence and cognitive stimulation therapies in reducing agitation and depression. Overall, sensory-based interventions are proven to be effective in managing behaviours in the short-term, although evidence suggests that the intervention must be ongoing to maintain these gains over the long-term.

Combination therapies

A total of 17 articles featured different interventions that were evaluated as part of single studies. For example, a large group of papers examined a person-centered approach to care described as developing personalized strategies according to the personal preferences and previous life histories of the resident in the LTC environment. Other interventions combined two approaches, for example, relaxation and dance therapy.

Person-centred care approaches

Six studies examined person-centered approaches to care (Ballard et al., 2016; Cohen-Mansfield, Marx, Dakheel-Ali, & Thein, 2015; Cohen-Mansfield, Thein, & Marx, 2014; Oppikofer & Geschwindner, 2014; Stacpoole, Hockley, Thompsell, Simard, & Volicer, 2015; Van Haitsma et al., 2015). Both Ballard et al. (2016) and Stacpoole et al. (2015) found that person-centered interventions improved neuropsychiatric symptoms, and the latter also noted improved quality of life through pain management. Additionally, Stacpoole et al. (2015) implemented a multidimensional program called Namaste Care, which focused on sensory stimulation, shared activity and increased social interaction. Ballard et al. (2016) found that combining a review of antipsychotic medication with social interaction significantly reduced antipsychotic medication intake use and mortality without worsening neuropsychiatric symptoms.

Individual care interventions, like stimulation (e.g., basal stimulation, aromatherapy, etc.) or distraction (e.g., taking a walk, listening to music, singing, etc.) led to the elimination of agitation and increased happiness and interest (Oppikofer & Geschwindner, 2014). According to authors Oppikofer and Geschwindner (2014), the most successful interventions included avoiding noise, attending to lavatory needs, communication/validation, walking/movement and offering or administering fluids. Cohen-Mansfield et al. (2015) identified the following interventions to be superior to others: one-on-one interaction, hand massage, music, and useful and therefore meaningful activities (e.g., folding towels). However, study findings indicated that person-centered interventions are very dependent on a resident's ability to communicate their unmet needs (Cohen-Mansfield et al., 2014).

Accordingly, while evaluating certified nursing assistants (CNAs) leading one-on-one activities tailored to a person's individual preference and ability, Van Haitsma et al. (2015) demonstrated that the greatest

benefits occurred when Individualized Positive Psychosocial Intervention (IPPI) increased positive affect and positive verbal and nonverbal behaviour compared to persons receiving the usual care.

Last, in a study informed by PCC principles, Wilkinson, Tong, Zare, Kanik, and Chignell (2018) described an Ambient Technology unit (ABBY) accessible to residents 24/7 that integrates touchscreen monitors, sensors, and manipulative activity opportunities such as petting a cat or turning a wheel (Wilkinson et al., 2018). Researchers found interaction within the ABBY reduced responsive behaviours in individuals living with dementia in LTC environments (Wilkinson et al., 2018).

Individualized care planning and activities

A study examining the effects of individualized learning therapy, such as the use of reading aloud and/or arithmetic exercises depending on the personal background of the resident, found improvement in neuropsychiatric symptoms (i.e., irritation) with the most significant improvement observed at seven weeks into the intervention (H.-M. Chen, Tsai, Chao, & Clark, 2016). Two additional studies examined individualized interventions, reporting that residents enjoyed personalized activities and demonstrated positive behaviour as a result (Travers, 2017; Van Haitsma et al., 2015). Eritz et al. (2016) analyzed the effectiveness of a life history intervention, which involved the creation of personal biographies of participants by asking about participants' childhood, family and friends, personality and important life events. Study results indicated limited effects on resident aggression, although the authors noted improvements in resident quality-of-life and staff perception of the resident's personhood (Eritz et al., 2016).

In regards to the efficacy of different types of nonpharmacological interventions, including PCC, a systematic review conducted by Jutkowitz et al. (2016) found insufficient evidence to support a specific nonpharmacological approach suggesting that PCC is one such approach to nonpharmacological interventions. Failure to reach efficacy stemmed from not being able to adequately change staff behaviour and integrate the interventions into the workflow (Jutkowitz et al., 2016). Finally, Park, Moon, Ha, and Lee (2017) developed a group health education intervention that demonstrated reduced depression scores while participants successfully met goals in exercise, stress management, communication, medication, and sleep (Park et al., 2017).

Multiple modalities

The following research initiatives combined several different nonpharmacological interventions into single studies. For example, Adam, Ramli, and Shahar (2016) brought together relaxation exercises and dance and found that that relaxation independent of physical movement was not as effective as when combined, with respect to decreasing anxiety and depression. However, the study's authors assert that relaxation therapy alone may more effectively reduce anxiety and depression symptoms if sessions are conducted on a frequent basis (i.e., >50 sessions). The combination of music and exercise occurred in two studies with both reporting positive outcomes on responsive behaviours (i.e., irritability and aggression) and depressive symptoms (Cheung, Lai, Wong, & Leung, 2018; Langhammer et al., 2019). The success of these outcomes may be a result of the personalized approach as well as one-on-one contact. Onieva-Zafra, Hernández-Garcia, Gonzalez-del-Valle, Parra-Fernández, and Fernandez-Martinez (2018) saw a reduction in depression symptoms when combining music intervention with reminiscence therapy and reality orientation. Reality orientation is a technique where repetition and the use of information related to the current time, place, and people for people living with dementia (Onieva-Zafra et al., 2018).Lastly,

combining environmental modifications, including changing the lighting, music, wall colour, wall clocks, and staff uniforms occurred in a study by (Bautrant et al., 2019), which indicated that wandering behaviour lessened, especially during the late hours.

Overall, the effects of combining therapies and personalizing activities on responsive behaviours varied. We identified PCC approaches as the most common interventions, which were successful in improving neuropsychiatric symptoms, decreasing agitation and improving mood (Ballard et al., 2016; Oppikofer & Geschwindner, 2014; Stacpoole et al., 2015). The success of these interventions often depended on residents' abilities to communicate their preferences (Cohen-Mansfield et al., 2014). Other interventions that we identified as reducing responsive behaviours included the combination of relaxation and dance exercises, music and exercise, and health coaching self-management programs (Adam et al., 2016; Cheung et al., 2018; Onieva-Zafra et al., 2018; Park et al., 2017).

A promising innovation – The Butterfly Home

A nursing home in the Region of Peel in Ontario is the first LTC provider to create what they call a "Butterfly Home".[1] In March 2017, the Peel region hired David Sheard, a nursing home specialist from England, to help transform an LTC home based on an emotion-based model. This involved training staff to understand their own emotional states to better empathize with residents. The home was arranged in vivid sections of bright retro colours to help residents navigate otherwise confusing corridors of beige walls. After one year of the Butterfly Project, resident and staff outcomes included less staff sick days, fewer residents falling, less antipsychotic use, and higher social engagement.

Social contact

Fifteen articles examined social contact through both real and simulated presence interventions; this included robotic pet therapy (n=5); animal-assisted interventions (AAI) (n=3); comparing AAI to robotic pet therapy (n=1); clowning/humor interventions (n=2); doll therapy (n=2); and real or stimulated presence therapy (n=2).

Five studies examined the use of a therapeutic pet-type robot, PARO (resembling a baby harp seal), as an alternative to animal-assisted therapy (Jones et al., 2018; Jøranson, Pedersen, Rokstad, & Ihlebæk, 2015; Mervin et al., 2018; Moyle, Bramble, Jones, & Murfield, 2019; Moyle et al., 2017). Three found that the PARO intervention significantly improved depression and agitation (Jones et al., 2018; Jøranson et al., 2015; Moyle et al., 2017). Jones et al. (2018) found that the intervention was less effective with residents who were severely agitated at baseline. When compared to a plush toy, the PARO seal was more effective in encouraging engagement as demonstrated by greater verbal communication and eye contact (Moyle et al., 2019; Moyle et al., 2017). Conversely, Mervin et al. (2018) found no significant changes in agitation involving PARO when compared with a plush toy or usual care. However, the authors reported data issues with care staff not or partially completing questionnaires.

A recent systematic review examined both the effects of PARO and AAI and three other studies explored the efficacy of AAI specifically on reducing responsive behaviours (Aarskog, Hunskår, & Bruvik, 2019; Nordgren & Engström, 2014; Olsen et al., 2016; Wesenberg, Mueller, Nestmann, & Holthoff-Detto, 2019). The review of both interventions found statistically significant positive results from AAI in improving BPSD

[1] https://www.peelregion.ca/ltc/butterfly-home/ and http://projects.thestar.com/dementia-program/

(6/11), although these effects were not sustained post-intervention period (Aarskog et al., 2019). The other studies reported no significant positive effects related specifically to AAI, and frequently noted increased levels of verbal agitation (Olsen et al., 2016; Wesenberg et al., 2019).

Brodaty et al. (2014) and Kontos et al. (2016) examined the effect of clowning/humor interventions on symptoms associated with dementia. In the first, nursing home staff received "LaughterBoss" training from Clown Doctors to learn how to incorporate humor and play into daily care practices (Brodaty et al., 2014). Importantly, staff commitment to LaughterBoss promoted resident engagement, which reduced depression, agitation, and neuropsychiatric symptom scores (Brodaty et al., 2014). Kontos et al. (2016) explored the use of "Elderclowns" and found significant reductions in neuropsychiatric symptoms, improvements in quality-of-life and a non-significant decrease in agitation (Kontos et al., 2016).

Two studies evaluating the use of dolls as a therapeutic tool in nursing homes saw a reduction in BPSD and caregiver stress (Cantarella, Borella, Faggian, Navuzzi, & De Beni, 2018; Shin, 2015). The intervention demonstrated significant reductions in profanity, shouting, aggression, wandering, and fewer obsessive behaviours (Shin, 2015). Shin (2015)also noted increases in positive mood (i.e., calm presence), physical appearance (i.e., looking comfortable), and significant decreases in depression among participating residents.

When comparing real or "simulated" (i.e., use of video or audio recordings of family members) presence therapy, Abraha et al. (2017) found a mixed-intervention effect, and a difference could not be discerned between intervention and control groups. Similarly, the real presence of family in the form of either Skype conversations or landline telephone calls resulted in non-significant reduction in agitation levels; although the reduction was greater in the Skype group (Van der Ploeg, Eppingstall, & O'Connor, 2016). These results suggest that combining visual with auditory sensory inputs might capture the attention and reduce agitated behaviours more effectively than auditory inputs alone (Van der Ploeg et al., 2016).

Overall, the use of social contact as an intervention positively affected depression, agitation, and mood. However, studies analyzing animal/pet-assisted interventions were inconclusive. In fact, some studies noted increased verbal agitation after the intervention, potentially from the animal being taken away (Olsen et al., 2016; Wesenberg et al., 2019). A systematic review by Livingston et al. (2014) found low and limited evidence on the use of pet therapy for agitation. While only two articles discussed dolls as a therapeutic tool, this intervention was found to significantly reduce responsive behaviours including profanity, shouting, aggression, wandering, and obsessive behaviours (Cantarella et al., 2018; Shin, 2015). PARO interventions appear the most successful social contact interventions for reducing responsive behaviours among residents with dementia, and while there is potential for other animal/pet-assisted interventions, they require further research.

Behavioural therapies

A total of 12 studies evaluated the effects of behavioural therapies on reducing responsive behaviours. Most such interventions involved reminiscence therapy, followed by cognitive stimulation, de-escalation techniques, mindfulness practices, and integrative validation therapy.

Each of the four studies that examined reminiscence therapy interventions found they significantly improved depressive symptoms among residents (Bailey, Stevens, LaRocca, & Scogin, 2017; Duru Aşiret & Kapucu, 2016; Huang et al., 2015; Van Bogaert et al., 2016). Defined in one paper, reminiscence therapy, as an intervention based on remembering events, feelings, and thoughts previously experienced in order to increase adaption to the present aging process (Onieva-Zafra et al., 2018). In addition, Bailey et al. (2017) evaluated a question-asking-reading (QAR) intervention that involved reading passages during group sessions to promote reminiscence, found participants displayed an increase in verbal interaction and engagement during the session. Lin, Yang, Cheng, and Wang (2018) compared the effects of cognitive stimulation therapy and reminiscence therapy. Cognitive stimulation therapy is described as covering a wide range of activities, like doing puzzles and word games, to stimulate thinking and memory. The results revealed that cognitive stimulation therapy as well as reminiscence therapy interventions both led to improved cognitive function and quality-of-life (Lin et al., 2018). Although reminiscence therapy outcomes seem to be mixed, two studies reported improved cognitive function (Duru Aşiret & Kapucu, 2016; Huang et al., 2015).

Four studies examined various cognitive stimulation therapies. Lin et al. (2018) determined that cognitive stimulation therapy had a greater short-term effect on cognition and quality-of-life than reminiscence therapy, however both approaches may sustain effects beyond a 12-week period. Folkerts et al. (2018) also found a positive short-term effect on cognition as well as a positive effect on neuropsychiatric symptoms. When completing a computer-based system of games there was an improvement in cognition, and in 70% of participants, improved mood (Burdea et al., 2015). Finally, Anderson, Wickramariyaratne, and Blair (2018) studied the effect of group-based behavioural therapy and found no change in depression and anxiety measures due to a limited sample of clinical cases of these symptoms.

Two studies analyzed different de-escalation strategies for dealing with challenging behaviours of residents with dementia. First, a systematic review (where only one study was included) noted in a lack of support for de-escalation management strategies for persons exhibiting responsive behaviours (Spencer, Johnson, & Smith, 2018). Karel, Teri, McConnell, Visnic, and Karlin (2016) analyzed the STAR-VA interdisciplinary behavioural approach for managing challenging behavior and found that the frequency and severity of depression, anxiety, and agitation all significantly decreased. The success of the STAR-VA approach was attributed to the healthcare teams' attitude and enthusiasm, staff training, as well as staff empathy.

Only one study analyzed a mindfulness intervention, the Present in the Now (PIN) initiative, consisting of the following three components: attentiveness exercises, compassion mediation, and body awareness activities (Kovach, Evans, Sattell, Rosenau, & Gopalakrishnan, 2018). The study found that the intervention reduced agitation, anger, anxiety, and discomfort (Kovach et al., 2018).

The final study by Erdmann and Schnepp (2016) evaluated an integrative validation therapy (IVA) that comprised the following four steps: (1) Perceiving feelings and motivation of the person; (2) validating feelings and motivation with short sentences; (3) generalizing feelings and motivation with common phrases; and, (4) validating the person with short sentences about biographical themes (Erdmann & Schnepp, 2016). The study found that the intervention reduced agitation, aggressive behavior and use of benzodiazepine and neuroleptics. According to Erdmann and Schnepp (2016), understanding the *institutional context* exerts an important effect on the application of IVA and can also bring about reported outcomes. For example, using IVA in a "segregative care" home, or where thea residential facility

specializes in caring for only those living with dementia. In segregative care homes, nursing staff who are specifically trained for care of those living with dementia may increase the success of the intervention (Erdmann & Schnepp, 2016).

Overall, behavioural therapy interventions aiming to reduce responsive behaviours of residents with dementia were effective. All studies that analyzed reminiscence therapy found a reduction in depressive symptoms (Bailey et al., 2017; Duru Aşiret & Kapucu, 2016; Huang et al., 2015; Van Bogaert et al., 2016), and most studies also demonstrated an improvement in cognitive function (Bailey et al., 2017; Duru Aşiret & Kapucu, 2016; Testad et al., 2014; Van Bogaert et al., 2016). Studies analyzing cognitive stimulation interventions also demonstrated encouraging results for improving cognitive function. De-escalation interventions, however, provided inconclusive outcomes (Karel et al., 2016; Spencer et al., 2018). Out of all the behavioural therapies presented in this review, reminiscence therapy seems to have the most promise with respect to improving outcomes.

Structured activities

A total of 11 articles evaluated the effects that various structured activities had on improving quality-of-life or reducing behavioural responses. Most of these interventions involved either individual or group-based exercise programming while the remaining three studies looked at creative structured programming.

Exercise interventions may reduce agitation of persons living with dementia, as identified by physical activity interventions that ranged from 12 weeks to 15 months in duration (Boström et al., 2016; Neville, Henwood, Beattie, & Fielding, 2014; Telenius, Engedal, & Bergland, 2015; Traynor, Veerhuis, Johnson, Hazelton, & Gopalan, 2018). Physical activity interventions showed decreases in agitation, wandering, functional mobility, and memory function (Cancela, Ayán, Varela, & Seijo, 2016; Neville et al., 2014; Traynor et al., 2018). Telenius et al. (2015) reported better scores on neuropsychiatric indicators six months post intervention among an exercise group. To ensure a sustainable program, Traynor et al. (2018) developed an intervention using existing staffing level and resources. Interestingly, both Cancela et al. (2016) and Boström et al. (2016) reported lack of improvement in depression scores among the intervention group, suggesting that physical activity may be less effective in reducing depression among older adults with dementia when compared to those who do not participate in exercise. One study exploring the effects of a dementia-tailored aquatic exercise intervention found improvement in psychological well-being (Neville et al., 2014).

Group exercise interventions (e.g., wheelchair-bound resistance band exercise) saw a reduction in depression, and K.-M. Chen, Kuo, Chang, Huang, and Cheng (2017) attributed this finding to the increased socialization element of the programming. Similarly, a group-based Laughing Qigong program saw improvement in cognitive functioning and mood compared to the control group (Hsieh, Chang, Tsai, & Wu, 2015). Creative expression interventions demonstrated mixed results. For example, the TimeSlips program that encourages persons with dementia to contribute collectively to shared narratives about staged pictures did not have an impact on either mood or behaviour (Houser, George, & Chinchilli, 2014). Yet, an evaluation of an eight-week intervention named “play activities program” (PAP) found treatment effects that included reduction in pain intensity and depressive symptoms, as well as an increase in happiness levels (Tse et al., 2018). Similarly, a scoping review by Wong et al. (2016) included storytelling as a group-based structured activity and found no reduction in responsive behaviours.

Many studies could not confirm that exercise therapy results in a significant reduction in agitation (Berkheimer et al., 2017; Boström et al., 2016; Henskens, Nauta, van Eekeren, & Scherder, 2018; Livingston et al., 2014; Telenius et al., 2015). Additionally, many of the exercise and group-based activities involved several components (e.g., exercise and one-on-one interactions) and as such, studies could not confirm which aspect may have led to successful outcomes (Neville, 2014). Based on our review, structured activity interventions, including exercise and group-based interventions, have not been proven effective in reducing responsive behaviours.

Staff training and education

A total of 11 articles looked at the effect of staff education/training interventions to manage responsive behaviours. These involved either training-focused interventions, introduction of a new clinical protocol, or multidisciplinary interventions.

Of the interventions that centred on staff training, two focused on improving staff communication skills (Levy-Storms, Harris, & Chen, 2016; Tjia et al., 2017), one aimed to improve bathing interactions (Gozalo, Prakash, Qato, Sloane, & Mor, 2014), and Testad et al. (2014) evaluated the effectiveness of a training aimed at reducing the use of restraint, agitation, and antipsychotic medication in care homes. Notably, all these studies mention “unmet needs” among residents as a source of agitation. Tjia et al. (2017) and Gozalo et al. (2014) reported a reduction in antipsychotic use and rates of aggressive and agitated behaviours during residents’ baths. Similarly, Levy-Storms et al. (2016) reported mixed results when CNAs significantly increased effective communication techniques, yet residents’ refusals remained constant.

Introducing new clinical protocols were the basis of four papers—two of which evaluated the same protocol. McCabe et al. (2015) and Mellor et al. (2015) evaluated a training program by randomly assigning facilities to four different conditions: (1) training in a BPSD-structured clinical protocol, plus external clinical support; (2) a workshop on BPSD with outside clinical support; (3) training in the use of the protocol alone; and (4) usual care.. The authors reported the most significant improvement in challenging behaviours was among staff that received training in the BPSD-tool and had clinical support (Mellor et al., 2015). The structured clinical protocol reduce the frequency of the disruptive behaviour, its perceived disruptiveness and staff stress levels (McCabe et al., 2015). The authors suggest that achieving a substantial reduction in the severity of challenging behaviours may require embedding structured clinical protocols in organizational practices, including workflow for point-of-care staff (McCabe et al., 2015). Similarly, Ryan et al. (2018) also evaluated a structured protocol combined with staff training and clinical support, and informed by a PCC, biopsychosocial approach. Interestingly, results differed across implementation sites. The intervention was not associated with a reduction in BPSD in the residential care setting. This finding might speak to the difficulty of reducing BPSD when faced with organizational and workforce barriers (Ryan et al., 2018). Examples include constraints on training resources and facility size resulting in less staff trained to adequately attend to the number of residents.

For three interventions, staff training involved a multidisciplinary team and a variety of evidence-based supports for staff (Pieper et al., 2016; Resnick et al., 2016; Zwijsen et al., 2014). Resnick et al. (2016) described an implementation strategy, Evidence Integration Triangle for Behavioral and Psychological Symptoms of Dementia (EIT-4-BPSD). There are four central tenets to the strategy: (1) Assessment of environment and policies; (2) staff education; (3) establishing person-centred care plans; and (4) mentoring and motivating staff. Authors reported statistical improvements in agitation and quality-of-life,

but not in pain, function or psychotropic medication use (Resnick et al., 2016). Two studies reported positive outcomes on delusions, depression, and apathy when a stepwise approach to identifying and addressing behaviours was implemented (Pieper et al., 2016; Zwijsen et al., 2014).

Staff training/education demonstrated positive effects in 10 out of 11 studies. Most commonly the following outcomes were improved; responsive behaviours, agitation, aggression, and verbal assaults (Gozalo et al., 2014; McCabe et al., 2015; Pieper et al., 2016; Resnick et al., 2016; Ryan et al., 2018; Zwijsen et al., 2014). What remains unclear are the long-term positive trends associated with staff education interventions. Three studies noted that positive effects had declined at follow-up (Y.-H. Chen & Lin, 2016; McCabe et al., 2015; Tjia et al., 2017) and one reported longer-term positive outcomes (Pieper et al., 2016). The systematic review by Livingston et al. (2014) aligns with these findings, providing preliminary evidence that training caregivers in behavioural management and communication skills can effectively reduce agitation over the short-term.

Environmental modifications

Three articles examined environmental modifications including a custom lighting intervention (Figueiro et al., 2014), indoor daylight exposure (Konis, Mack, & Schneider, 2018) and an indoor air temperature intervention (Tartarini, Cooper, Fleming, & Batterham, 2017). A light delivery system designed to increase circadian stimulation during the day and reduce it during the evening not only improved a sleep-related measure, it also decreased agitation (Figueiro et al., 2014). A similar study by Konis et al. (2018), demonstrated that regularly exposing residents with dementia to daylight may reduce depressive symptoms. When indoor air temperature was explored, agitated behaviours of residents with dementia was reduced when indoor temperatures were between 20° and 26° Celsius (Tartarini et al., 2017). A scoping review by Wong and Leland (2016), saw a reduction in agitated behaviours when modifications were made to the physical environment (e.g., moving activities to the outdoors).

Nursing and medical care

Three articles examined nursing/medical care interventions, including two studies that examined caffeine use.

For young persons with dementia, a 5-step care program called “Grip on NPS in Institutionalized People with Yong Onset Dementia” combined staff education and a multidisciplinary team in detecting, analyzing, treating, and evaluation neuropsychiatric symptoms in this unique population (Appelhof et al., 2019). Overtime this intervention proved unsuccessful at reducing responsive behaviour or psychotropic medication use. The studies examining caffeine reduction/removal found an increase in resident apathy during the intervention (de Pooter-Stijnman, Vrijkotte, & Smalbrugge, 2018; Kromhout, Jongerling, & Achterberg, 2014). Both studies also demonstrated improved sleep quality with the reduction of caffeine. Notable is that Kromhout et al. (2014) showed an increase in abnormal motor behaviour as caffeine was reduced.

Caring for BPSD: The Value of Specialized Care Settings

Six of the articles in this review included participants residing in specialized care units (SCUs) or settings (Jones et al., 2018; Jøranson et al., 2015; Langhammer et al., 2019; Onega et al., 2016; Reynolds, Rodiek,

Lininger, & McCulley, 2018; Zwijsen et al., 2014) and one (Erdmann & Schnepp, 2016) spoke to the value of integrating interventions to support BPSD within dementia-specific units where staff are more likely to be trained, adept, and willing to implement new initiatives.

Hand searching the literature produced several studies on the topic of specialized care settings. According to Lai et al. (2009), SCUs emerged in the 1980s to accommodate the unique needs of persons with dementia and gained momentum in the 90s. However, there have been reports of a steady decline in the opening of SCUs (Gruneir et al., 2008). There is no standard definition of an SCU; rather it is broadly considered a set of interventions, which can include a unique staff mix, special programming, or environmental modifications. Despite the proliferation of SCUs, reports have been mixed as to their clinical effectiveness. For this reason, Lai et al. (2009) conducted a systematic review to evaluate their efficacy in managing responsive behaviours among those with dementia. The authors found inadequate evidence to support the assumption that residents in SCUs receive superior care than in traditional nursing units. A German-based study reported on quality-of-life variables of SCU residents with dementia compared to those residing in traditional nursing homes (Weyerer, Schäufele, & Hendlmeier, 2010). They found that for those residing in an SCU, there was higher volunteerism; more social contact with staff; more expression of interest; more involvement in activities; more participation in physical activation; more participation in 1:1 sessions, and; less physical-restraint and antipsychotics, and more use of antidepressants.

Associations have also been found between SCU design features and residents' neuropsychiatric symptoms. Zeisel et al. (2003) found environmental design characteristics associated with reduced aggression, depression, social withdrawal, and agitated behaviour include privacy, personalization in bedrooms, residential character (i.e., homey furniture and wall décor), ambient environment (i.e., familiar smells, sights, sounds, etc.), common areas that vary in ambiance, and camouflaged exit door to divert exit-seeking behaviour. Studies have evaluated the effectiveness of purpose-built specialized care facilities (SCFs) for middle-to-late stage dementia (Reimer et al., 2004). Residents in the SCF group showed stable measures of quality-of-life, better activities of daily living function and affect with less anxiety and showing more interest than those in traditional long-term care institutions.

Common Factors Across Successful Intervention Types

The PCC framework informed many of the interventions featured in these studies. This relates to three interwoven concepts, all necessary to enact change and demonstrate sustainable efforts:

- tailoring activities and supports to individual preferences and remaining abilities;
- building a culture of person-centred care within institutions; and
- ensuring the engagement of support staff and the leadership team.

A person's self or life history can be used to validate the individual's identity (Erdmann & Schnepp, 2016; Long, 2016). For example, allowing an individual who was a server their entire life to assist during meals (Long, 2016). Other examples that might represent an individual's biography include religious practices, food preferences and even their movements could disclose previous habits. Interventions that either involved person-centred approaches to care or PCC skills of communication and/or training contributed to better outcomes (Legere, McNeill, Schindel Martin, Acorn, & An, 2018; Livingston et al., 2014). This allows programs to be tailored to individual needs and preferences and thus meet the unmet needs of

the person living with dementia as they relate to attachment, occupation, and/or socialization (Legere et al., 2018; Stacpoole et al., 2015; Telenius et al., 2015). For example, music therapy should use playlists that speak to each resident's personal history or music choices (Thomas et al., 2017).

The research suggests deploying a broader PCC framework to underpin the LTC home culture (Gozalo et al., 2014; Van Bogaert et al., 2016). Such a framework is guided by five principles: (1) knowing the person; (2) welcoming family; (3) providing meaningful activities; (4) being in a personalized environment; and, (5) experiencing flexibility and continuity (Van Bogaert et al., 2016). A PCC framework as suggested in previous studies would need a change of culture rather than changes at individual or team levels (Livingston et al., 2014). In a study by Stacpoole et al. (2015), authors mention that during the implementation process of Namaste Care, staff and researchers reflected on related changes in culture and practice. This shared understanding enabled the team to identify the impact of other organizational changes during the study.

Having clinical support and engaged leadership may be a necessary "active ingredient" in changing the culture in the care setting (Livingston et al., 2014). In fact, Brodaty et al. (2014) found "good leadership" is associated with better resident outcomes, even more so than resident-level demographic and clinical characteristics. These findings, and others by Ballard et al. (2016) and Karel et al. (2016) emphasize the importance of management and staff engagement in the success of interventions. Importantly, longer term success may depend on the use of "multilevel implementation support mechanisms," including facility leadership support and local champions to model staff acceptance of a new care approach (Karel et al., 2016). For one study, authors took note of two factors associated with the success of the person-centered initiative, which involved strong leadership guiding the program and adequate staff offering good nursing and medical care for the program to succeed (Stacpoole et al., 2015).

All three of the above core concepts (i.e., available clinical support, engaged leadership and multilevel sources of support) must be incorporated into facility-based LTC if programs are to be sustainable over the long-term. For example, for programs relying on existing staff and resources, feasibility needs to be considered in the design of the intervention (Van Haitsma et al., 2015). This might look like introducing short intervention periods 10-15 minutes in length that utilize available, inexpensive materials. Another important element to the success of interventions speaks to integrating change into the regular staff workflow to ensure its sustainability (Jutkowitz et al., 2016). Study authors Jutkowitz et al. (2016) note that many studies often fail to execute this crucial step; however, having a dedicated person to implement and evaluate the effects of nonpharmacological interventions might increase consistent practice (Cohen-Mansfield et al., 2014).

Conclusion

Our synthesis of over 100 studies of targeted interventions to reduce responsive behaviours related to dementia yielded the following common themes and key findings:

1. ***Person-centred care and one-on-one interaction*:** In this context, PCC approaches to care integrated key tenets that seek to meet the needs of persons with dementia for attachment, comfort, identity, occupation, and inclusion. Driving PCC involves enhanced knowledge about dementia and BPSD, including the ability to empathize with residents and understand agitation as a response to an unmet need.
2. ***Tailoring activities*:** Interventions appear to work best when they are tailored to individual needs, preferences, and abilities (e.g., tailoring sensory-based interventions to each individual's preferences).
3. ***Support and leadership*:** For studies that described multicomponent interventions, we could not infer precisely which of the components were leading to the observed outcomes. Available clinical support and present leadership often seemed intertwined as mechanisms underlying staff acceptance of new care approaches.
4. ***Considering the facility culture*:** The success of many of the interventions seemed dependent on becoming part of the facility-wide culture, receiving ongoing support from administration/managers, and receiving on-going education and knowledge development around dementia care and BPSD.
5. ***Sustainability*:** An important but seemingly rarely mentioned concept relates to the "sustainability" of the actual intervention in practice. When mentioned, authors described the above four themes as critical for program sustainability. Most notably, the need to embed PPC framework principles into organizational procedures and policies. This will likely allow the care team to redefine their clinical role and target BPSD management as a core component of care. Most of the interventions required on-going application to have sustained effects. Interventions that were complex or required additional specialists to implement were at risk of early demise.

Specialized care units/facilities are one approach to managing responsive behaviours among people living with dementia. However, evidence of their benefit over traditional care is inconclusive. Few studies have found outcomes associated with better quality-of-care for SCU residents compared to non-SCU residents. This might speak to their highly heterogeneous care philosophy, staffing levels and mix, and programming. Additional studies are needed to advance the case for the benefits of SCUs. Therefore, while the physical environment is an integral element of behaviour management, PCC-informed care processes are important for those displaying difficult and disruptive behaviour. Although severe behavioural problems stemming from several factors, including size and strength of the resident and pre-existing psychiatric comorbidity may require more targeted solutions (Foley, Sudha, Sloane, & Gold, 2003). Solutions to address this level of risk include but are not limited to: (1) educating healthcare providers in de-escalation techniques; (2) installing personal safety alarm systems to allow providers to call for help; and (3) ensuring protocols are available that outline how to respond to violent situations (Casey, June 2019).

References

Aarskog, N. K., Hunskår, I., & Bruvik, F. (2019). Animal-Assisted Interventions With Dogs and Robotic Animals for Residents With Dementia in Nursing Homes: A Systematic Review. *Physical & Occupational Therapy In Geriatrics, 37*(2), 77-93. doi:10.1080/02703181.2019.1613466

Abraha, I., Rimland, J. M., Lozano-Montoya, I., Dell'Aquila, G., Vélez-Díaz-Pallarés, M., Trotta, F. M., . . . Cherubini, A. (2017). Simulated presence therapy for dementia. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.CD011882.pub2

Adam, D., Ramli, A., & Shahar, S. (2016). Effectiveness of a Combined Dance and Relaxation Intervention on Reducing Anxiety and Depression and Improving Quality of Life among the Cognitively Impaired Elderly. *Sultan Qaboos University Medical Journal, 16*(1), e47-53. doi:10.18295/squmj.2016.16.01.009

Alzheimer Society of Canada. (2010, 2010). Rising tide: The impact of dementia on Canadian society. *Alzheimer Society.* Retrieved from https://alzheimer.ca/sites/default/files/files/national/advocacy/asc_rising_tide_full_report_e.pdf

Anderson, K., Wickramariyaratne, T., & Blair, A. (2018). A feasibility study of group-based cognitive behaviour therapy for older adults in residential care: Group-based CBT in long-term aged care. *Clinical Psychologist, 22*(2), 192-202. doi:10.1111/cp.12109

Appelhof, B., Bakker, C., de Vugt, M. E., van Duinen-van den IJssel, J. C. L., Zwijsen, S. A., Smalbrugge, M., . . . Koopmans, R. T. C. M. (2019). Effects of a Multidisciplinary Intervention on the Presence of Neuropsychiatric Symptoms and Psychotropic Drug Use in Nursing Home Residents WithYoung-Onset Dementia: Behavior and Evolution of Young-Onset Dementia Part 2 (BEYOND-II) Study. *The American Journal of Geriatric Psychiatry, 27*(6), 581-589. doi:10.1016/j.jagp.2018.12.032

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International journal of social research methodology, 8*(1), 19–32.

Armstrong, P., & Daly, T. (2004). There are not enough hands CONDITIONS IN ONTARIO'S LONG-TERM CARE FACILITIES. Retrieved from https://archive.cupe.ca/updir/CUPELTC-ReportEng1.pdf

Bailey, E. M., Stevens, A. B., LaRocca, M. A., & Scogin, F. (2017). A Randomized Controlled Trial of a Therapeutic Intervention for Nursing Home Residents With Dementia and Depressive Symptoms. *Journal of Applied Gerontology, 36*(7), 895-908. doi:10.1177/0733464815627956

Ballard, C., Orrell, M., YongZhong, S., Moniz-Cook, E., Stafford, J., Whittaker, R., . . . Fossey, J. (2016). Impact of Antipsychotic Review and Nonpharmacological Intervention on Antipsychotic Use, Neuropsychiatric Symptoms, and Mortality in People With Dementia Living in Nursing Homes: A Factorial Cluster-Randomized Controlled Trial by the Well-Being and Health for People With Dementia (WHELD) Program. *American Journal of Psychiatry, 173*(3), 252-262. doi:10.1176/appi.ajp.2015.15010130

Bauer, M., Rayner, J.-A., Tang, J., Koch, S., While, C., & O'Keefe, F. (2015). An evaluation of Snoezelen® compared to 'common best practice' for allaying the symptoms of wandering and restlessness among residents with dementia in aged care facilities. *Geriatric Nursing, 36*(6), 462-466. doi:10.1016/j.gerinurse.2015.07.005

Bautrant, T., Grino, M., Peloso, C., Schiettecatte, F., Planelles, M., Oliver, C., & Franqui, C. (2019). Impact of Environmental Modifications to Enhance Day-Night Orientation on Behavior of Nursing Home Residents With Dementia. *Journal of the American Medical Directors Association, 20*(3), 377-381. doi:10.1016/j.jamda.2018.09.015

Berkheimer, S. D., Qian, C., & Malmstrom, T. K. (2017). Snoezelen Therapy as an Intervention to Reduce Agitation in Nursing Home Patients With Dementia: A Pilot Study. *Journal of the American Medical Directors Association, 18*(12), 1089-1091. doi:10.1016/j.jamda.2017.09.009

Blackburn, R., & Bradshaw, T. (2014). Music therapy for service users with dementia: a critical review of the literature: Music therapy for dementia. *Journal of Psychiatric and Mental Health Nursing, 21*(10), 879-888. doi:10.1111/jpm.12165

Boström, G., Conradsson, M., Hörnsten, C., Rosendahl, E., Lindelöf, N., Holmberg, H., . . . Littbrand, H. (2016). Effects of a high-intensity functional exercise program on depressive symptoms among people with dementia in residential care: a randomized controlled trial: Effects of exercise on depressive symptoms. *International Journal of Geriatric Psychiatry, 31*(8), 868-878. doi:10.1002/gps.4401

Briggs, J. (2019). 11.1.2 Scoping reviews and evidence based practice - JBI Reviewer's Manual - JBI GLOBAL WIKI. Retrieved from https://wiki.joannabriggs.org/display/MANUAL/Chapter+11%3A+Scoping+reviews

Brodaty, H., Low, L.-F., Liu, Z., Fletcher, J., Roast, J., Goodenough, B., & Chenoweth, L. (2014). Successful Ingredients in the SMILE Study: Resident, Staff, and Management Factors Influence the Effects of Humor Therapy in Residential Aged Care. *The American Journal of Geriatric Psychiatry, 22*(12), 1427-1437. doi:10.1016/j.jagp.2013.08.005

Burdea, G., Polistico, K., Krishnamoorthy, A., House, G., Rethage, D., Hundal, J., . . . Pollack, S. (2015). Feasibility study of the BrightBrainer ™ integrative cognitive rehabilitation system for elderly with dementia. *Disability and Rehabilitation: Assistive Technology, 10*(5), 421-432. doi:10.3109/17483107.2014.900575

Canadian Institute for Health Information. (2018, 2018-11-05). Dementia in long-term care | CIHI. Retrieved from https://www.cihi.ca/en/dementia-in-canada/dementia-across-the-health-system/dementia-in-long-term-care

Cancela, J. M., Ayán, C., Varela, S., & Seijo, M. (2016). Effects of a long-term aerobic exercise intervention on institutionalized patients with dementia. *Journal of Science and Medicine in Sport, 19*(4), 293-298. doi:10.1016/j.jsams.2015.05.007

Cantarella, A., Borella, E., Faggian, S., Navuzzi, A., & De Beni, R. (2018). Using dolls for therapeutic purposes: A study on nursing home residents with severe dementia. *International Journal of Geriatric Psychiatry, 33*(7), 915-925.

Casey, B. (June 2019). Violence Facing Health Care Workers in Canada: Report of the Standing Committee on Health. Retrieved from https://www.ourcommons.ca/Content/Committee/421/HESA/Reports/RP10589455/hesarp29/hesarp29-e.pdf

Chambers, L. W., Bancej, C., & McDowell, I. (2016). *Prevalence and monetary costs of dementia in Canada: Population health expert panel*: Alzheimer Society of Canada in collaboration with the Public Health Agency ….

Chen, H.-M., Tsai, L.-J., Chao, S.-Y., & Clark, M. J. (2016). Study on the effects of individualized learning therapy on cognitive function and behavioral and psychological symptoms of dementia in the institutionalized older adults. *Journal of Nursing Research*, 1. doi:10.1097/jnr.0000000000000118

Chen, K.-M., Kuo, C.-C., Chang, Y.-H., Huang, H.-T., & Cheng, Y.-Y. (2017). Resistance Band Exercises Reduce Depression and Behavioral Problems of Wheelchair-Bound Older Adults with Dementia: A Cluster-Randomized Controlled Trial. *Journal of the American Geriatrics Society, 65*(2), 356-363. doi:10.1111/jgs.14526

Chen, Y.-H., & Lin, L.-C. (2016). Ability of the Pain Recognition and Treatment (PRT) Protocol to Reduce Expressions of Pain among Institutionalized Residents with Dementia: A Cluster Randomized Controlled Trial. *Pain Management Nursing, 17*(1), 14-24. doi:10.1016/j.pmn.2015.08.003

Cheung, D. S. K., Lai, C. K. Y., Wong, F. K. Y., & Leung, M. C. P. (2018). The effects of the music-with-movement intervention on the cognitive functions of people with moderate dementia: a randomized controlled trial. *Aging & Mental Health, 22*(3), 306-315. doi:10.1080/13607863.2016.1251571

Clifford, C., & Doody, O. (2018). Exploring nursing staff views of responsive behaviours of people with dementia in long-stay facilities. *Journal of Psychiatric and Mental Health Nursing, 25*(1), 26-36.

Cohen-Mansfield, J. (2004). Nonpharmacologic interventions for inappropriate behaviors in dementia: a review, summary, and critique. *Focus, 9*(2), 361–308.

Cohen-Mansfield, J., Marx, M. S., Dakheel-Ali, M., & Thein, K. (2015). The use and utility of specific nonpharmacological interventions for behavioral symptoms in dementia: an exploratory study. *The American Journal of Geriatric Psychiatry, 23*(2), 160-170.

Cohen-Mansfield, J., Thein, K., & Marx, M. S. (2014). Predictors of the Impact of Nonpharmacologic Interventions for Agitation in Nursing Home Residents With Advanced Dementia. *The Journal of Clinical Psychiatry, 75*(07), e666-e671. doi:10.4088/JCP.13m08649

Cox, E., Nowak, M., & Buettner, P. (2014). Live Music Promotes Positive Behaviours in People with Alzheimer's Disease. *British Journal of Occupational Therapy, 77*(11), 556-564. doi:10.4276/030802214X14151078348477

Daly, T., Banerjee, A., Armstrong, P., Armstrong, H., & Szebehely, M. (2011). Lifting the 'violence veil': Examining working conditions in long-term care facilities using iterative mixed methods. *Canadian Journal on Aging/La Revue canadienne du vieillissement, 30*(2), 271-284.

de Pooter-Stijnman, L., Vrijkotte, S., & Smalbrugge, M. (2018). Effect of caffeine on sleep and behaviour in nursing home residents with dementia. *European Geriatric Medicine, 9*(6), 829-835.

Dupuis, S. L., Wiersma, E., & Loiselle, L. (2012). Pathologizing behavior: Meanings of behaviors in dementia care. *Journal of Aging Studies, 26*(2), 162–173.

Duru Aşiret, G., & Kapucu, S. (2016). The Effect of Reminiscence Therapy on Cognition, Depression, and Activities of Daily Living for Patients With Alzheimer Disease. *Journal of Geriatric Psychiatry and Neurology, 29*(1), 31-37. doi:10.1177/0891988715598233

Erdmann, A., & Schnepp, W. (2016). Conditions, components and outcomes of Integrative Validation Therapy in a long-term care facility for people with dementia. A qualitative evaluation study. *Dementia, 15*(5), 1184-1204. doi:10.1177/1471301214556489

Eritz, H., Hadjistavropoulos, T., Williams, J., Kroeker, K., R. Martin, R., M. Lix, L., & V. Hunter, P. (2016). A life history intervention for individuals with dementia: a randomised controlled trial examining nursing staff empathy, perceived patient personhood and aggressive behaviours. *Ageing and Society, 36*(10), 2061-2089. doi:10.1017/S0144686X15000902

Figueiro, M., Plitnick, B., Lok, A., Jones, G., Higgins, P., Hornick, T., & Rea, M. (2014). Tailored lighting intervention improves measures of sleep, depression, and agitation in persons with Alzheimer's disease and related dementia living in long-term care facilities. *Clinical Interventions in Aging*, 1527. doi:10.2147/CIA.S68557

Foley, K. L., Sudha, S., Sloane, P. D., & Gold, D. T. (2003). Staff perceptions of successful management of severe behavioral problems in dementia special care units. *Dementia, 2*(1), 105-124.

Folkerts, A.-K., Dorn, M. E., Roheger, M., Maassen, M., Koerts, J., Tucha, O., . . . Kalbe, E. (2018). Cognitive Stimulation for Individuals with Parkinson's Disease Dementia Living in Long-Term Care: Preliminary Data from a Randomized Crossover Pilot Study. *Parkinson's Disease, 2018*, 1-9. doi:10.1155/2018/8104673

Gozalo, P., Prakash, S., Qato, D. M., Sloane, P. D., & Mor, V. (2014). Effect of the Bathing Without a Battle Training Intervention on Bathing-Associated Physical and Verbal Outcomes in Nursing Home Residents with Dementia: A Randomized Crossover Diffusion Study. *Journal of the American Geriatrics Society, 62*(5), 797-804. doi:10.1111/jgs.12777

Gruneir, A., Lapane, K. L., Miller, S. C., & Mor, V. (2008). Does the presence of a dementia special care unit improve nursing home quality? *Journal of aging and health, 20*(7), 837-854.

Henskens, M., Nauta, Ilse M., van Eekeren, Marieke C. A., & Scherder, Erik J. A. (2018). Effects of Physical Activity in Nursing Home Residents with Dementia: A Randomized Controlled Trial. *Dementia and Geriatric Cognitive Disorders, 46*(1-2), 60-80. doi:10.1159/000491818

Houser, W. S., George, D. R., & Chinchilli, V. M. (2014). Impact of TimeSlips Creative Expression Program on Behavioral Symptoms and Psychotropic Medication Use in Persons with Dementia in Long-term Care: A Cluster-randomized Pilot Study. *The American Journal of Geriatric Psychiatry, 22*(4), 337-340. doi:10.1016/j.jagp.2012.12.005

Hsieh, C.-J., Chang, C., Tsai, G., & Wu, H.-F. (2015). Empirical study of the influence of a Laughing Qigong Program on long-term care residents: LQP on long-term care residents. *Geriatrics & Gerontology International, 15*(2), 165-173. doi:10.1111/ggi.12244

Huang, H.-C., Chen, Y.-T., Chen, P.-Y., Huey-Lan Hu, S., Liu, F., Kuo, Y.-L., & Chiu, H.-Y. (2015). Reminiscence Therapy Improves Cognitive Functions and Reduces Depressive Symptoms in Elderly People With Dementia: A Meta-Analysis of Randomized Controlled Trials. *Journal of the American Medical Directors Association, 16*(12), 1087-1094. doi:10.1016/j.jamda.2015.07.010

Ikemata, S., & Momose, Y. (2017). Effects of a progressive muscle relaxation intervention on dementia symptoms, activities of daily living, and immune function in group home residents with dementia in Japan: Effects of muscle relaxation on dementia. *Japan Journal of Nursing Science, 14*(2), 135-145. doi:10.1111/jjns.12147

Jones, C., Moyle, W., Murfield, J., Draper, B., Shum, D., Beattie, E., & Thalib, L. (2018). Does Cognitive Impairment and Agitation in Dementia Influence Intervention Effectiveness? Findings From a Cluster-Randomized-Controlled Trial With the Therapeutic Robot, PARO. *Journal of the American Medical Directors Association, 19*(7), 623-626. doi:10.1016/j.jamda.2018.02.014

Jøranson, N., Pedersen, I., Rokstad, A. M. M., & Ihlebæk, C. (2015). Effects on Symptoms of Agitation and Depression in Persons With Dementia Participating in Robot-Assisted Activity: A Cluster-Randomized Controlled Trial. *Journal of the American Medical Directors Association, 16*(10), 867-873. doi:10.1016/j.jamda.2015.05.002

Jutkowitz, E., Brasure, M., Fuchs, E., Shippee, T., Kane, R. A., Fink, H. A., . . . Kane, R. L. (2016). Care-Delivery Interventions to Manage Agitation and Aggression in Dementia Nursing Home and Assisted Living Residents: A Systematic Review and Meta-analysis. *Journal of the American Geriatrics Society, 64*(3), 477-488. doi:10.1111/jgs.13936

Karel, M. J., Teri, L., McConnell, E., Visnic, S., & Karlin, B. E. (2016). Effectiveness of Expanded Implementation of STAR-VA for Managing Dementia-Related Behaviors Among Veterans. *The Gerontologist, 56*(1), 126-134. doi:10.1093/geront/gnv068

Keshavarz, S., Mirzaei, T., & Ravari, A. (2017). The Effect of Head and Face Massage on the Agitation in Elderly Patients with Alzheimer's disease. *Evidence Based Care*(Online First). doi:10.22038/ebcj.2017.25958.1589

Kirkham, J., Sherman, C., Velkers, C., Maxwell, C., Gill, S., Rochon, P., & Seitz, D. (2017). Antipsychotic use in dementia: is there a problem and are there solutions? *The Canadian Journal of Psychiatry, 62*(3), 170–181.

Konis, K., Mack, W. J., & Schneider, E. L. (2018). Pilot study to examine the effects of indoor daylight exposure on depression and other neuropsychiatric symptoms in people living with dementia in long-term care communities. *Clinical Interventions in Aging, Volume 13*, 1071-1077. doi:10.2147/CIA.S165224

Kontos, P., Miller, K.-L., Colobong, R., Palma Lazgare, L. I., Binns, M., Low, L.-F., . . . Naglie, G. (2016). Elder-Clowning in Long-Term Dementia Care: Results of a Pilot Study. *Journal of the American Geriatrics Society, 64*(2), 347-353. doi:10.1111/jgs.13941

Kovach, C. R., Evans, C.-R., Sattell, L., Rosenau, K., & Gopalakrishnan, S. (2018). Feasibility and Pilot Testing of a Mindfulness Intervention for Frail Older Adults and Individuals With Dementia. *Research in Gerontological Nursing, 11*(3), 137-150. doi:10.3928/19404921-20180223-01

Krippendorff, K. (2004). Reliability in content analysis. *Human communication research, 30*(3), 411–433.

Krippendorff, K. (2017). Three concepts to retire. *Annals of the International Communication Association, 41*(1), 92–99.

Kromhout, M. A., Jongerling, J., & Achterberg, W. P. (2014). Relation between caffeine and behavioral symptoms in elderly patients with dementia: An observational study. *The journal of nutrition, health & aging, 18*(4), 407-410. doi:10.1007/s12603-013-0417-9

Kwan, R. Y. C., Leung, M. C. P., & Lai, C. K. Y. (2016). The Effect of Acupressure on Agitation and Salivary Cortisol in People with Dementia: A Pilot Study. *The Journal of Alternative and Complementary Medicine, 22*(11), 903-910. doi:10.1089/acm.2016.0062

Kwan, R. Y. C., Leung, M. C. P., & Lai, C. K. Y. (2017). A Randomized Controlled Trial Examining the Effect of Acupressure on Agitation and Salivary Cortisol in Nursing Home Residents with Dementia. *Dementia and Geriatric Cognitive Disorders, 44*(1-2), 92-104. doi:10.1159/000478739

Lai, C. K., Yeung, J. H., Mok, V., & Chi, I. (2009). Special care units for dementia individuals with behavioural problems. *Cochrane Database of Systematic Reviews*(4).

Langhammer, B., Sagbakken, M., Kvaal, K., Ulstein, I., Nåden, D., & Rognstad, M. K. (2019). Music Therapy and Physical Activity to Ease Anxiety, Restlessness, Irritability, and Aggression in Individuals With Dementia With Signs of Frontotemporal Lobe Degeneration. *Journal of Psychosocial Nursing and Mental Health Services, 57*(5), 29-37. doi:10.3928/02793695-20190124-02

Legere, L. E., McNeill, S., Schindel Martin, L., Acorn, M., & An, D. (2018). Nonpharmacological approaches for behavioural and psychological symptoms of dementia in older adults: A systematic review of reviews. *Journal of Clinical Nursing, 27*(7-8), e1360-e1376. doi:10.1111/jocn.14007

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: advancing the methodology. *Implementation science, 5*(1), 69.

Levy-Storms, L., Harris, L. M., & Chen, X. (2016). A Video-Based Intervention on and Evaluation of Nursing Aides' Therapeutic Communication and Residents' Agitation During Mealtime in a Dementia Care Unit. *Journal of Nutrition in Gerontology and Geriatrics, 35*(4), 267-281. doi:10.1080/21551197.2016.1238430

Lin, H.-C., Yang, Y.-P., Cheng, W.-Y., & Wang, J.-J. (2018). Distinctive effects between cognitive stimulation and reminiscence therapy on cognitive function and quality of life for different types of behavioural problems in dementia. *Scandinavian Journal of Caring Sciences, 32*(2), 594-602. doi:10.1111/scs.12484

Livingston, G., Kelly, L., Lewis-Holmes, E., Baio, G., Morris, S., Patel, N., . . . Cooper, C. (2014). A systematic review of the clinical effectiveness and cost-effectiveness of sensory, psychological and behavioural interventions for managing agitation in older adults with dementia. *Health Technology Assessment, 18*(39). doi:10.3310/hta18390

Long, E. (2016). Effect of a personalized music playlist on a patient with dementia and evening agitation. *Ann Long Term Care, 24*(11), 31-33.

Maseda, A., Sánchez, A., Marante, M. P., González-Abraldes, I., Buján, A., & Millán-Calenti, J. C. (2014). Effects of Multisensory Stimulation on a Sample of Institutionalized Elderly People With Dementia Diagnosis: A Controlled Longitudinal Trial. *American Journal of Alzheimer's Disease & Other Dementiasr, 29*(5), 463-473. doi:10.1177/1533317514522540

McCabe, M. P., Bird, M., Davison, T. E., Mellor, D., MacPherson, S., Hallford, D., & Seedy, M. (2015). An RCT to evaluate the utility of a clinical protocol for staff in the management of behavioral and psychological symptoms of dementia in residential aged-care settings. *Aging & Mental Health, 19*(9), 799-807. doi:10.1080/13607863.2014.967659

Mellor, D., McCabe, M., Bird, M., Davison, T., MacPherson, S., Hallford, D., & Seedy, M. (2015). Staff Compliance With Protocols to Improve the Management of Behavioral and Psychological Symptoms of Dementia. *Journal of Gerontological Nursing, 41*(2), 44-52. doi:10.3928/00989134-20140701-01

Mervin, M. C., Moyle, W., Jones, C., Murfield, J., Draper, B., Beattie, E., . . . Thalib, L. (2018). The Cost-Effectiveness of Using PARO, a Therapeutic Robotic Seal, to Reduce Agitation and Medication Use in Dementia: Findings from a Cluster–Randomized Controlled Trial. *Journal of the American Medical Directors Association, 19*(7), 619-622.e611. doi:10.1016/j.jamda.2017.10.008

Millan-Calenti, J. C., Lorenzo-López, L., Alonso-Búa, B., de Labra Pinedo, C., González-Abraldes, I., & Maseda, A. (2016). Optimal nonpharmacological management of agitation in Alzheimer's disease: challenges and solutions. *Clinical Interventions in Aging*, 175. doi:10.2147/CIA.S69484

Morrison, A., Polisena, J., Husereau, D., Moulton, K., Clark, M., Fiander, M., . . . Rabb, D. (2012). The effect of English-language restriction on systematic review-based meta-analyses: a systematic review of empirical studies. *International journal of technology assessment in health care, 28*(2), 138–144.

Moyle, W., Bramble, M., Jones, C. J., & Murfield, J. E. (2019). "She Had a Smile on Her Face as Wide as the Great Australian Bite": A Qualitative Examination of Family Perceptions of a Therapeutic Robot and a Plush Toy. *The Gerontologist, 59*(1), 177-185. doi:10.1093/geront/gnx180

Moyle, W., Jones, C. J., Murfield, J. E., Thalib, L., Beattie, E. R., Shum, D. K., . . . Draper, B. M. (2017). Use of a robotic seal as a therapeutic tool to improve dementia symptoms: A cluster-randomized controlled trial. *Journal of the American Medical Directors Association, 18*(9), 766-773.

Neville, C., Henwood, T., Beattie, E., & Fielding, E. (2014). Exploring the effect of aquatic exercise on behaviour and psychological well-being in people with moderate to severe dementia: A pilot study of the Watermemories Swimming Club: Aquatic exercise and dementia. *Australasian Journal on Ageing, 33*(2), 124-127. doi:10.1111/ajag.12076

Nishiura, Y., Hoshiyama, M., & Konagaya, Y. (2018). Use of parametric speaker for older people with dementia in a residential care setting: A preliminary study of two cases. *Hong Kong Journal of Occupational Therapy, 31*(1), 30-35.

Nordgren, L., & Engström, G. (2014). Effects of dog-assisted intervention on behavioural and psychological symptoms of dementia: Lena Nordgren and Gabriella Engström present the results from a study that used dogs as an alternative or a complement to pharmacological treatments. *Nursing Older People, 26*(3), 31-38. doi:10.7748/nop2014.03.26.3.31.e517

Olsen, C., Pedersen, I., Bergland, A., Enders-Slegers, M.-J., Patil, G., & Ihlebaek, C. (2016). Effect of animal-assisted interventions on depression, agitation and quality of life in nursing home residents suffering from cognitive impairment or dementia: a cluster randomized controlled trial: Animal-assisted interventions for dementia patients. *International Journal of Geriatric Psychiatry, 31*(12), 1312-1321. doi:10.1002/gps.4436

Onega, L. L., Pierce, T. W., & Epperly, L. (2016). Effect of Bright Light Exposure on Depression and Agitation in Older Adults with Dementia. *Issues in Mental Health Nursing, 37*(9), 660-667. doi:10.1080/01612840.2016.1183736

Onieva-Zafra, M. D., Hernández-Garcia, L., Gonzalez-del-Valle, M. T., Parra-Fernández, M. L., & Fernandez-Martinez, E. (2018). Music Intervention With Reminiscence Therapy and Reality Orientation for Elderly People With Alzheimer Disease Living in a Nursing Home: A Pilot Study. *Holistic Nursing Practice, 32*(1), 43-50. doi:10.1097/HNP.0000000000000247

Oppikofer, S., & Geschwindner, H. (2014). Nursing interventions in cases of agitation and dementia. *Dementia, 13*(3), 306-317. doi:10.1177/1471301212461110

Park, Y.-H., Moon, S.-H., Ha, J.-Y., & Lee, M.-H. (2017). The long-term effects of the health coaching self-management program for nursing-home residents. *Clinical Interventions in Aging, 12*, 1079.

Pieper, M. J. C., Francke, A. L., van der Steen, J. T., Scherder, E. J. A., Twisk, J. W. R., Kovach, C. R., & Achterberg, W. P. (2016). Effects of a Stepwise Multidisciplinary Intervention for Challenging Behavior in Advanced Dementia: A Cluster Randomized Controlled Trial. *Journal of the American Geriatrics Society, 64*(2), 261-269. doi:10.1111/jgs.13868

Ray, K. D., & Mittelman, M. S. (2017). Music therapy: A nonpharmacological approach to the care of agitation and depressive symptoms for nursing home residents with dementia. *Dementia, 16*(6), 689-710. doi:10.1177/1471301215613779

Reimer, M. A., Slaughter, S., Donaldson, C., Currie, G., & Eliasziw, M. (2004). Special care facility compared with traditional environments for dementia care: a longitudinal study of quality of life. *Journal of the American Geriatrics Society, 52*(7), 1085-1092.

Resnick, B., Kolanowski, A., Van Haitsma, K., Boltz, M., Galik, E., Bonner, A., . . . Mulhall, P. M. (2016). Pilot Testing of the EIT-4-BPSD Intervention. *American Journal of Alzheimer's Disease & Other Dementiasr, 31*(7), 570-579. doi:10.1177/1533317516662337

Reynolds, L., Rodiek, S., Lininger, M., & McCulley, M. A. (2018). Can a Virtual Nature Experience Reduce Anxiety and Agitation in People With Dementia? *Journal of Housing For the Elderly, 32*(2), 176-193. doi:10.1080/02763893.2018.1431583

Ryan, N. P., Scott, L., McPhee, M., Mathers, S., Davis, M.-C., Maule, R., & Fisher, F. (2018). Evaluating the Utility of a Structured Clinical Protocol for Reducing the Impact of Behavioural and Psychological Symptoms of Dementia in Progressive Neurological Diseases: A Pilot Study. *Behavioural Neurology, 2018*, 1-9. doi:10.1155/2018/5420531

Särkämö, T., Laitinen, S., Numminen, A., Kurki, M., Johnson, J. K., & Rantanen, P. (2015). Clinical and Demographic Factors Associated with the Cognitive and Emotional Efficacy of Regular Musical Activities in Dementia. *Journal of Alzheimer's Disease, 49*(3), 767-781. doi:10.3233/JAD-150453

Schindel Martin, L., Gillies, L., Coker, E., Pizzacalla, A., Montemuro, M., Suva, G., & McLelland, V. (2016). An education intervention to enhance staff self-efficacy to provide dementia care in an acute care hospital in Canada: A nonrandomized controlled study. *American Journal of Alzheimer's Disease & Other Dementias®, 31*(8), 664–677.

Scott, A., Ryan, A., James, I., & Mitchell, E. A. (2011). Perceptions and implications of violence from care home residents with dementia: a review and commentary. *International journal of older people nursing, 6*(2), 110-122.

Shin, J. H. (2015). Doll Therapy: An Intervention for Nursing Home Residents With Dementia. *Journal of Psychosocial Nursing and Mental Health Services, 53*(1), 13-18. doi:10.3928/02793695-20141218-03

Spencer, S., Johnson, P., & Smith, I. C. (2018). De-escalation techniques for managing non-psychosis induced aggression in adults. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.CD012034.pub2

Stacpoole, M., Hockley, J., Thompsell, A., Simard, J., & Volicer, L. (2015). The Namaste Care programme can reduce behavioural symptoms in care home residents with advanced dementia. *International Journal of Geriatric Psychiatry, 30*(7), 702-709.

Tartarini, F., Cooper, P., Fleming, R., & Batterham, M. (2017). Indoor Air Temperature and Agitation of Nursing Home Residents With Dementia. *American Journal of Alzheimer's Disease & Other Dementiasr, 32*(5), 272-281. doi:10.1177/1533317517704898

Telenius, E. W., Engedal, K., & Bergland, A. (2015). Long-term effects of a 12 weeks high-intensity functional exercise program on physical function and mental health in nursing home residents with dementia: a single blinded randomized controlled trial. *BMC geriatrics, 15*(1). doi:10.1186/s12877-015-0151-8

Testad, I., Corbett, A., Aarsland, D., Lexow, K. O., Fossey, J., Woods, B., & Ballard, C. (2014). The value of personalized psychosocial interventions to address behavioral and psychological symptoms in people with dementia living in care home settings: a systematic review. *International Psychogeriatrics, 26*(7), 1083-1098.

Thomas, K. S., Baier, R., Kosar, C., Ogarek, J., Trepman, A., & Mor, V. (2017). Individualized Music Program is Associated with Improved Outcomes for U.S. Nursing Home Residents with Dementia. *The American Journal of Geriatric Psychiatry, 25*(9), 931-938. doi:10.1016/j.jagp.2017.04.008

Tjia, J., Hunnicutt, J. N., Herndon, L., Blanks, C. R., Lapane, K. L., & Wehry, S. (2017). Association of a Communication Training Program With Use of Antipsychotics in Nursing Homes. *JAMA Internal Medicine, 177*(6), 846. doi:10.1001/jamainternmed.2017.0746

Travers, C. (2017). Increasing enjoyable activities to treat depression in nursing home residents with dementia: A pilot study. *Dementia, 16*(2), 204-218. doi:10.1177/1471301215586069

Traynor, V., Veerhuis, N., Johnson, K., Hazelton, J., & Gopalan, S. (2018). Evaluating the effects of a physical activity on agitation and wandering (PAAW) experienced by individuals living with a dementia in care homes. *Journal of Research in Nursing*, 174498711875647. doi:10.1177/1744987118756479

Tse, M. M. Y., Lau, J. L., Kwan, R., Cheung, D., Tang, A. S. K., Ng, S. S. M., . . . Yeung, S. S. Y. (2018). Effects of play activities program for nursing home residents with dementia on pain and psychological well-being: Cluster randomized controlled trial: Play activity for older adults with dementia. *Geriatrics & Gerontology International, 18*(10), 1485-1490. doi:10.1111/ggi.13509

Tsoi, K. K. F., Chan, J. Y. C., Ng, Y.-M., Lee, M. M. Y., Kwok, T. C. Y., & Wong, S. Y. S. (2018). Receptive Music Therapy Is More Effective than Interactive Music Therapy to Relieve Behavioral and Psychological Symptoms of Dementia: A Systematic Review and Meta-Analysis. *Journal of the American Medical Directors Association, 19*(7), 568-576.e563. doi:10.1016/j.jamda.2017.12.009

Van Bogaert, P., Tolson, D., Eerlingen, R., Carvers, D., Wouters, K., Paque, K., . . . Engelborghs, S. (2016). SolCos model-based individual reminiscence for older adults with mild to moderate dementia in

nursing homes: a randomized controlled intervention study. *Journal of Psychiatric and Mental Health Nursing, 23*(9-10), 568-575. doi:10.1111/jpm.12336

Van der Ploeg, E. S., Eppingstall, B., & O'Connor, D. W. (2016). Internet video chat (Skype) family conversations as a treatment of agitation in nursing home residents with dementia. *International Psychogeriatrics, 28*(4), 697-698. doi:10.1017/S1041610215001854

Van Haitsma, K. S., Curyto, K., Abbott, K. M., Towsley, G. L., Spector, A., & Kleban, M. (2015). A Randomized Controlled Trial for an Individualized Positive Psychosocial Intervention for the Affective and Behavioral Symptoms of Dementia in Nursing Home Residents. *The Journals of Gerontology: Series B, 70*(1), 35-45. doi:10.1093/geronb/gbt102

Wang, S.-C., Yu, C.-L., & Chang, S.-H. (2017). Effect of music care on depression and behavioral problems in elderly people with dementia in Taiwan: a quasi-experimental, longitudinal study. *Aging & Mental Health, 21*(2), 156-162. doi:10.1080/13607863.2015.1093602

Watson, K., Hatcher, D., & Good, A. (2019). A randomised controlled trial of Lavender (Lavandula Angustifolia) and Lemon Balm (Melissa Officinalis) essential oils for the treatment of agitated behaviour in older people with and without dementia. *Complementary Therapies in Medicine, 42*, 366-373. doi:10.1016/j.ctim.2018.12.016

Wesenberg, S., Mueller, C., Nestmann, F., & Holthoff-Detto, V. (2019). Effects of an animal-assisted intervention on social behaviour, emotions, and behavioural and psychological symptoms in nursing home residents with dementia. *Psychogeriatrics, 19*(3), 219-227. doi:10.1111/psyg.12385

Weyerer, S., Schäufele, M., & Hendlmeier, I. (2010). Evaluation of special and traditional dementia care in nursing homes: results from a cross-sectional study in Germany. *International Journal of Geriatric Psychiatry, 25*(11), 1159-1167.

Wilkinson, A., Tong, T., Zare, A., Kanik, M., & Chignell, M. (2018). Monitoring Health Status in Long Term Care Through the Use of Ambient Technologies and Serious Games. *IEEE Journal of Biomedical and Health Informatics, 22*(6), 1807-1813. doi:10.1109/JBHI.2018.2864686

Wong, C., & Leland, N. E. (2016). Non-Pharmacological Approaches to Reducing Negative Behavioral Symptoms: A Scoping Review. *OTJR: Occupation, Participation and Health, 36*(1), 34-41. doi:10.1177/1539449215627278

Wu, J., Wang, Y., & Wang, Z. (2017). The effectiveness of massage and touch on behavioural and psychological symptoms of dementia: A quantitative systematic review and meta-analysis. *Journal of Advanced Nursing, 73*(10), 2283-2295. doi:10.1111/jan.13311

Yang, Y.-P., Lee, F.-P., Chao, H.-C., Hsu, F.-Y., & Wang, J.-J. (2016). Comparing the Effects of Cognitive Stimulation, Reminiscence, and Aroma-Massage on Agitation and Depressive Mood in People With Dementia. *Journal of the American Medical Directors Association, 17*(8), 719-724. doi:10.1016/j.jamda.2016.03.021

Yoshiyama, K., Arita, H., & Suzuki, J. (2015). The Effect of Aroma Hand Massage Therapy for People with Dementia. *The Journal of Alternative and Complementary Medicine, 21*(12), 759-765. doi:10.1089/acm.2015.0158

Zeisel, J., Silverstein, N. M., Hyde, J., Levkoff, S., Lawton, M. P., & Holmes, W. (2003). Environmental correlates to behavioral health outcomes in Alzheimer's special care units. *The Gerontologist, 43*(5), 697-711.

Zwijsen, S. A., Smalbrugge, M., Eefsting, J. A., Twisk, J. W. R., Gerritsen, D. L., Pot, A. M., & Hertogh, C. M. P. M. (2014). Coming to Grips With Challenging Behavior: A Cluster Randomized Controlled Trial on the Effects of a Multidisciplinary Care Program for Challenging Behavior in Dementia. *Journal of the American Medical Directors Association, 15*(7), 531.e531-531.e510. doi:10.1016/j.jamda.2014.04.007

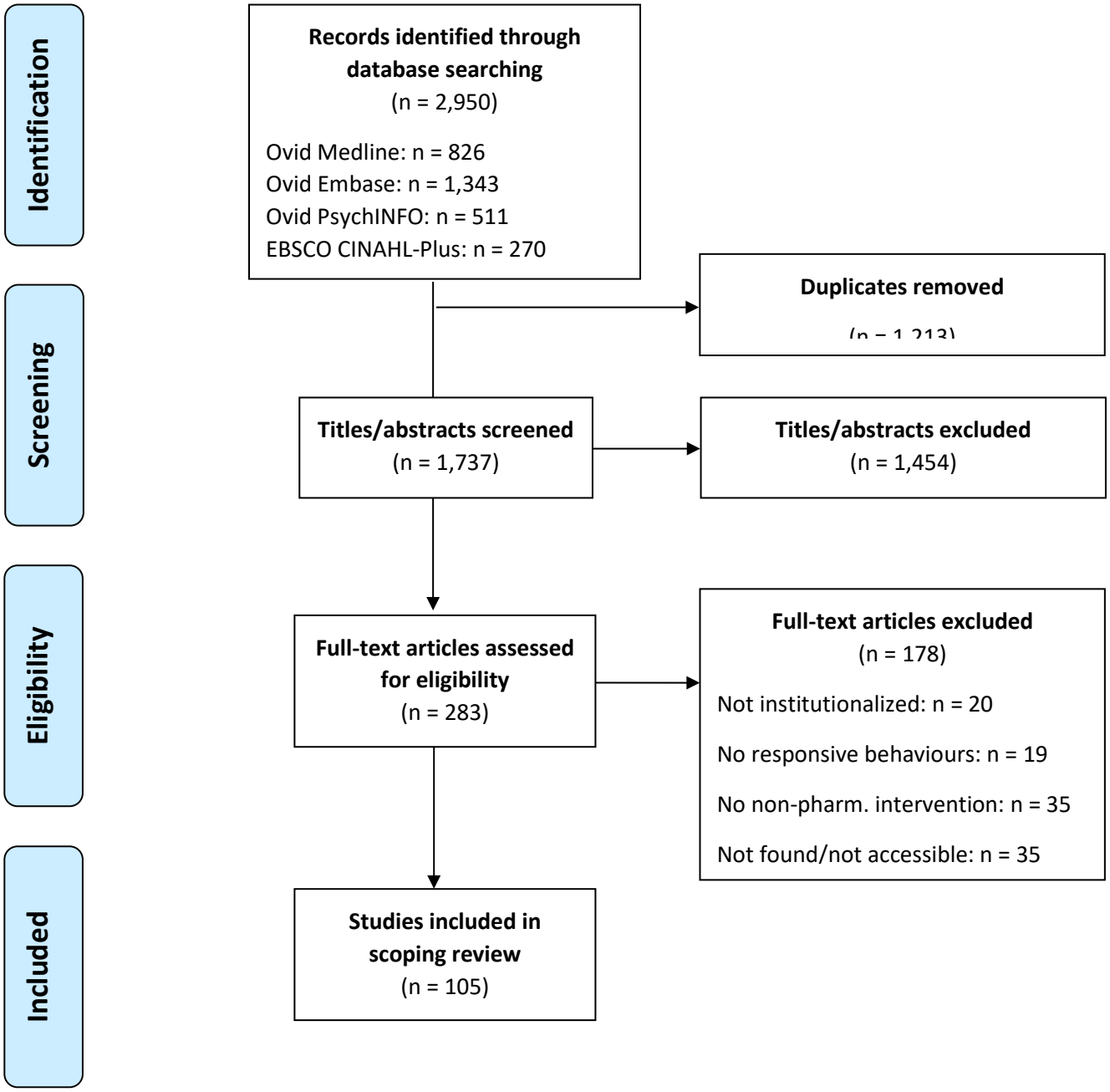
Appendix A: Search Strategy

Electronic database search strategy (July 6, 2019)

Database	Syntax	Results
Ovid MEDLINE (n = 826)	1. exp Dementia/	155,250
	2. exp Cognitive Dysfunction/	12,381
	3. (dement* or ((cognitiv* or neurocognitiv* or neuro-cognitiv*) adj2 (impair* or declin* or dysfunction* or deterior* or disord* or degenerat*))).tw,kf.	180,125
	4. ((challenging or inappropriate or responsive or combative) adj2 behavio?r).tw,kf.	2,663
	5. (agitat* or depress* or aggress* or abus* or assault* or wander* or yell* or scream* or restless* or hit* or grab* or ((behavio?r* or psychol*) adj2 symptom*)).tw,kf.	915,839
	6. exp Respite Care/	1,000
	7. ((nursing or 'long-term' or 'long term' or 'longterm' or institution* or assist* or resident* or respite or 'old age' or aged or elder* or geriatr* or convalescen* or intermediate) adj2 (care or home* or hous* or setting or living or facilit*)).tw,kf.	127,393
	8. exp Homes for the Aged/	13,322
	9. 1 or 2 or 3	261,685
	10. 4 or 5	917,971
	11. 6 or 7 or 8	130,259
	12. 9 and 10 and 11	3,491
	13. limit 12 to (English language and humans and yr="2013 -Current" and ("all aged (65 and over)" or "aged (80 and over)"))	826
Ovid EMBASE (n = 1,343)	1. exp cognitive defect/	462,922
	2. (dement* or ((cognitiv* or neurocognitiv* or neuro-cognitiv*) adj2 (impair* or declin* or dysfunction* or deterior* or disord* or degenerat*))).tw,kw.	273,328
	3. ((challenging or inappropriate or responsive or combative) adj2 behavio?r).tw,kw.	3,592
	4. (agitat* or depress* or aggress* or abus* or assault* or wander* or yell* or scream* or restless* or hit* or grab* or ((behavio?r* or psychol*) adj2 symptom*)).tw,kw.	1,293,246
	5. exp respite care/	1,088
	6. exp institutional care/	30,090
	7. ((nursing or 'long-term' or 'long term' or 'longterm' or institution* or assist* or resident* or respite or 'old age' or aged or elder* or geriatr* or convalescen* or intermediate) adj2 (care or home* or hous* or setting or living or facilit*)).tw,kw.	164,917
	8. 1 or 2	515,764
	9. 3 or 4	1,295,984
	10. 5 or 6 or 7	185,948
	11. 8 or 9 or 10	5,591
	12. limit 11 to (human and English language and yr="2013 -Current" and aged <65+ years>)	1,343
Ovid PsychINFO (n = 511)	1. exp Neurocognitive Disorders/	85,704
	2. exp Cognitive Impairment/	34,271
	3. (dement* or ((cognitiv* or neurocognitiv* or neuro-cognitiv*) adj2 (impair* or declin* or dysfunction* or deterior* or disord* or degenerat*))).ti,ab,tw.	107,728
	4. ((challenging or inappropriate or responsive or combative) adj2 behavio?r).ti,ab,tw.	4,063
	5. (agitat* or depress* or aggress* or abus* or assault* or wander* or yell* or scream* or restless* or hit* or grab* or ((behavio?r* or psychol*) adj2 symptom*)).ti,ab,tw.	526,868
	6. exp Respite Care/	431
	7. exp Residential Care Institutions/ or exp Treatment Facilities/	604,403
	8. exp Long Term Care/	4,822
	9. ((nursing or 'long-term' or 'long term' or 'longterm' or institution* or assist* or resident* or respite or 'old age' or aged or elder* or geriatr* or convalescen* or intermediate) adj2 (care or home* or hous* or setting or living or facilit*)).ti,ab,tw.	49,559
	10. 1 or 2 or 3	146,770

	11. 4 or 5 12. 6 or 7 or 8 or 9 13. 10 and 11 and 12 14. limit 13 to (human and English language and ("380 aged <age 65 yrs and older>" or "390 very old <age 85 yrs and older>") and yr="2013 -Current")	530,036 95,767 3,098 511
EBSCO CINAHL-Plus (n = 270)	S1. (MH "Delirium, Dementia, Amnestic, Cognitive Disorders+") S2. TI (dement* or ((cognitiv* or neurocognitiv* or neuro-cognitiv*) N2 (impair* or declin* or dysfunction* or deterior* or disord* or degenerat*))) or AB (dement* or ((cognitiv* or neurocognitiv* or neuro-cognitiv*) N2 (impair* or declin* or dysfunction* or deterior* or disord* or degenerat*))) S3. TI ((challenging or inappropriate or responsive or combative) N2 behavio#r) or AB ((challenging or inappropriate or responsive or combative) N2 behavio#r) S4. TI (agitat* or depress* or aggress* or abus* or assault* or wander* or yell* or scream* or restless* or hit* or grab* or ((behavio#r* or psychol*) N2 symptom*)) or AB (agitat* or depress* or aggress* or abus* or assault* or wander* or yell* or scream* or restless* or hit* or grab* or ((behavio#r* or psychol*) N2 symptom*)) S5. (MH "Residential Care+") S6. (MH "Residential Facilities+") S7. (MH "Nursing Home Patients") S8. (MH "Long Term Care") S9. TI ((nursing or 'long-term' or 'long term' or 'longterm' or institution* or assist* or resident* or respite or 'old age' or aged or elder* or geriatr* or convalescen* or intermediate) N2 (care or home* or hous* or setting or living or facilit*)) or AB ((nursing or 'long-term' or 'long term' or 'longterm' or institution* or assist* or resident* or respite or 'old age' or aged or elder* or geriatr* or convalescen* or intermediate) N2 (care or home* or hous* or setting or living or facilit*)) S10. S1 OR S2 S11. S3 OR S4 S12. S5 OR S6 OR S7 OR S8 OR S9 S13. S10 AND S11 AND S12 S14. Limiters - Published Date: 20130101-20190731; English Language; Exclude MEDLINE records; Human; Age Groups: Aged: 65+ years, Aged, 80 and over	89,269 68,548 1,709 234,114 6,899 29,213 12,323 24,165 105,477 113,106 235,474 133,406 2,811 270

Appendix B: PRISMA



Adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097

Appendix C: Summary of the Review Literature

Table C1. Sensory interventions

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Key Findings	Contextual factors
Bauer et al., 2015	Compare Snoezelen to common best practice for allying wandering and restlessness	Methods: Descriptive/ Observational Outcomes/Measures: Wandering Behavioural disturbances; QEBAGS	Snoezelen: use of multi-sensory rich environments to stimulate the primary senses of sight, smell, hearing, taste and touch.	16	Significant reduction in reported behavioural symptoms between pre-intervention and immediately post-intervention for both groups.	Sessions were implemented based on diversion therapist's knowledge of the resident and prior experience. Multi-sensory interventions in many NHs may be more of a recreational activity, rather than a targeted intervention for BPSD.
Berkheimer et al., 2017	Compare the effects of a Snoezelen program to an exercise program on agitation	Methods: Pilot Study, prospective cross-over, Observational Outcomes/Measures: Agitation; CMAI	6-week intervention (3 weeks of Snoezelen and 3 weeks of exercise), three 30-minute sessions a week.	13	After 3 weeks Exercise: 6.5-point average decrease in the CMAI compared with baseline. After 3 weeks Snoezelen: 6.0-point average decrease in the CMAI compared with baseline.	n/a
Blackburn & Bradshaw, 2014	Explain how music therapy might work theoretically, and update evidence base for its effectiveness	Methods: Literature review Outcomes/Measures: Depression Anxiety/ agitation Cognitive functioning	Music therapy: active and passive types.	6 Studies (n=28-111)	Small positive effects of music therapy on anxiety, agitation, depression, cognitive functioning and QOL. Even when beneficial effects of music therapy are shown, they may dissipate soon after the intervention.	Unclear how much exposure to music therapy participants need within time period, whether group/ individual delivery is more effective, and who is the best person to deliver it and how much training they need.
Chung et al., 2016	Explore the experience of media presentations of natural scenes in PWD's everyday lives	Methods: Qualitative; interviews Outcomes/Measures: Experience, Agitation	Exposure to fascinating natural scenes in a recreation room 7-10 min once a day, 3 days a week, for 4 weeks.	23	Positive feelings, enthusiasm for or fascination, which could have positive emotional/physical consequences. Felt presentation was interesting and engaging. Relaxation effect, a reminding effect, and reflection as the highest cognitive benefit of the media presentation.	Explained by some as a feeling of disconnection from their real lives. This may be due to the lack of direct interactive activity between the participants and natural elements. Some expressed their desire to view particular types of images. Personalizing media presentations would improve health outcomes of patients viewing the natural scenes.

					No significant change in quantitative measures.	
Cox et al., 2014	Examine the positive effect of live music on affective, functional, and leisure behaviours of people with AD	Methods: Quasi-experimental, observational Outcomes/Measures: Affective behaviour Functional behaviour Participatory behaviour; frequency on a 10-point scale	Live violin recital (duration 18 minutes) individually for each participant. Short song melodies familiar to this age group were played, with each excerpt played twice.	7	Positive behaviours were consistently displayed during and/or after the intervention by all participants, 9/16 behaviours assessed were significant changes. Six PWD made personal/contextual suggesting insight into the content of the song, such as the theme (for instance, love), the lyrics, or its personal significance to them.	Presence of the violinist in a familiar environment may itself provide therapeutic value, as the individualized, non- demanding contact enabled experiences of meaningful, appropriate social connection and interaction; which may have reduced distressing emotions, such as isolation and loneliness, which can lead to the development of agitated behaviour.
Davison et al., 2015	Test the Memory Box system to reduce agitation and improve symptoms of depression and anxiety among residents with dementia	Methods: RCT, cross-over trial; Questionnaire and interviews Outcomes/Measures: Agitated behaviour, Depression, Anxiety; CMAI, CSDD, RAID	"Memory Box" each participant received a total of four training sessions, with a total training time of 2 h. Training sessions focused on teaching participants how to select from four media types, to reflect PWD's backgrounds and preferences.	n=73 residents n=99 staff	During the Memory Box condition, CSDD scores fell significantly from a mean 5.7 to 3.5. There were no significant changes in the control condition. Anxiety in Dementia scale fell significantly from a mean of 6.6 to 3.2 Reports were overwhelmingly positive; majority would recommend for other residents with dementia. Simplified interface and choice of material were all praised.	More severely impaired residents needed help to use the device, despite efforts to make it as simple as possible. Making video messages proved a challenge for relatives with limited technical skills and only a couple had access to family movies. Personalized digital material, family photographs in particular, fostered enjoyable discussions with family visitors and with staff members highlighting potential for facilitating social engagement.
Ikemata & Momose, 2017	Evaluate the effects of progressive muscle relaxation on BPSD, ALDs, and immune function of dementia residents in group homes	Methods: Double blind-Observational study; Interviews Outcomes/Measures: BPSD; Neuropsychiatric Inventory scores, ADL and immune function	Progressive muscle relaxation (breathing) for 15 min each day for 90 days in a group environment.	37	Neuropsychiatric Inventory scores were significantly better in the intervention group, specifically in agitation and anxiety, significantly improved lower apathy and irritability scores. Significant improvement in the Interest, Volition, and Social relationships scores on the Mental State Scale. Improvements in total daily living. No effect on immune function.	Scores in Interest, Volition, and Social relationships may have improved because of group setting. Significant improvement in the N-ADL scores 30-90 days after initial intervention may be attributed to a decreased stress response from adding progressive muscle relaxation to daily life; improved mental health, relaxed body and decreased muscle tension, and helped maintain and improve ADLs.
Keshavarz et al., 2018	Determine the effects of head& face massage on agitation in elderly Alzheimer's patients	Methods: RCT Outcomes/Measures: Agitation; CMAI	Massage therapy using the effleurage and compression techniques, usual way	70	Mean scores decreased from 77.2±14.4 (IG) and 82.1±17.3 (CG) 49.7±6.0 (IG) and 80.8±18.3 (CG).	No key components to success discussed.

	living in nursing homes in Yazd, Iran		to control the symptoms of agitation was physical restraint.		Change in sub-category (IG); • Hiding/hoarding before/ after intervention 4.1±2. and 3.4±1.3. • Physically non-aggressive behaviors 20.0±4.9 before and 14.6±2.6 after. • Aggressive behaviors; 37.7±9.8 before and 23.0±4.4 after. • Verbally aggressive; 15.2±2.6 before and 8.5±1.6 after.	
Kwan et al., 2016	Identify the acupressure effect over time, compare dosage efficacy, and identify feasibility issues with intervention	Methods: Time series design Outcomes/Measures: Agitation; CMAI, Stress; Salivary cortisol (SC)	9-minute acupressure sessions on five acupoints - two frequencies and four durations (8 dosage combinations).	24	Acupressure decreased agitation immediately at week 1, effect diminished in week 2 and 3, and resurged at week 4, 5 and 6, diminished gradually after this, fell off at week 8. SC slightly reduced at beginning (week 1), progressively reduced weeks 2-3, bottomed out at week 4, and resurged at weeks 5-7, sharp decrease week 8.	Acupressure showed largest effect when it was performed twice a day for 2 weeks (more significant than once a day). Ensuring that study participants are well hydrated may play an important role in successful saliva collection.
Kwan et al., 2017	Examine the effect of acupressure on agitation (CMAI), and on salivary control	Methods: RCT Outcomes/Measures: Agitation; CMAI, Stress; SC	9-minute acupressure sessions on five accupoints.	119	Acupressure reduced agitation over time, with largest effect in the 5th week. Downward trend over time in agitation in the acupressure group, almost significant. Post-hoc pairwise tests showed acupressure significantly reduced agitation at T2 compared to baseline. Significant interaction effects between groups and time points were observed on the level of salivary cortisol. No significant differences found between treatment and control groups.	Acupoint activation is not significantly effective component for reducing agitation. Acupressure triggers a significantly large neuro-hormonal response of cortisol through acupoint stimulation, but it is a short-lasting effect. Acupressure is safe (no adverse effects), feasible (can be correctly implemented by trained nonprofessionals), and well accepted by PWD (compliance 91.9%). Saliva samples were collected at the basal level in the morning.
Long, 2016	Explore the effect of a personalized music playlist on a patient with dementia with significant evening agitation	Methods: Case report Outcomes/Measures: Reduced agitation at night, social communication with student, use of anti-psychotics	Individual personalized iPod music playlist, weekly for 10 weeks.	1	(7th week) After listening, patient began talking in complete sentences, providing details of earlier life, spoke for 2 hours. In subsequent visits, patient continued to speak about things from her past such as details about her house and her street name, she remembered details about her family, her job waitressing. Found if the patient was allowed to clean a table each evening, her agitation	Personalized music can evoke memories from the past and increase communication which may help to explain current behaviors. Personalized playlists can be a cost-effective intervention to reduce agitation in patients with cognitive issues. Without consultants, student relied on visual and verbal cues to choose appropriate music. The patient did not begin significant communication until the

					greatly decreased. No antipsychotic medication in the last 9 months.	student was able to locate music that had meaning for the patient.
Maseda et al., 2014	Evaluate the long-term effectiveness of the MSSE; behaviour, mood, and cognitive and functional impairment in basic ADLs	Methods: Controlled longitudinal study Outcomes/Measures: Behavior, mood, cognitive, and functional impairment in basic activities of daily living. CMAI and NPI-NH	MSSE and activity groups participated in two 30-minute weekly individualized intervention sessions over 16 weeks.	30	Physically nonaggressive behavior improved in MSSE group more than activity group. CMAI significant time effects in both. No sig. diff between the groups on CMAI behaviour factor. Mood (CSDD scores) improved in both MSSE & activity group during intervention, but both group scores worsened in follow-up period. Cognitive level: Significant time effect, decrease in both MSSE and activity groups. Functional Status in ADL: Improved in MSSE group not in activity or control group.	Positive effect on the patients' mood may determine by the one-to-one attention rather than intervention. One- to-one therapy, either MSSE or activity sessions, could prevent the worsening of depressive symptomatology in people with dementia. Can be attributed to the higher time/ effort being spent with the PWD, the perceived qualitative shift in the relationship between the patient and the staff and as a result improved care. Behaviour got worse at follow-up period.
Moyle et al., 2014	Compare the effect of foot massage and quiet presence on agitation and mood in PWD	Methods: RCT using a within-subjects, crossover design Outcomes/Measures: Agitation, CMAI, OERS	10-min foot massage (intervention) or quiet presence (control), every weekday for 3 weeks.	53	Agitation increased in both groups, greater in quiet presence than foot massage. Positive change in alertness for participants in the foot massage group, negative change for quiet presence group.	The change away from a calming woman, used to working in this environment to an unfamiliar assistant seemed to distress participants in both groups, but findings suggest that the use of foot massage may have tempered this effect.
Nishiura et al., 2018	Investigate the effects on BPSD of a new tech intervention; a parametric speaker, creating a narrow personal acoustic environment	Methods: Preliminary study: Two cases Outcomes/Measures: Instances of behaviours like wandering and agitation, GDS, MMSE, NPI	A parametric speaker was placed on the ceiling of a large day room, and personally selected pieces of music were provided in a narrow space just under the speaker during the intervention.	2	Found significant decrease in mean number of BPSDs that necessitated care (lower in LS than NLS session). MSSE; Case 1 increased from 13 to 17, but no change in Case 2. NPI improved in both cases. Case 1: After intervention period, agitation and depression reduced. Case 2: frequency of hallucination/ disinhibition diminished post intervention, but not agitation and depression. Reduced caregiver burden. No long-term effects on BPSD.	Each participant's favourite pieces of music was selected according to advice from their families. Advantages: (1) provided a personal acoustic environment in a common room, (2) the sound did not disturb other residents and caregivers in the room, (3) the residents did not need to wear a device (e.g. headphones or earphones), and (4) caregivers could observe residents as usual.
Onega et al., 2016	Evaluate the effectiveness of bright light exposure, on depression and agitation	Methods: RCT; 2x2 mixed model Outcomes/Measures: 3 measures of depression (DSAOA, DMAS-17, CSDD) and 4 measures	30 minutes of light exposure twice a day 5 days a week for 8 weeks.	60 (4 facilities with dementia specific care)	Interaction between time and bright light was identified on all measures of depression. Significant improvement on all three depression measures in Bright Light Group, Same pattern of results was observed for all four measures of agitation. Bright Light Group displayed lower mean depression scores	Participants in the Bright Light Group had more room for improvement over the course of the intervention than did participants in the Placebo. For participants in the control condition there was no significant improvement in the three measures of depression or four measures of agitation.

		of agitation (CMAI-F, CMAI-D, PAS, BARS)			post-intervention, significantly lower scores in agitation.	They did not start out similar; significantly higher levels of both in treatment group.
Ray & Mittelman, 2015	Investigate if participation in a small group music therapy reduces and sustains level of depressive symptom-atology, agitation, and wandering behaviours	Methods: Exploratory Study Outcomes/Measures: Changes in symptoms of depression, agitation and wandering	Small group (4-6 participants) music therapy lasting from 15min-1hr. Therapeutic program utilizing preferred music therapy. Sessions held 3 times a week for two weeks (total of 6 sessions).	132	Two weeks of music therapy significantly reduced symptoms of depression and maintained these changes for at least two weeks post treatment. Agitation was reduced significantly immediately following music therapy and the intervention had lingering effects on agitation. Music therapy intervention was not effective in lessening symptoms of wandering. Number of times music therapy was provided significantly influenced depressive symptoms.	The music therapy interventions were constructed by the research music therapists to be sensory stimulating. Music therapy intervention was designed around the participant's musical preferences. When compared to usual care, music therapy intervention reduced symptoms of depression and agitation but not wandering behaviours.
Reynolds et al., 2018	Test if a virtual nature experience, within a memory care unit, can reduce stressful emotions of agitation, and anxiety among PWD	Methods: Crossover design Outcomes/Measures: Heart rate, agitation, anxiety, sadness, pleasure, alertness	Nature video played in residents living room including nature sounds 1-hour fixed angle unedited nature video.	14	Heart rate significantly decreased in treatment group, agitation and anger significantly declined in both interventions. Virtual nature experiences significantly reduced heart rate and while not statistically increasing pleasure and decreasing anxiety within only 10 minutes of exposure. Pleasure increased more in the treatment intervention, and while not significant, this is consistent with participants comments of pleasure.	Virtual nature experience, as an adjunctive care management strategy, can reduce stress and negative emotions and increase pleasure with very little staff involvement. The significant decrease in agitation and anger in both interventions may have been due to the pleasant theme of the generational movie, with a familiar action from the participants past. Virtual nature space can serve as a cost-effective adjunct to the outdoors.
Sarkamo et al., 2016	Determine how clinical, demographic, and musical background factors effect cognitive and emotional efficacy of caregiver-implemented musical activities	Methods: RCT; Neuro-psychological testing Outcomes/Measures: General cognition, orientation, working memory, executive functions, remote episodic memory, QOL depression, caregiver burden	10-week group-based music coaching program; either singing sessions or music listening, Held weekly (1.5hrs/session) 10 participants.	89 dyads; patients and their caregivers	Music listening had larger short-term and long-term benefits on general cognition in PWDs with moderate dementia than with mild dementia. Greater decline of executive function in younger than older PWDs, singing intervention had larger long-term benefits on executive function and orientation in younger than older PWDs. Singing greater short-term Effect PWDs with mild dementia. Music listening intervention had larger long-term benefits on QOL, in PWDs who had non-AD dementia living in nursing home.	Dementia etiology and severity, age, and care situation all mediate the cognitive and emotional efficacy of regular singing and/or music listening in PWDs to some extent, whereas the musical history or the previous musical activity of the PWD does not play a role. Music is one of few activities that visually impaired individuals can take part in.

Shibazaki & Marshall, 2017	Determine the ways live music concerts influence PWD, their caregivers and their family members	Methods: Observational interviews Outcomes/Measures: Client preferences & behaviours, Music and disability, evidence of cognitive activity, staff perspectives, visitors and families	Concerts performed by professional musicians. Concerts lasted one hour, took place in afternoon. Audience ranged in size from 30 to 47 clients.	53	Residents in both countries were able to remember music content and the words of songs chosen from a range of styles and decades Almost all staff, nurses and volunteers reported that clients were generally calmer and more responsive following the visit by the musicians According to families, music stimulated new memories, extended conversations and created increased quality visitor experiences.	Evidence to suggest that live music concerts provide numerous benefits to all those involved with PWD care Musical events in a variety of guises still appears to produce similar impacts on those involved.
Shiltz et al., 2018	Investigate if expected positive changes from listening to music would result corresponding decrease pharmaco-logical interventions	Methods: Prospective Outcomes/Measures: BPSD, behaviour, cognition; CMAI, MMSE	Personalized music delivered with headphones via an iPod shuffle (3x week, 30 min a session. Both scheduled and non-scheduled sessions (when residents agitation levels increased).	92	No significant effect on depression, POMS anxiety. Group with non-medicated music listener's depression improved and medicated music listener group's depression worsened. CMAI scores decreased significantly across the course of the study for all participants, time effect. Four-way interaction between group, antipsychotics, dementia severity and time.	Findings suggest that adding patient-preferred, personalized music listening to the ADRD medication regimen of PWD may reduce their agitation to levels similar unmediated. Music faculty educators met with participants/ families pick music genres and specific popular songs from their late teens to early twenties Changes in BPSD depend on if the resident had a prescription for antipsychotic medication at outset.
Thomas et al., 2017	Compare resident outcomes before/after an individualized music program	Methods: Aggressive behaviour scale, Questionnaire Outcomes/Measures: Discontinuation of anxiolytic and anti-psychotic medications, BPSD	Music and Memory program that provides residents with music specific to their personal histories and preferences.	12,905 facilities and 12,811 comparison LTCs	Difference in the rates of discontinued antipsychotic and anxiolytic medication use and reduced behavioral problems was greater in M&M facilities compared with pair-matched comparison facilities.	Music and memory program may be associated with reductions in antipsychotic and anxiolytic medication use as well as improvement in BPSD among nursing home residents with ADRD.
Tsoi et al., 2018	Evaluate effects on cognitive functions and behavioural symptoms between interactive and receptive music therapies for PWD	Methods: Systematic review and meta-analysis Outcomes/Measures: Cognitive function, behavioural & neuropsycho-logical symptoms (apathy, anxiety, depression,	Interactive music therapy; techniques that involve active participation of the PWD such as singing, playing musical instrument, movement or talking with others), Receptive music therapy (listened	38 trials (1418 particip-ants)	Participants with moderate-to-severe dementia receiving receptive music therapy showed significant decrease in anxiety symptoms than usual care group but no significant difference in cognitive function, agitation, and behavioral problems. The participants with receptive music therapy had a statistically significant decrease in scores of anxiety symptoms, agitation, and behavioral problems than the ones with usual care.	Neither interactive nor receptive music therapy is able to enhance cognitive function in older PWD. Suggest that understanding the music preferences of older adults is the key for successful implementation of receptive music therapy, should be integrated into their daily routine, such as in a quiet room during mealtime or before bedtime.

		agitation, and behavioural problems)	either to favourite music or classical music).			
Van der Steen et al., 2015	Assess the effects of music-based therapeutic interventions on emotional well-being	Methods: Systematic Review Outcomes/Measures: Emotional well-being, mood disturbance, Behavioural problems	Music-based interventions min. of 5 sessions Therapy provided by qualified music therapist or interventions based on therapeutic relationship.	17	Music based therapeutic interventions reduced depressive symptoms at the end of treatment. No evidence of a reduction in the longer term, with a smaller estimate and a confidence interval including no effect. No evidence of an effect of agitation or aggression at the end of treatment nor in the long term.	Moderate quality evidence that at the end of treatment music-based interventions improved depressive symptoms and did not improve agitation or aggression and low-quality evidence that is had no effect of emotional well-being.
Wang et al., 2017	Examine the effectiveness of music care on cognitive function, depression, and behavioral problems among elderly PWD in LTC facilities in Taiwan	Methods: Quasi-experimental, longitudinal study Outcomes/Measures: Cognitive status, behavioural problems, depression, mood status; MMSE, CAPE-BRS	Kagayashiki music care (KMC) 2 times per week for 24 weeks activities lasted 30 mins, 13 to 20 participants per session.	149	A significant negative correlation between the MMSE and CAPE-BRS, a positive correlation between salivary cortisol level and the CSDD, and a positive correlation between the CSDD and CAPE-BRS. No statistically significant correlations between MMSE and salivary cortisol level, MMSE and CSDD or CAPE-BRS and salivary cortisol level. No statistically significant changes at the four measurement times in the MMSE, CSDD, CAPE-BRS, or salivary cortisol level.	Music care added to standard care helps elderly people to maintain cognitive function as well as levels of depression, health problems, and anxiety. To prevent cognitive decline, staff caregivers in long-term care facilities could use KMC as part of the daily activity KMC could be introduced and applied in long-term care facilities for elderly people with dementia to prevent cognitive decline, depression, anxiety, and the development of behavioral problems.
Watson et al., 2019	Evaluate and compare effectiveness of Lavender/Lemon Balm essential oils on the agitated behaviour of older people living in residential aged care facilities	Methods: Observational study Outcomes/Measures: NPI, CMAI	Participants were randomly assigned a treatment sequence of Lavender, Lemon Balm and placebo for the study duration with each older person trailing both treatments and placebo 14-day consecutive intervention treatment followed by 14-day washout period before next treatment.	2 residential care facilities	NPI total score was reduced in residents without dementia with Lemon Balm treatment -8.9 relative to the dementia group -2.03, whereas Lavender decreased NPI total score in residents with dementia -5.33 relative to those without dementia. Lavender and Lemon balm did not reduce the frequency of behaviour independent of cognitive status when compared to placebo in planned analysis.	Lemon balm reduced behaviour in residents without dementia compared to lavender, lavender reduced behaviours in residents with dementia compared to Lemon Balm. Differences in essential oil effect between cognitive groups may be attributed to impaired brain function in dementia. Hypersensitivity may be the reason why Lemon Balm was not tolerated as well in residents with dementia. Lavender scent may have evoked memories for older people, comforting them with recognized scent.
Whear et al., 2014	Examine the effectiveness of mealtime interventions aimed at improving	Methods: Systematic review	Meal-time interventions that were aimed to improve mealtime routine, experience or	11 Studies	All of the music intervention studies reported positive effects from mealtime music on behavioural symptoms, including physical aggressive and non-aggressive behaviours,	Music interventions demonstrated consistently positive effects of the intervention on physically aggressive behaviours, verbally aggressive behaviors,

	behavioral symptoms in elderly PWD in residential care	Outcomes/Measures: BPSD	environment 4 interventions: music, changes to food service, dining environment alteration, group conversation.		verbal agitated behaviours, hiding behaviours and total CMAI scores. Two studies which looked at improvements to dining room environment found positive effects of the intervention on mealtime independence, conversation, cognition, and interaction.	verbally agitated behaviors, and total CMAI score, as well as confusion, irritability, anxiety, fear/ panic, depressed mood, and restlessness. Simple and inexpensive interventions can help to alleviate agitated behavior.
Wu et al., 2017	Systematically evaluate the effective-ness of massage and touch on the behavioural and psychological symptoms of older PWD	Methods: Quantitative systematic review and meta-analysis Outcomes/Measures: BPSD, verbal, physical aggressive and non-aggressive behaviour, depression, anxiety, anger, sadness	Massage or touch therapy.	526	The effect of massage and touch on the management of BPSD was statistically significant Statistically significant effect in favour of massage and touch on the management of physical aggressive behaviour, physical non-aggressive behaviour, verbal aggressive behaviour and verbal non- aggressive behavior.	Results of meta-analysis indicate that massage and touch interventions have a statistically significant effect on the total score BPSD, subgroup scores of physical aggressive behaviour, physical non-aggressive behaviour, verbal aggressive behaviour and verbal non-aggressive behaviour. Massage and touch can provide sense of meaningful communication.

Table C2. Combination therapies

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Key Findings	Contextual factors
Adam et al., 2016	Determine effectiveness of combined dance & relaxation intervention in reducing anxiety/ depression and improving QOL, cognition among elderly people with cognitive impairment in publicly funded institutions	Methods: Quasi-experimental-Questionnaires Outcomes/Measures: Anxiety, QOL Depression; Hospital Anxiety and Depression Scale Quality of Life in Alzheimer's Disease questionnaire	Intervention group did a combination of poco-poco dance and relaxation exercises whilst the control group participated only in the relaxation exercises. Both groups had sessions twice per week for six weeks resulting in a total of 12 sessions.	84	Participants in intervention group showed improved cognitive impairment, reduced anxiety and depression levels and improved QOL. Relaxation therapy alone without the physical movements encouraged by the dance intervention was not as effective in decreasing anxiety or depression among studied participants with a low QOL.	Gradually increasing the intensity and biomechanical movements within dance sessions may further improve aspects of cognitive function, balance and QOL. Relaxation therapy alone may more effectively reduce anxiety and depression symptoms if sessions are conducted more frequently (i.e., at least 50 sessions).
Ballard et al., 2016	Implement intervention best practice guidelines for prescribing and review of antipsychotics in PWD living in NHs alongside non-pharmacological approaches	Methods: Cluster RCT at the NH level; Questionnaires Outcomes/Measures: Depression Agitation, NPS, Mortality Dementia severity; CSDD, CMAI, NPI-NH, CDR, FASI	All 16 homes received an intervention to implement PCC. 8 randomly assigned to antipsychotic review. 8 to an intervention to increase social interaction, and 8 to an exercise intervention.	277	There was a significant reduction in antipsychotic use in the review group (50%) compared with the non-review group. Exercise significantly improved NPS but not depression levels, social interaction did not improve either agitation or total NPS. The antipsychotic review group in combination with social interaction had a significant reduction in mortality.	Although NH staff were able to gather life story information, found it difficult to develop/ maintain tailored plans or PCC interventions from this. Antipsychotic review group experienced a significantly worse outcome on overall NPS, this impact was mitigated by the concurrent delivery of social interaction, significantly reduced antipsychotic use and mortality without worsening of NPS, and exercise improved neuropsychiatric symptoms.
Bautrant et al., 2019	Evaluate the prevalence of agitation/physical aggression, wandering and screaming over 24 hours and during the late hours (6-12 PM) before and after environmental rearrangements	Methods: Prospective 6-month study/two-phase study (baseline and intervention); Questionnaires Outcomes/Measures: Agitation/ physical aggression Wandering Screaming; CSDD	Skyline ceiling tiles in part of the shared premises, progressive decrease of the illuminance at night (6-8pm) together with soothing streaming music, reinforcement of the illuminance during the day, walls painted in light beige, oversized clocks in corridors, and night team clothes color (dark blue) different from that of the day team (sky blue).	19	Significantly lower number of patients showing wandering during phase 2. Number of BPSD/patient over 24 hours or during late hours was not statistically different between phase I and 2 although there was a trend to shift toward lower values during phase 2. Agitation/aggression /screaming episodes were observed mainly outside late hours opposed to warning episodes. Number of agitation/physical aggression and screaming and both the number and mean duration of wandering episodes were significantly decreased over 24 hours following environmental rearrangements.	The nonpharm intervention did not directly involve the resident, their family, or the medical or caregiver staff, thus allowing it to overcome the barriers found with other nonpharm interventions. The environmental rearrangements are simple, relatively costless, easy to implement, and not dangerous for the resident.

Chen & Lin, 2016	Examine effects of individualized learning therapy on cognition and neuropsychiatric symptoms among elderly PWD	Methods: Quasi-experimental Outcomes/Measures: NPS Cognitive Function Physical function; Barthel Index, MMSE, Neuro-psychiatric Inventory	Individualized learning therapy, PCC reading books and arithmetic exercises 30 minutes per session, twice a week for 3 months.	44	NPS of the participants in the EG improved compared to CG. EG group showed statistically significant improvements in hallucinations, depression, apathetic expression, irritation, bizarre behavior, and sleep disorder. MMSE scores increased significantly in the EG. Participants who were usually withdrawn became more active and more willing to sit in the living room and interact with others, they smiled more frequently	Appreciation of positive and enriching interpersonal relationships may prevent the disabling effects of dementia. Residents were encouraged, and their achievements were affirmed. 7 weeks may be a critical time; at week 7, significant improvements in emotional and behavioral expressions. Material designed based on personal backgrounds of participants, content was selected from the things/stories that were familiar and might make them happy
Cheung et al., 2018	Examine the effects of the 6-week music-with-movement (MM), compared with music listening (ML) and social activity (SA), on the cognitive function of people with moderate dementia	Methods: RCT Outcomes/Measures: Anxiety, Cognition, Depression, Short-term memory, MMSE. Verbal fluency; GDS, RAID, Fuld's Object Memory Evaluation, Modified Fuld Verbal Fluency Test.	The participants in the MM group (4-6 participants in a closed group) listened to their preferred music and moved their limbs and trunk, twice a week for six weeks.	165	Difference in outcomes between groups did not attain the level of statistical significance. Only the MM group, and not the ML group, showed a significant reduction in depressive symptoms. MM may be useful for improving memory storage and delayed memory, and that it lasted for at least six weeks, which was not the case with the SA group. The ML group also demonstrated a significant improvement in delayed memory from baseline to T1.	It is a rather promising indication that by listening to their preferred music, PWD may also experience a reduction in their symptoms of anxiety and depression.
Cohen-Mansfield et al., 2014	Study influence of personal characteristics (demographic, medical, and functional variables) and possible barriers on the efficacy of nonpharmacological interventions in reducing agitation	Methods: RCT, Observations Outcomes/Measures: Observed agitation, ABMI	Individualized algorithm (TREA-Treatment Routes for Exploring Agitation), identifies unmet needs &matches interventions to needs and to PWD's sensory, cognitive, & functional abilities, as well as to self-identity and preferences. 4 hours every 10 days.	89	Measures of higher functioning, quantified as higher cognitive status, greater communication ability, and higher responsiveness, are related to greater and more effective impact of individualized nonpharmacological interventions for persons with advanced dementia.	The only medically variable found to significantly impact the efficacy of the intervention was pain. Caretakers need to be aware of the importance of talking with a resident and encouraging him/her to talk by using strategies appropriate to individual's remaining capabilities. Making caregivers aware of their own use of techniques and the resident can help prolong the period of effective communication, and hence produce more effective interventions.
Cohen-Mansfield et al., 2015	Compare non-pharmacological interventions for persons with BPSD on	Methods: RCT; Questionnaires	24 interventions divided into 9 categories: Care, theme, manipulative, sensory stimulation,	231	The most highly rated interventions impacting BPSD were: care, ball toss, food or drink, going outside, coloring or painting, walking, folding towels, sewing, and family video.	The most highly utilized interventions were; one-on-one interaction, real looking doll, magazine, respite video, and music. The

	frequency of use and perceived efficacy in terms of change in behavior and interest	Outcomes/Measures: Behavioral symptoms Interest change; CAR	movement activities, work-like activities, simulated social, and social category. Trial phase and treatment phase.		Relatively high rating on BPSD impact were sorting, flower arranging, hand massage, real looking doll, one-on-one interaction, group activity, and book. Ratings were lowest for fabric book and robotic animal interventions.	least often used were: sewing, book, fabric book, flower arranging, and going outside. Interventions will have low utilization if they require abilities not present for most participants, if they are not efficacious, or if they are not available for other reasons, such as resource allocation.
Eritz et al., 2016	Test that life histories would elicit increased empathy ratings, higher rating for personhood, QOL, fewer PRN & antipsychotic medication and significantly fewer acts of aggressive behaviour	Methods: RCT/mixed methods; Questionnaires/ Family Interviews Outcomes/Measures: Personhood Aggression/ agitated behaviour, QOL, Empathy, Cognition; PDQ, ABS, CMAI, ADRQL, JSE-HP Version, CPS	Staff members were presented with either the medical or life histories of the participants. Histories were placed in the residents' rooms/on charts, that staff were encouraged to refer and to speak with the either staff members about what they learned/ direct others to posted histories.	n=73 (residents) n=99 (staff)	Life history benefited resident QOL and improvements in staff perception of resident's personhood. Did not improve aggressive behaviours. No quantitative significant change in staff ratings during follow-up period; intervention might not be strong enough to have sustained long-term effects. 60% of staff changed their interactions with residents, mostly communications. Attitude changes; staff had better understanding of the residents' behaviour and greater ability to relate to their perspectives.	Staff members were more likely to refer to those with severe dementia in the past tense and knew less about them as individuals and about their histories. These results suggest that staff members are aware of their limited knowledge about the residents with more severe impairments and that providing information about residents' histories, interests and personalities is especially important when residents are experiencing severe cognitive impairments.
Jutkowitz et al., 2016	Evaluate the efficacy of non-pharmalogical care-delivery interventions for management and reduction of aggression and agitation in nursing home and assisted living residents	Methods: Systematic review and meta-analysis (19 studies) Outcomes: Agitation, aggression, general behavior, antipsychotic and other psychotropic use	Staff training, care delivery models (DCM, PCC), environmental changes, emotionally oriented care, and clinical protocols to reduce the use of antipsychotic and other psychotropic drugs, and other unique interventions.	ranged from 31-308	Low-strength evidence that DCM, PCC and usual care have a similar effect on the frequency of agitation and aggression. Insufficient evidence that clinical protocols have any effect on antipsychotic/ other psychotropic drug use. No reported effect of emotion-oriented care on agitation, and insufficient evidence on general behaviour or antipsychotic/ other psychotropic drug use. None of the unique trials showed any effects on agitation or aggression.	Insufficient evidence for the efficacy of nonpharmacological care-delivery interventions to reduce agitation or aggression. Offered very little in way of discussing successful elements, rather pointed out methodological difficulties and limitations with studies, e.g., "Interventions were often customized to the specific needs of participants, but this resulted in poor fidelity").
Langhammer et al., 2019	Evaluate whether a combined intervention of physical activity and music therapy could reduce anxiety, restlessness, irritability, and aggression among	Methods: Exploratory design Outcomes/Measures: BVC; 6 observable patient behaviors, confusion, irritable, boisterous, verbally threatening, physically threatening,	Combined intervention of individualized music therapy with increased physical activity for 8 weeks.	6 Under 65 in special care unit	Significantly improved individual BVC total score. Intervention was feasible, reduced anxiety, restlessness, irritability, and aggression. Mixed behaviour, ranging from severe physical aggression to combinations of delusion, confusion, hallucination, agitation, and depression (in addition to restlessness/wandering according to baseline NPI-Q). Confusion, irritability, and verbal	Song/music activities were integrated as key elements in many of the ADLs. Some PWDs were more prone to be active, or experience boredom when the activities stopped in the evenings. Others were particular about the music and repetition could cause irritability and distress, a source of noncompliance, indicating need for individual adaptation. Participation geared by a need for company,

	people with severe dementia.	attacking objects. NPI-Q for BPSD			threats were the most prominent in the overall BVC.	level of energy, as well as pain. All caretakers stressed one-to-one contact and social interaction on the terms of the PWD. Some emphasized the importance of smaller groups, proper medication levels. Need to adapt to individual daily "rhythms" through respect for resident's need for activity/rest.
Onieva-Zafra et al., 2018	Investigate effect of an 8-week nursing intervention of music and reminiscence therapy sessions with application of reality orientation (RO) techniques	Methods: Pre/post-test intervention design; Interviews Outcomes/Measures: GDAS;18-item self-report symptom inventory, and Tinetti Test; static and dynamic balance abilities	2 weekly sessions for 8 weeks (45 minutes long) of reminiscence and music therapy with the application of reality orientation techniques, and all were conducted by a nurse using different musical "experiences"	19	No difference was found between the 2 groups regarding the pretest GDAS but a difference between the 2 groups was found with the Tinetti test. The difference between posttest GDS was found to be statistically significant for depression but not for anxiety. A reduction of depression symptoms can occur in patients with AD after 8-week intervention	Found valuable effect of music therapy and RT with reality orientation techniques on depression in patients with mild AD. May be implemented by a typical nursing team working in a nursing home (once the relevant skills and knowledge to conduct music, RT and RO are acquired), allowing these interventions to easy integration into daily lives. Nurse should act as the principal contact in these therapies.
Oppikof & Geschwindner, 2014	Assess/compare the frequency and circumstances of agitation, and generate decision making aids for the treatment of agitation patients by nursing intervention	Methods: 1002 measurements of open nursing interventions in cases of agitation were obtained Outcomes/Measures: Behavioural disturbances; CMAI and PAS	Wide range of interventions including stimulation (basal stimulation, aromatherapy, etc.) or distraction (e.g. taking a walk, listening to music, singing).	60 Staff	The mean CMAI of residents did not differ between T1-T2, but did differ T2-T3. Five nursing interventions were implemented successfully. These interventions are as follows: (1) avoiding noise (61%); (2) attending to lavatory needs (34%); (3) communication/validation; (4) walking/movement (30%); (5) offering or administering liquids (28%). 2/3 of the residents were never agitated, ¼ was moderately agitated	In almost half the cases, agitation occurred while the person was alone (46%), in 26% of agitation as a constant state. Rarely any agitation while residents were engaged in activities. Each nursing home preferred certain specific nursing intervention most frequent interventions were very common; communication /validation or PCC and attendance. Interventions should be individualized and have impact on (1) unmet needs and (2) acquired behaviour, (3) environmental factors and reduced threshold of distress.
Park et al., 2017	Evaluate effects of the health-coaching self-management program for NHR on 1) self-efficacy and goal attainment scaling (GAS), 2) health status/QOL of elderly	Methods: Clustered RCT Outcomes/Measures: 31 items from the SRICD, Self-efficacy, psychological and physical health Status, also personal goals, QOL	HCSMP-NHR intervention, composed of group health education and individual coaching, for 8 weeks. Conventional care was provided to the conventional group.	90	IG showed better results for self-efficacy, health distress, depression, and QOL at week 9. Mean GAS score of the IG gradually increased from −0.38 to 0.74. The time × group interaction; significant improvements in QOL of IG, significant reductions in health distress and depression. IG had significant reductions in health distress, fatigue, and	Self-efficacy was identified as an important factor of self-management, predictor of health behavior change and sustenance, implying that additional interventions to improve self-efficacy are needed within 3 months. A longer intervention period may be needed for lasting effects. GAS might have contributed to

	including those with cognitive impairment				sleep problems (at week 20) compared to CG. IG at week 20 did not have a change in energy or QOL, but participants in CG had a deterioration in both.	improving the interest and achievement of the participants in the intervention group.
Stacpoole et al., 2015	Evaluate the effects of the Namaste Care program on behavioural symptoms of LTC residents with advanced dementia and their pain management	Methods: Action research Outcomes/Measures: Neuro-psychiatric symptoms	NR	30	Neuropsychiatric symptoms improved significantly in 4 of 5 care homes. Reduction in NPI scores has been found to correlate with improved quality of life in people with dementia who are able to self-rate their quality of life. The NPI-NH scores in CH B and CH D showed a slight reduction in the effectiveness of the intervention towards the end of the research period.	Engagement was optimized by a long introduction for the stimulus, a moderate level of sounds, and being in a group of 20-24 people.
Travers., 2017	Assess feasibility and acceptability of BE-ACTIV and compare the effectiveness of BE-ACTIV against a control condition, give edification of key mechanism(s) underlying BE-ACTIV's efficacy	Methods: RCT Outcomes/Measures: Depression and QOL	8-week intervention 2 components: (1) weekly sessions with research staff and resident to identify pleasant activities (2) education of facility staff regarding depression and their involvement in the intervention	18	Depression scores did not change significantly from baseline-follow-up for either group nor was changes in QOL significant for BE-ACTIV group. Qualitative data indicated that residents benefited from the BE-ACTIV intervention and observed benefits included improved mood in half the participants, while anxiety and sun downing were reported to be considerably less in one participant.	Nursing home residents with dementia were readily able to identify activities they would enjoy and appreciated very simple activities such as going for a walk or sitting in the sun. Residents appreciated having 1:1 time with a staff member which they appeared to prefer over other organized group activities. Qualitative feedback indicated the sessions were informative and well received.
Van Haitsma et al., 2015	Test the effectiveness of individualized activities, led by certified nursing assistants (CNAs), to increase positive and reduce negative affect and behavior among nursing home PWD	Methods: RCT Outcomes/Measures: Sadness, Anger, Anxiety, Pleasure, Alertness, Verbal behaviour, aggression	Individualized positive psychological intervention (IPPI). Clinicians worked together to select appealing activities for each PWD assigned to the IPPI group. Researchers collected information; leisure interests keeping with goal of honoring resident's life history.	180	Both positive &negative effects were observed simultaneously. Higher withdrawal and ADL impairment scores were related to less pleasure, more anger, more anxiety, and less alertness. The IPPI group showed significantly more very positive responses than either the UC or AC groups. Nonverbal responses were significantly higher in the UC group compared with either the AC or IPPI groups.	Residents receiving the IPPI showed the greatest benefit, followed by those taking part in the attention control activity. Customizing care to individual preferences is feasible within the conventional nursing home environment.

Wilkinson, 2018	Develop a health monitoring model in healthcare environments	Methods: Pretest-posttest Outcomes/Measures: Agitation, behaviour, depression, ADL, QOL, cognition; CMAI, CSDD, BEHAVE- AD, Barthel Index, QOL-AD, MMSE	ABBY: Ambient Activity Technologies use PCC principles. 24/7ABBY integrates technology, including interactive touchscreen monitors, sensors, programming logic, with familiar, tactile, manipulative activity experiences.	27	Clear evidence that using ABBY had beneficial effects on well-being and reduced the expression of responsive behaviours in individuals living with dementia in long term care environments.	Observation suggested that residents liked to have the personalized content and that the personalized content facilitated communication with staff and family members Available 24-hours a day, 7-days a week, and does not require staff intervention.

Table C3. Multiple modalities

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Adam et al., 2016	Determine effectiveness of combined dance & relaxation intervention in reducing anxiety/ depression and improving QOL, cognition among elderly people with cognitive impairment in publicly funded institutions	Methods: Quasi-experimental; Questionnaires Outcomes/Measures: Anxiety, QOL Depression; Hospital Anxiety and Depression Scale Quality of Life in Alzheimer's Disease questionnaire	Intervention group did a combination of poco-poco dance and relaxation exercises whilst the control group participated only in the relaxation exercises. Both groups had sessions twice per week for six weeks resulting in a total of 12 sessions.	84	Participants in intervention group showed improved cognitive impairment, reduced anxiety and depression levels and improved QOL. Relaxation therapy alone without the physical movements encouraged by the dance intervention was not as effective in decreasing anxiety or depression among studied participants with a low QOL.	Gradually increasing the intensity and biomechanical movements within dance sessions may further improve aspects of cognitive function, balance and QOL. Relaxation therapy alone may more effectively reduce anxiety and depression symptoms if sessions are conducted more frequently (i.e., at least 50 sessions).
Ballard et al., 2016	Implement intervention best practice guidelines for prescribing and review of anti-psychotics in PWD living in NHs alongside nonpharmacological approaches	Methods: Cluster RCT at the NH level; Questionnaires Outcomes/Measures: Depression Agitation, NPS, Mortality Dementia severity; CSDD, CMAI, NPI-NH, CDR, FASI	All 16 homes received an intervention to implement PCC. 8 randomly assigned to antipsychotic review. 8 to an intervention to increase social interaction, and 8 to an exercise intervention.	277	There was a significant reduction in antipsychotic use in the review group (50%) compared with the non-review group. Exercise significantly improved NPS but not depression levels, social interaction did not improve either agitation or total NPS. The antipsychotic review group in combination with social interaction had a significant reduction in mortality.	Although NH staff were able to gather life story information, found it difficult to develop/ maintain tailored plans or PCC interventions from this. Antipsychotic review group experienced a significantly worse outcome on overall NPS, this impact was mitigated by the concurrent delivery of social interaction, significantly reduced antipsychotic use and mortality without worsening of NPS, and exercise improved neuropsychiatric symptoms.
Bautrant et al., 2019	Evaluate the prevalence of agitation/physical aggression, wandering and screaming over 24 hours and during the late hours (6-12pm) before and after environmental rearrangements	Methods: Prospective 6-month study in 2 phases (baseline and intervention); Questionnaires Outcomes/Measures: Agitation/physical aggression Wandering Screaming; CSDD	Skyline ceiling tiles in part of the shared premises, progressive decrease of the illuminance at night (6-8pm) together with soothing streaming music, reinforcement of the illuminance during the day, walls painted in light beige, oversized clocks in corridors, and night team clothes color	19	Significantly lower number of patients showing wandering during phase 2. Number of BPSD/patient over 24 hours or during late hours was not statistically different between phase 1 and 2 although there was a trend to shift toward lower values during phase 2. Agitation/aggression/screaming episodes were observed mainly outside late hours opposed to warning episodes. Number of agitation/physical aggression and screaming and both the number and mean duration of wandering episodes were significantly	The nonpharmalogical intervention did not directly involve the resident, their family, or the medical or caregiver staff, thus allowing it to overcome the barriers found with other nonpharmalogical interventions. The environmental rearrangements are simple, relatively costless, easy to implement, and not dangerous for the resident.

			(dark blue) different from that of the day team (sky blue).		decreased over 24 hours following environmental rearrangements.	
Chen & Lin, 2016	Examine effects of individualized learning therapy on cognition and neuropsychiatric symptoms among elderly PWD	Methods: Quasi-experimental Outcomes/Measures: NPS Cognitive Function Physical function; Barthel Index, MMSE, Neuropsychiatric Inventory	Individualized learning therapy, PCC reading books and arithmetic exercises 30 minutes per session, twice a week for 3 months.	44	NPS of the participants in the EG improved compared to CG. EG group showed statistically significant improvements in hallucinations, depression, apathetic expression, irritation, bizarre behavior, and sleep disorder. MMSE scores increased significantly in the EG. Participants who were usually withdrawn became more active and more willing to sit in the living room and interact with others, they smiled more frequently.	Appreciation of positive and enriching interpersonal relationships may prevent the disabling effects of dementia. Residents were encouraged, and their achievements were affirmed. 7 weeks may be a critical time; at week 7, significant improvements in emotional and behavioral expressions. Material designed based on personal backgrounds of participants, content was selected from the things/ stories that were familiar and might make them happy.
Cheung et al., 2018	To examine the effects of the 6-week music-with-movement (MM), compared with music listening (ML) and social activity (SA), on the cognitive function of people with moderate dementia	Methods: RCT Outcomes/Measures Anxiety, Cognition, Depression, Short-term memory, MMSE, Verbal fluency; GDS, RAID, Fuld's Object Memory Evaluation, Modified Fuld Verbal Fluency Test.	The participants in the MM group (4-6 participants in a closed group) listened to their preferred music and moved their limbs and trunk, twice a week for six weeks.	165	Difference in outcomes between groups did not attain the level of statistical significance. Only the MM group, and not the ML group, showed a significant reduction in depressive symptoms. MM may be useful for improving memory storage and delayed memory, and that it lasted for at least six weeks, which was not the case with the SA group. The ML group also demonstrated a significant improvement in delayed memory from baseline to T1.	It is a rather promising indication that by listening to their preferred music, PWD may also experience a reduction in their symptoms of anxiety and depression.
Cohen-Mansfield et al., 2014	Study influence of personal characteristics (demographic, medical, and functional variables) and possible barriers on the efficacy of nonpharmacological interventions in reducing agitation	Methods: RCT, Observations Outcomes/Measures: Observed agitation, ABMI	Individualized algorithm (TREA-Treatment Routes for Exploring Agitation), identifies unmet needs &matches interventions to needs and to PWD's sensory, cognitive, & functional abilities, as well as to self-identity and preferences. 4 hours every 10 days.	89	Measures of higher functioning, quantified as higher cognitive status, greater communication ability, and higher responsiveness, are related to greater and more effective impact of individualized nonpharmacological interventions for persons with advanced dementia.	The only medically variable found to significantly impact the efficacy of the intervention was pain. Caretakers need to be aware of the importance of talking with a resident and encouraging him/her to talk by using strategies appropriate to individual's remaining capabilities. Making caregivers aware of their own use of techniques and the resident can help prolong the period of effective communication, and hence produce more effective interventions.

Cohen-Mansfield et al., 2015	Compare non-pharmaco-logical interventions for persons with BPSD on frequency of use and perceived efficacy in terms of change in behavior and interest.	Methods: RCT; Questionnaires Outcomes/Measures: Behavioral symptoms Interest change; CAR	24 interventions divided into 9 categories: Care, theme, manipulative, sensory stimulation, movement activities, work-like activities, simulated social, and social category. Trial Phase and Treatment Phase.	231	The most highly rated interventions impacting BPSD were: care, ball toss, food or drink, going outside, coloring or painting, walking, folding towels, sewing, and family video. Relatively high rating on BPSD impact were sorting, flower arranging, hand massage, real looking doll, one-on-one interaction, group activity, and book. Ratings were lowest for fabric book and robotic animal interventions.	The most highly utilized interventions were; one-on-one interaction, real looking doll, magazine, respite video, and music. The least often used were: sewing, book, fabric book, flower arranging, and going outside. Interventions will have low utilization if they require abilities not present for most participants, if they are not efficacious, or if they are not available for other reasons, such as resource allocation.
Eritz et al., 2016	Test that life histories would elicit increased empathy ratings, higher rating for personhood, QOL, fewer PRN & antipsychotic medication and significantly fewer acts of aggressive behaviour	Methods: RCT/mixed methods Questionnaires/ Family Interviews Outcomes/Measures: Personhood, Aggression/ agitated behaviour, QOL, Empathy, Cognition; PDQ, ABS, CMAI, ADRQL, JSE-HP Version, CPS	Staff members were presented with either the medical or life histories of the participants. Histories were placed in the residents' rooms/ on charts, that staff were encouraged to refer and to speak with the either staff members about what they learned/ direct others to posted histories	n=73 residents n=99 staff	Life history benefited resident QOL and improvements in staff perception of resident's personhood. Did not improve aggressive behaviours. No quantitative significant change in staff ratings during follow-up period; intervention might not be strong enough to have sustained long-term effects. 60% of staff changed their interactions with residents, mostly communications. Attitude changes; staff had better understanding of the residents' behaviour and greater ability to relate to their perspectives.	Staff members were more likely to refer to those with severe dementia in the past tense and knew less about them as individuals and about their histories. These results suggest that staff members are aware of their limited knowledge about the residents with more severe impairments and that providing information about residents' histories, interests and personalities is especially important when residents are experiencing severe cognitive impairments.
Jutkowitz et al., 2016	Evaluate the efficacy of non-pharmalogical care-delivery interventions for management and reduction of aggression and agitation in nursing home and assisted living residents	Methods: Systematic review and meta-analysis (19 studies) Outcomes/Measures: Agitation, aggression, general behavior, antipsychotic and other psychotropic use	Staff training, care delivery models (DCM, PCC), environmental changes, emotionally oriented care, and clinical protocols to reduce the use of antipsychotic and other psychotropic drugs, and other unique interventions.	ranged from 31-308	Low-strength evidence that DCM, PCC and usual care have a similar effect on the frequency of agitation and aggression. Insufficient evidence that clinical protocols have any effect on antipsychotic/ other psychotropic drug use. No reported effect of emotion-oriented care on agitation, and insufficient evidence on general behaviour or antipsychotic/ other psychotropic drug use. None of the unique trials showed any effects on agitation or aggression.	Insufficient evidence for the efficacy of nonpharmacological care-delivery interventions to reduce agitation or aggression. Offered very little in way of discussing successful elements- rather pointed out methodological difficulties and limitations with studies, e.g. "Interventions were often customized to the specific needs of participants, but this resulted in poor fidelity").
Langhammer et al., 2019	Evaluate whether a combined intervention	Methods: Exploratory design	Combined intervention of individualized music	6	Significantly improved individual BVC total score. Intervention was feasible, reduced	Song/music activities were integrated as key elements in many of the ADLs. Some PWDs

	of physical activity and music therapy could reduce anxiety, restlessness, irritability, and aggression among people with severe dementia.	Outcomes/Measures: BVC; 6 observable patient behaviors, confusion, irritable, boisterous, verbally threatening, physically threatening, attacking objects. NPI-Q for BPSD.	therapy with increased physical activity for 8 weeks.	Under 65 In special care unit	anxiety, restlessness, irritability, and aggression. Mixed behaviour, ranging from severe physical aggression to combinations of delusion, confusion, hallucination, agitation, and depression (in addition to restlessness/ wandering according to baseline NPI-Q). Confusion, irritability, and verbal threats were the most prominent in the overall BVC.	were more prone to be active, or experience boredom when the activities stopped in the evenings. Others were particular about the music and repetition could cause irritability and distress, a source of noncompliance, indicating need for individual adaptation. Participation geared by a need for company, level of energy, as well as pain. All caretakers stressed one-to-one contact and social interaction on the terms of the PWD. Some emphasized the importance of smaller groups, proper medication levels. Need to adapt to individual daily "rhythms" through respect for resident's need for activity/rest.
Onieva-Zafra et al., 2018	Investigate effect of an 8-week nursing intervention of music and reminiscence therapy sessions with application of reality orientation (RO) techniques	Methods: Pre-/post-test intervention design; Interviews Outcomes/Measures: GDAS;18-item self-report symptom inventory, and Tinetti Test; static and dynamic balance abilities	2 weekly sessions for 8 weeks (45 minutes long) of reminiscence and music therapy with the application of reality orientation techniques, and all were conducted by a nurse using different musical "experiences".	19	No difference was found between the 2 groups regarding the pretest GDAS but a difference between the 2 groups was found with the Tinetti test. The difference between posttest GDS was found to be statistically significant for depression but not for anxiety. A reduction of depression symptoms can occur in patients with AD after 8-week intervention.	Found valuable effect of music therapy and RT with reality orientation techniques on depression in patients with mild AD. May be implemented by a typical nursing team working in a nursing home (once the relevant skills and knowledge to conduct music, RT and RO are acquired), allowing these interventions to easy integration into daily lives. Nurse should act as the principal contact in these therapies.
Oppikof & Geschwindner, 2014	(1) Assess/ compare the frequency and circumstances of agitation (2) generate decision-making aids for the treatment of agitation patients by nursing intervention	Methods: 1002 measurements of open nursing interventions in cases of agitation were obtained Outcomes/Measures: Behavioural disturbances; CMAI and PAS	Wide range of interventions including stimulation (basal stimulation, aromatherapy, etc.) or distraction (e.g. taking a walk, listening to music, singing).	60 Staff	The mean CMAI of residents did not differ between T1-T2, but did differ T2-T3. Five nursing interventions were implemented successfully. These interventions are as follows: (1) avoiding noise (61%); (2) attending to lavatory needs (34%); (3) communication/validation; (4) walking/movement (30%); (5) offering or administering liquids (28%). 2/3 of the residents were never agitated, ¼ was moderately agitated.	In almost half the cases, agitation occurred while the person was alone (46%), in 26% of agitation as a constant state. Rarely any agitation while residents were engaged in activities. Each nursing home preferred certain specific nursing intervention most frequent interventions were very common; communication /validation or PCC and attendance. Interventions should be individualized and have impact on (1) unmet needs and (2) acquired behaviour, (3) environmental factors and reduced threshold of distress.

Park et al., 2017	Evaluate effects of the health-coaching self-management program for NHR on 1) self-efficacy and goal attainment scaling (GAS), 2) health status /QOL of elderly including those with cognitive impairment	Methods: Clustered RCT Outcomes/Measures: 31 items from the SRICD, Self-efficacy, psychological and physical health Status, also personal goals, QOL	HCSMP-NHR intervention, composed of group health education and individual coaching, for 8 weeks. Conventional care was provided to the conventional group	90	IG showed better results for self-efficacy, health distress, depression, and QOL at week 9. Mean GAS score of the IG gradually increased from −0.38 to 0.74. The time × group interaction; significant improvements in QOL of IG, significant reductions in health distress and depression. IG had significant reductions in health distress, fatigue, and sleep problems (at week 20) compared to CG. IG at week 20 did not have a change in energy or QOL, but participants in CG had a deterioration in both.	Self-efficacy was identified as an important factor of self-management, predictor of health behavior change and sustenance, implying that additional interventions to improve self-efficacy are needed within 3 months. A longer intervention period may be needed for lasting effects. GAS might have contributed to improving the interest and achievement of the participants in the intervention group.
Stacpoole et al., 2015	Evaluate the effects of the Nasmaste Care program on behavioural symptoms of LTC residents with advanced dementia and their pain management	Methods: Action research Outcomes/Measures: Neuro-psychiatric symptoms		30	Neuropsychiatric symptoms improved significantly in 4 of 5 care homes. Reduction in NPI scores has been found to correlate with improved quality of life in people with dementia who are able to self-rate their quality of life. The NPI-NH scores in CH B and CH D showed a slight reduction in the effectiveness of the intervention towards the end of the research period.	Engagement was optimized by a long introduction for the stimulus, a moderate level of sounds, and being in a group of 20-24 people.
Travers, 2017	Assess feasibility and acceptability of BE-ACTIV and compare the effectiveness of BE-ACTIV against a control condition, give edification of key mechanism(s) underlying BE-ACTIV's efficacy	Methods: RCT Outcomes/Measures: Depression and QOL	8-week intervention 2 components: (1) weekly sessions with research staff and resident to identify pleasant activities (2) education of facility staff regarding depression and their involvement in the intervention.	18	Depression scores did not change significantly from baseline-follow-up for either group nor was changes in QOL significant for BE-ACTIV group. Qualitative data indicated that residents benefited from the BE-ACTIV intervention and observed benefits included improved mood in half the participants, while anxiety and sun downing were reported to be considerably less in one participant.	Nursing home residents with dementia were readily able to identify activities they would enjoy and appreciated very simple activities such as going for a walk or sitting in the sun. Residents appreciated having 1:1 time with a staff member which they appeared to prefer over other organized group activities. Qualitative feedback indicated the sessions were informative and well received.
Van Haitsma et al., 2015	Test the effectiveness of individualized activities, led by certified nursing assistants (CNAs), to increase positive and	Methods: RCT Outcomes/Measures: Sadness, Anger, Anxiety, Pleasure, Alertness,	Individualized positive psychological intervention (IPPI). Clinicians worked together to select appealing activities for	180	Both positive &negative effects were observed simultaneously. Higher withdrawal and ADL impairment scores were related to less pleasure, more anger, more anxiety, and less alertness. The IPPI group showed significantly more very positive responses	Residents receiving the IPPI showed the greatest benefit, followed by those taking part in the attention control activity. Customizing care to individual preferences is feasible within the conventional nursing home environment

	reduce negative affect and behavior among nursing home PWD.	Verbal behaviour, aggression	each PWD assigned to the IPPI group. Researchers collected information; leisure interests keeping with goal of honoring resident's life history		than either the UC or AC groups. Nonverbal responses were significantly higher in the UC group compared with either the AC or IPPI groups	
Wilkinson 2018	Develop a health monitoring model in healthcare environments	Methods: Pretest-posttest Outcomes/Measures: Agitation, behaviour, depression, ADL, QOL, cognition; CMAI, CSDD, BEHAVE- AD, Barthel Index, QOL-AD, MMSE	ABBY: Ambient Activity Technologies use PCC principles. 24/7ABBY integrates technology, including interactive touch- screen monitors, sensors, programming logic, with familiar, tactile, manipulative activity experiences.	27	Clear evidence that using ABBY had beneficial effects on well-being and reduced the expression of responsive behaviours in individuals living with dementia in long term care environments	Observation suggested that residents liked to have the personalized content and that the personalized content facilitated communication with staff and family members Available 24-hours a day, 7-days a week, and does not require staff intervention

Table C4. Social contact interventions

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Aarskoga et al., 2019	Overview effects of AAI (using dogs or robotic animals) on BPSD, mood, depression, and QOL for PWD in nursing homes	Methods: Systematic Review Outcomes/Measures: Behavioral and psychological symptoms Depression and mood Quality of life	Animal-assisted interventions (AAI), animal assisted therapy (AAT), and animal-assisted activities (AAA) or dog-assisted interventions. Group sessions (3-15 participants), duration 20-60 minutes. Individual sessions. 10-60 minutes.	4 to 156	AAI reduced BPSD in more than half of the studies. 7/12 outcomes showed positive effects, and 3 studies found positive tendencies. 6/11 showed positive effects in BPSD. 6/8 studies reported significant positive effect on depression and mood, 3/5 studies reported positive effect on QOL. Other positive effects were found in; engagement and interaction, pulse oximetry and rate, and reduced pain medication use.	Most positive effects limited to immediate improvement of outcomes. In robotic interventions the therapist was typically nursing home staff. Some studies individually tailored sessions. 2 studies reported positive effect at follow-up but not during intervention. In most studies though positive effects of AAI, especially in behavioural and psychological symptoms. Declined at follow-up. Decline overtime appears to be a general trend.
Abraha et al., 2017	To assess the effects of simulated presence therapy (SPT)	Methods: Systematic Review Outcomes/Measures: Behavioural and psychological symptoms	The intervention was defined as the use of video or audiotape recordings that family members of caregivers have personalized and then have been played to the person with dementia.	30 to 54, total 144	Within each trial, the effect of SPT on behaviour, compared to usual care, was mixed and depended on measure used. Two trials that used a personalized music intervention reported no significant differences between simulated presence and music on behavioural outcomes.	Trial interventions showed large differences in equipment used (audio or video), intervention duration and frequency, selection of the contents of the audio/videotape, the washout period, and the professionals involved. Great variation in behaviours measured and assessment procedures used to measure the outcomes.
Brodaty et al., 2014	Test if humor therapy could improve agitation, depression, behavioral disturbances, QOL, social engagement in PWD	Methods: Cluster RCT; Questionnaires and Observation Outcomes/Measures: Depression, Agitation, Social engagement Behavioral disturbance QOL; CSDD, CMAI, DEMQOL, NPI-NH, MOSES	LaughterBoss training for one NH staff member per facility and 9-12 weekly sessions; how to incorporate humor into daily care practices/ communication/ fun/ routines..	35 NHs, n=189 residents (intervention), 209 residents (control group)	Commitment ratings were associated with increased Resident Engagement, which affected depression, agitation, and neuropsychiatric symptom scores. Management Support scores for the humor program had significant positive effects on LaughterBoss Commitment, thereby contributing to the positive effects of LaughterBoss Commitment on depression, agitation, and QOL via Resident Engagement.	External factors may have more influence on medium term changes in mood and behavior of residents than do personal characteristics. Severity of dementia should not be a barrier to psychosocial interventions. To maximize the effects of psychosocial interventions, staff need to be committed to the intervention and management must be supportive.
Cantarella et al., 2018	To measure the impact of doll therapy (DT) on people with severe	Methods: RCT w/control group; Questionnaires	Residents received either a doll or hand warmer 5 times a week	DT, n=16	Participants in the DT group showed a significant reduction in their BPSD, with	The sessions took place in the same area each time (activity hall); ensuring the room

	dementia, including eating behaviour	Outcomes/Measures: Mental status questionnaire; neuropsychiatric inventory; caregiver's distress; easting behaviour	for 60 minutes over 1 month.	Control, n=16	corresponding significantly lower levels of related caregiver distress. DT showed no impact on eating behaviour.	was quiet at the time, and thus avoiding stimuli.
Jones et al., 2018	Investigate if the severity of cognitive impairment and agitation of older PWD predicts outcomes in agitation, engagement, and mood	Methods: Clustered RCT Outcomes/Measures: Participants' levels of engagement, mood states, and agitation at week 10	Individual, non-facilitated, 15-minute intervention sessions with PARO, a robotic seal, 3 afternoons per week for 10 weeks.	138 (in dementia care homes)	Participants with initial more severe agitation had higher levels of agitation at week 10 (strongest finding). Low levels of baseline agitation predicted greater positive PARO engagement, fewer instances of agitation. Greater visual engagement was found in participants of lower agitation and cognitive impairment. Greater pleasure at week 10 was found in those with less cognitive impairment.	In clinical practice, PARO intervention should be limited to people with low-moderate severity of agitation. Agitation and cognitive impairment explained only a small amount of variance in each of these models, suggesting that other unknown factors were also contributing a large part to these outcomes.
Joranson et al., 2015	Examine effects on NH resident's agitation; with moderate-severe dementia, participating in robot-assisted group activity with PARO	Methods: Clustered RCT Outcomes/Measures: Baseline: cognitive status, regular medication, agitation (BARS), and depression (CSDD)	30-minute group sessions with PARO twice a week over the course of 12 weeks; trained local nurses.	60; in 10 adapted dementia care units	Statistically significant changes found on agitation and depression between T0 to T2. Although the symptoms of the intervention group declined, CG's symptoms developed in the opposite direction, statistically significant differences in group changes. No significant difference from T0-T1 in agitation or depression for either group. No statistical differences between onset and result in outcome measures or regular medication use.	Long-term positive effect on depression and agitation might be attributed in part to positive social setting/ increase in oxytocin. Persistent attention on Paro could increase its effect on participants, fostering an emotional exchange with Paro. Key causes of reduced agitation are the calming effect and reduced stress responses resulting from the social and physical interaction, tactile effects, and bonding.
Kontos et al., 2016	Assess effect of elder-clowning on moderate to severe BPSD of PWD (primarily Alzheimer's) in nursing homes	Methods: Before and After Study Outcomes/Measures: BPSD, QOL, occupational disruptiveness, agitation, nursing burden of care and psychiatric medication use; NPI-NH, CMAI, M-NCAS, DCM	A pair of elder-clowns visited all residents twice weekly (10 minutes per visit) for 12 weeks. Used improvisation, humor, empathy, and expressive modalities such as song, musical instruments, and dance to individualize resident engagement.	23	Over 12 weeks, NPI-NH scores declined significantly and DCM quality-of-life scores improved significantly. CMAI agitation scores decreased nominally- not statistically significant. Occupational disruptiveness score significantly improved.	Lack of detectable change in the NPI-NH domain scores (other than agitation/ aggression) may suggest that elder-clowning is not effective for other behaviors, such as apathy. A structured training period may be required to improve the ratings for these symptoms that care aides provide. Not able to discern between changes in need-driven behaviors that may be amenable to psychosocial intervention and those with other causes that may not (pain).

Mervin et al., 2018	Examine the cost-effectiveness and within-trial costs of PARO, compared to a plush toy and usual care, for reducing agitation and medication	Methods: An economic evaluation, nested within a clustered RCT. Outcomes/Measures: Economic outcomes; in trial costs, compared to health outcomes of PARO, agitation,	3 groups; PARO (individual, non-facilitated 15-minute sessions, 3 afternoons per week for 10 weeks); plush toy (as per PARO but with artificial intelligence disabled); and usual care.	415 residents from 28 facilities with document-ed dementia diagnosis	Within-trial costs, the PARO was $50.47 more expensive per resident compared to usual care, and plush toy was $37.26 more expensive. No statistically significant differences between groups in agitation levels after 10 weeks. Incremental cost-effectiveness ratios were $13.01 for PARO and $12.85 for plush toy. Only a trend in reduced agitation in the PARO group (2.66) and the plush toy group (1.68), increase in agitation in the usual care group.	No key components to success. Medication use measures may also be influenced by prescribing schedules/ intervals of General Practitioner's separate from the intervention, staff may not have informed GPs about changes in agitation levels that would promote change in medication dosage.
Moyle et al., 2017	Test effects of individual, nonfacilitated sessions with PARO compared to look-alike plush toy and usual care, on emotional & behavioral symptoms of PWD in LTCs	Methods: Parallel, 3-group, cluster-randomized controlled trial Outcomes/Measures: Changes in engagement, mood states, and agitation (CMAI) after a 10-week intervention, assessed by coded video observations (baseline, weeks 1, 5, 10, and 15)	9 facilities were randomized to the PARO group (individual, non-facilitated, 15-minute sessions 3 times per week for 10 weeks); 10 to plush toy (same but given PARO with robotic features disabled); and 9 to usual care.	415	Participants in the PARO group were more verbally and visually engaged than Plush toy group. Both PARO and plush toy had significantly greater reduced neutral affect compared with usual care. PARO was more effective than usual care in improving pleasure and agitation, which continued to be significant at week 5. There was no difference between groups on CMAI-SF. At week 5, plush toy reduced sadness more than usual care, long-term effects at week 15 were minimal,	An initial novelty effect in response to PARO and plush toy. PARO was only more effective than a plush toy in encouraging engagement, shown by greater verbal communication and eye contact. For visual engagement, difference was of a medium magnitude, suggesting a unique and clinically relevant advantage of PARO when its robotic features are enabled- important as they observed low levels of general engagement for all participants at baseline, e.g., wandering.
Moyle et al., 2019	Explore relative's perceptions of PARO, and a look-alike Plush Toy, when used by their family with dementia	Methods: Descriptive Qualitative approach, nested in a larger RCT. Outcomes/Measures: Family members perceptions of PARO/ PT. Linked to larger RCTs outcomes; agitation, mood states, engagement.	15 min, 3 afternoons per week for 10 weeks, playing with PARO or Plush Toy	20	Family members of PWD in LTC had positive perceptions of PARO, it improved mood, reduced agitation, and provided opportunity for communication. Family members had negative perceptions of plush toy because of its lack of movement and engagement (static & unresponsive) seen as unimportant in improving QOL.	Robotic features may be central in encouraging engagement/interaction. Current cost of PARO was identified by relatives and care staff as a major limitation to use in LTCs. Better than live animal; no responsibilities of care, feeding, no biting risk. Did not matter which animal it was, as long as the resident perceived it to be real, a companion. Presence and therapeutic ability made PARO more desirable.
Nordgren & Engström, 2014	Evaluate the effect of a dog-assisted intervention on the BPSD of residents with dementia during a six-month period	Methods: Quasi-experimental, pre-test/post-test research Outcomes/Measures: CMAI, MDDAS	A dog assisted intervention, 10 sessions between 45 and 60 minutes, once/ twice a week.	33	IG changes from baseline to follow up were not significant. Some positive trends immediately after intervention, CMAI'S physical non-aggressive behaviours decreased, behavioural symptoms decreased (MDDAS). Mean verbal agitation score	Some participants may have experienced loss or loneliness after the contact stopped, recognized the dogs and talked about them in positive ways. Appears that mere stimulus of live human engagement has the ability to decrease verbal agitation.

					increased significantly 17.2 (baseline) to 20.6 (6 months post intervention).	
Olsen et al., 2016	Examine the possible effects on depression, agitation and QOL in NH PWD's or cognitive impairment, through an intervention with AAA	Methods: Prospective, cluster randomized multi-center trial with a follow-up measurement 3 months Outcomes/Measures: Depression (Norwegian version of CSDD), agitation (BARS) and quality of life (Quality-of-Life in Late-stage Dementia scale), CDR	12-week intervention with AAA. 30-mins twice weekly in groups of 3-6 participants, led by a qualified dog handler.	58	No significant effects of intervention on depression T0 to T1. IG had a continual decrease in the CSDD score, significant effect T0-T2, CG had a continual increase in the CSDD score. Depression; More participants in the AAA group improved than in the CG. No significant effects on agitation. CG showed an increase in the QUALID score (decline in QOL), IG showed a decrease in the QUALID score. Significant effects on QOL for severe dementia, no effects in mild-moderate dementia.	Number of sessions attended did not affect the outcome of the CSDD, BARS or QUALID scores. Possible that AAA had particular value for those with severe dementia, as they have a high prevalence of unmet needs regarding meaningful activities and social contact. Group intervention where a dog is the center of attention reduce the pressure in social interaction, dog serves as a mediator for conversation and lead to social cohesion within the group, increased social interaction with staff (as demonstrated through T2 effects).
Shin, 2015	Examine effects of dolls on the physical, emotional & psychosocial facets of PWD in a Korean nursing home	Methods: One group, pretest-posttest Outcomes/Measures: Changes in behaviour, mood and interactions with others	Dolls placed in activity room and residents could choose what doll to play with.	62	Participants used fewer swear words, shouted less, were less aggressive, exhibited fewer obsessive behaviours and wandered less (statistically significant). Significant differences in positive mood and positive physical appearance. Statistically significant decreases in depression, looking uncomfortable. Interactions with others increased over time.	Family member's viewpoints should be explored as without realizing the potential benefits of doll therapy they may see the intervention as demeaning their loved ones. Doll therapy can be a valuable took to promote positive mood, behaviours, and social interactions in individuals with dementia.
Van der Ploeg et al., 2016	Compare the effect of internet video calls (Skype) versus standard landline telephone calls on agitated behaviour in nursing home residents with dementia.	Methods: RCT, observation Outcomes/Measures: Agitated behaviour	4x20-min conversations were booked with a family member over 2 weeks, after conditions were switched. Calls were initiated by research staff. The family member conversed however they pleased, preferably for the entire 20 minutes.	9	Skype conversations lasted longer than landline telephone calls and mean agitation levels fell at a non-significant amount for the Skype calls.	Combining visual with auditory sensory inputs captures attention and reduces agitated behaviours more effectively than auditory inputs alone.

Wesenberg et al., 2019	Investigate if the inclusion of an animal adds value to psychosocial interventions for people with dementia	Methods: Within-subject design with two studied conditions Outcomes/Measures: Social interaction, emotional expression, behavioural and psychological symptoms	AAI therapy program called Tierische Tandems; Conducted by trained dog owner's with knowledge of the PWDs and the animals; delivered in weekly group sessions with five participants and conducted by one human-dog team.	19	Physical contact/touch between the patients and the dogs was significantly longer in the AAI than in the CG at all three time points, but no significant difference in duration between time points. Significantly more upper body movements in the AAI group, and significantly longer. Behavioural and psychological symptoms rarely detected in either the AAI or the control intervention.	Participants interacted more often in the AAI than in the control intervention without a dog. Both non-verbal and verbal interactions occurred more frequently in the AAI. Animal-assisted intervention-specific effects on behavioural and psychological symptoms of dementia were not shown in our study.

Table C5. Behaviour therapies

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Anderson, et al., 2018	Determine the feasibility of providing older adults living in residential aged care with group-based cognitive behavioural therapy	Methods: Mixed methods (RCT + Qualitative feedback + Observations) Outcomes: Depression Anxiety; GDS15, GAI Depression Anxiety Stress Scales	A manualized Cognitive Behaviour Therapy program over 10 weeks. Weekly 2-hour group sessions.	18	Participants in the treatment group maintained depressive symptoms in the normal range whilst in the control group depressive symptoms deteriorated into the moderate range.	Possible that resident's with higher levels of symptomatology may be more reluctant to engage in group therapy. IG participants benefited from therapy such as building their skills and resilience, receiving validation, emotional support from their fellow residents and fostering friendships and social networks which continued beyond the conclusion of the program.
Bailey et al., 2015	Evaluate the impact of Question-Asking Reading (QAR) on cognitively impaired NH residents' depressive symptoms and QOL	Methods: Quasi-experimental; Behavioral observation, self- and caregiver report, clinician interview) Outcomes: Depression, QOL; CSDD, ABC, GDS, QOL-AD; Activity Employment rating	Two 30-min group sessions 2x per week for 6 weeks. QAR-Depression reading passages to promote reminiscence and expressions of thoughts/feelings about oneself and significant others.	51	QAR-Depression intervention had a positive impact on the well-being of mildly to moderately demented nursing home residents. Residents in the QAR-Depression condition showed significant improvement in depressive symptoms. QAR-Depression also resulted in significantly more verbal interaction and engagement with materials during the group activity.	A salient feature of QAR is active involvement, positive in two ways: (1) verbal interaction/engagement with the environment are objective indications of QOL, reflect interest in the environment /higher levels of stimulation; (2) cognitive impairments of participants suggest that they could not benefit from the cognitive aspects of the intervention without active participation in treatment.
Burdea et al., 2014	Describe the development of BrightBrainer system and determine clinical feasibility	Methods: Feasibility trial/ pre-post Outcomes: Emotive and cognitive outcomes; BDI, NAB, Attention Module, EF Module	BrightBrainer utilized a game controller and. 3 games were developed to train ability to focus and memory	10	Mood improved post-training in 7/10 participants. Cognitive improvement was noted for word generation, and two separate measures, one of verbal attention and the other of attention processing speed almost reached significance.	The table supporting the BrightBrainer computer had to be selected to have less metal content so to avoid interference with the pendant readings.
Duru Asiret & Kapucu, 2015	Investigate effect of RT on cognition, depression, ADLs of institutionalized mild-moderate Alzheimer patients.	Methods: RCT; Questionnaire +Observation Outcomes/Measures: Depression, ADLs, Cognition; GDS, MMSE, Daily Living Activities	Reminiscence therapy was applied in the form of sessions lasting a total of 12 weeks and 30-45 minutes in conversation form.	62	Significant increase in mean MMSE score in IG compared to control group. Decrease in mean GDS score of intervention group compared to control group, significant. Positive change in intervention groups' communication, collaboration, socialization, and restlessness parts of the Daily Living Activities.	Regular visiting hours were taken into account when preparing this schedule. Individual directing the group played an important role in managing RT properly. The leader also needs to help the group members form connections between the past and the present day based on what they remember during the sessions.

Table C6. Structured activities interventions

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Bostrom et al., 2015	Evaluate high intensity functional exercise on depressive symptoms & determine if effect differed subgroups of dementia type/ level	Methods: Rater-blinded, stratified, cluster-randomized controlled trial Outcomes/Measures: Depression	High-Intensity Functional Exercise (HIFE) program. 39 exercises to imitate ADL movements. All participants were individually supervised, and each participant had an individually based exercise program.	186	No difference in effect on GDS or MADRS score at 4 or 7 months was observed between the exercise and control activities. No difference in effect between the exercise and control activities was found in subgroups of dementia type or depressive symptom level.	NR
Brett et al., 2016	Evaluate evidence from RCTs & cluster RCTs measuring effects of physical exercises on the health/ well-being of PWD in nursing homes.	Methods: Systematic Review Outcomes/Measures: Cognitive function, mood and depression Functional ability Unmet needs; MMSE NOSGER, AMS, CSDD, GDS, MADRS, CMAI	Varied across the studies: (1) multimodal; (2) walking; (3) music and movement; and (4) hand exercises. Duration varied greatly from 4 to 52 weeks, as did frequency (mean 4.5 sessions per week) and length (mean 49.4 minutes) of the intervention.	12 studies	9/12 studies showed significant improvement in the intervention group and/or deterioration in control group. Cognitive, mood & depression, agitation, unmet needs, mobility, balance, and functional ability all showed significant improvements. Mood and depression and agitation were most consistent (75% of studies examining outcomes had positive effect in at least 1) 3 studies showed improvement in mood and depression, 1 study showed agitation improvement.	PTs would be the most appropriate to deliver because of their knowledge and understanding of physical exercise. Could be that physical exercise interventions engaged in participants and encouraged interaction with others, which may have given them a feeling of belonging and purpose whilst distracting them from negative feelings. Of the 5 studies that found significant changes in cognition, 3 used multimodal physical exercise intervention, and 1 study was a music and movement group.
Cancela et al., 2016	Evaluate exercise pro-gram effects on; cognitive decline/impairment, depres-sion, memory, functional independence & neuro-psychiatric disturbances	Methods: RCTs, Observations Outcomes/Measures: Cognitive function Neuropsychiatric symptoms Memory function Functional mobility	Cycled continuously alone, or in pair, in a recumbent bicycle geared to a very low resistance, performance was assessed every 3 months. Residents in the EG cycles for at least 15 min daily for 15 months.	114	With the exception of depression, all variables improved in the EG and worsened in the CG: Significant improvements were observed in functional mobility and memory function in EG participants. Cognitive impairment, neuropsychiatric and memory function worsened significantly in the CG.	Depression improved more in the CG. Unexpected, given physical activity reportedly is effective in reducing depression in healthy elderly people, but may not apply to PWD. Suggest that a mean of 108 min of light aerobic cycling per week, if well tolerated, seems to be feasible for PWD. Subjects with more severe cognitive impairment appear to obtain a greater benefit from exercising, while those with milder impairment benefit less.
Chen et al., 2017	Test effects of a 15-month wheelchair- bound resistance band exercise	Methods: Single-blind, cluster-randomized	The resistance band exercises were conducted 3 times per week in 40-minute	127	Depression decreased significantly in the experimental groups, but their behavioural problems did not change significantly. Control participants' depression and behavioural	Group exercises/ leading a group provided opportunities for participant interaction fostered a sense of personal accomplishment, which increased participation resulted in greater

	program on BPSD of wheelchair-bound PWD	controlled trial with repeated measures Outcomes/Measures: Depression Behavioral problems; CSDD, Clifton Assessment Procedures for the Elderly-Behavior Rating Scale	sessions in two sequences: volunteer-led sessions for first 6 months (Stage I), DVD guided sessions for the next 9 months (Stage II).		problems became more severe. The application of DVD-guided technology can relieve the shortage of manpower and make routine, long-term resistance band exercises more feasible.	positive emotional effects. Low withdrawal and high attendance rates are attributable to the regular volunteers from their nursing homes acted as program instructors, knew the participants and built trusting relationships with them.
Henskens et al., 2018	Compare the effect of; ADL training, multicomponent exercise training, and combined ADL & exercise training on cognitive/physical functions, mood, and behavioral problems	Methods: RCT Outcomes/Measures: ADL ability Cognitive function Physical functions Mood Behaviour	Combined exercise (i.e., aerobic and strength), and ADL training. All sessions were group-based (4–6 residents) and took place 3 times per week for 6 months.	87	On average over time, ADL training had a significant positive effect on depressive symptoms among men. Comparing exercise to no exercise; no significant effect of on depressive symptoms/ apathy, 3 subscales and total CMAI score. Found that a 6-month ADL training positively affects cognitive, physical, and mood outcomes. Positive effects were found for executive function, shown after 6 months, and were reflected in improvements in verbal category fluency.	Cannot conclude which ADL training aspects contributed to the positive outcomes: may be motivation from staff, the cues, physical activity, practice itself, the one-on-one attention, or a combination. Effects of ADL training may not be solely contributable to increased physical activity, may also be due to the personal guidance and repeated practice of basic skills, paired with promoting independence and psychological well-being. It is possible that more improvement would have occurred in the exercise group with individual treatment.
Houser et al., 2014	To examine whether the TimeSlips intervention is associated with reduced mood and behavioral symptoms in PWD in LTC	Methods: RCT; observations Outcomes/Measures: Mood Behaviour	TimeSlips encourages drawing on creativity and imagination over memory or fact. A staged picture is distributed, and facilitators encourage input from all partici-pants as a collective narrative is formed.	20	When comparing intervention with control groups with respect to the two primary outcomes of mood and behavior, there was no statistically significant effects.	NR
Hsieh et al., 2015	Investigate if the Laughing Qigong Program could help decrease depressive tendencies & lowered moods states	Methods: Quasi-experimental; Questionnaire Outcomes/Measures: ALDs Cognition Mood Depression; BI of ADL, MMSE Faces Scale GDS Salivary cortisol	Participants in the experimental group attended the LQP carried out by a trained LQP practitioner for 50–60 min, twice a week for 4 weeks. Experimental participants attended a total of 8 interventions.	66	Experimental group showed significant improvement in their cognitive functioning, LQP group showed significant improvement in their mood states compared to control group. Participants in the LQP group showed significant improvement in their depression scores compared with participants in the control group.	Authors did not mention contextual mechanisms.

Neville et al., 2014	To explore the effects of a dementia-specific, aquatic exercise intervention on behavioural & psychological symptoms in PWD	Methods: Pilot Study Outcomes/Measures: PW-BCIP (+/-affective states & engagement behaviours), and RMBPC (BPSD), the caregiver's (RACF registered nurse) reaction to these behaviours.	12-week intervention consisting of aquatic exercises for strength, agility, flexibility, balance and relaxation (45 minutes at a time for a group of 5-7 PWD, twice weekly).	11	Statistically significant declines in the RMBPC and PW-BCIP. Median values in psychological well-being increased from T1 (32.5) to T3 (38.0), declined slightly at T4 (36.0). A significant decrease in the number of BPSD, from median of 2.0 (T1) to 0.0 (T3, T4). Significant decrease in the degree to which these behaviours distressed RACF staff, a statistically significant difference across the four time points for psychological well-being.	Program was evidenced-based, designed by an exercise physiologist who was in consultation with dementia experts. Each adult had a volunteer with them in the pool; a 1:1 ratio. Decline from T3 to T4 may have been due to one RACF going into quarantine status. This intervention was associated with an improvement in psychological well-being, but because of multifaceted nature, not possible in to pinpoint the most effective component.
Telenius et al., 2015	Investigate changes in physical function & mental health; baseline to 6 months follow-up and during detraining period	Methods: Single blinded RCT Outcomes/Measures: Physical function, mental health	3-6 participants at each nursing home exercised 2x per week for 12 weeks with physiotherapy sessions (50-60 mins.). All exercises were individually tailored, instructed and supervised.	170	12-week intensive function program had long-term effect after three months of detraining on balance. EG improved both balance ad strength during strength training period while the CG improved in balance and declined in strength. From baseline to 6 months assessment, the EG improved on the NPI sub score and all sub-scores while the CG deteriorated on these scores.	Possible effect of exercise on agitation is demonstrated after intervention period of 12 weeks followed by a detraining period of 12 weeks. Encouragement and stimulation to be physically active is of great importance, and access to rehabilitation staff seems crucial to achieve improvements in function among nursing home residents. Physical training needs to be on-going to be successful.
Traynor et al., 2018	Evaluate effect of a structured program on agitation, QOL, wandering, and mobility of PWD, using in house resources	Methods: Quasi-experimental pre-test and post-test Outcomes/Measures: Agitation and wandering	Structured physical activity (PA) program by physiotherapists, physiotherapy aides and diversional therapy staff-3 times per week for 30 mins over 16 weeks	72	Statistically significant decrease in agitated behaviours, aggressive behaviours and physically non-aggressive behaviours, eloping behaviours following the structure PA program. Trend of decreased verbal agitation, persistent walking.	Extensive consultation activity used workshops to consult with/ train the care home staff to develop the content for structured PA program, motivated staff. Workload was allocated by the Directors of Nursing and physiotherapist manager to nursing, organizational support at the highest levels ensured intervention was consistently implemented.
Tse et al., 2018	Explore the effectiveness of play activities program among nursing home residents with dementia	Methods: Clustered RCT Outcomes/Measures: Behavioural symptoms, functional mobility, pain, happiness/depression, cognitive function/functional status, and social involvement	Play activities Program (PAP) 8-week program1 hour session each week over 8 weeks 10 mins of warm up, 20 mins of play activities, 10 mins of cool down. Each session had a theme that involved a game.	29	No significant differences in pain level between the two groups. Significant treatment effects on pain, depression level and happiness level. No significant effects on ADLs, happiness, social engagement, behavioural symptoms & mobility. Significant effects on pain intensity and satisfaction with non-pharmacological effects on pain intensity and satisfaction with non-pharma therapy.	PAP has positive impacts on the nursing home residents with dementia with regard to the pain situation and psychological parameters Treatment effects of PAP included reduction in pain intensity and depressive symptoms, as well as improvement in happiness level Dementia residents expressed happiness over sevenfold more often during recreation time than during ordinary time.

Table C7. Staff training and education

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Chen et al., 2015	Compare effect of the Pain Recognition and Treatment (PRT) protocol with basic pain education versus basic pain education improving pain management performance of RNs for PWD.	Methods: Cluster RCT; Questionnaires + Observation Outcomes/Measures: Pain intensity and pain behaviours Agitated behaviors, referrals; MMSE, BI, VDS, PAI-NAD, CMAI, use of non-pharmalogical strategies	PRT protocol: (1) Primary pain assessment; (2) Secondary pain assessment (comprehensive); (3) Pain treatment; (4) Reassessment at regular intervals.	170	The experimental group of nurses used significantly more weekly non-pharmalogical strategies and referrals at post intervention, and the cognitively impaired residents had significantly lower weekly average scores on both VDS and PAIN-AD. Cognitively impaired residents in the EG had fewer verbal and behavioral expression of pain than those in the CG. No significant differences between groups in agitated behaviors.	Positive effects in non-pharmalogical substitutions were not seen at 3-month follow-up. Teaching and implementing the PRT protocol more effective at improving RN's pain management capabilities than basic education. PRT protocol not only enhanced knowledge but, by standardizing the care process, it increased level of implementation, thus adequate pain management and the relief. Suggests that the heavy workloads of RNs may reduce their intention to continue with intervention.
Gozalo et al., 2014	Evaluate the effectiveness of the Bathing Without a Battle in reducing physical and verbal aggressive behaviors for nursing home PWD	Methods: RCT; Observations Outcomes/Measures: Rate of physical/verbal aggressive behaviours, agitated behaviours, Bath duration Bath modality Antipsychotic medications; CAREBA	BWAB; different communication techniques to make bathing safe and comfortable for the persons receiving and giving care, regulates the physical environment.	240	Consistent with training, showers declined more than 10% and use of in-bed bathing increased 17%. Bath duration significantly decreased (1.5 minutes, or 15%, per bath). Fewer residents demonstrating aggressive or agitated behaviors after the intervention. BWAB was associated with a 15.2% reduction of time that residents were observed to be calling for help, statistically significant.	BWAB is successful when it becomes part of a facility-wide culture change, managers informed of implementation processes/ benefits to provide support and encourage revision of procedures. Train-the-trainer implementation model; using multiple in-staff trainers allows for customization to staff/ resident needs, thus reducing the costs of training, maintaining continuity of the intervention, reducing risk of losing trainer.
Levy-Storms et al., 2016	To improve CNAs' therapeutic techniques for relating to agitated residents during care	Methods: Mixed effect Poisson regression Outcomes/Measures: Poisson variables; count of the number of refusals across time intervals, CNAs communication behaviour	Training for CNAs to provide feeding assistance to patients with dementia, videos to evaluate	16	At post-test all counts of therapeutic communication behaviours increased significantly by 35%. 81% decrease in resident's refusals (not significant). At post-test, 2/4 of the therapeutic communication behaviors had significant effects on residents' refusals. No effect of the intervention as a whole on residents' refusals but did improve CNAs' communication. Significant negative association with refusals at post-test but not pretest.	Direct/redirect and sitting in front both were negatively associated with the count of residents' refusals. When CNAs used the communication techniques as needed, they would be engaging in person-centered care. Emotional connection techniques with CNAs represent fundamental aspects of humanity currently not substantively or meaningfully addressed in existing training or research.

McCabe et al., 2015	To evaluate a training program to assist staff to manage BPSD in residential care	Methods: RCT Outcomes/Measures: Changes in BPSD; CMAI and frequency/ duration of challenging behaviors. Changes in staff adjustment.	Four staff training conditions: (1) training in the use of a BPSD-structured clinical protocol, plus external clinical support, (2) a workshop on BPSD, plus external clinical support, (3) training in the use of structured clinical protocol alone, and (4) care as usual.	Staff (n = 204) and residents (n = 187)	Both conditions including training improved challenging behaviours, but effects were not maintained without clinical support. Training/ support condition sustained improvements in both staff & resident variables, other conditions only improved in some variables. BPSD lowered in all intervention conditions. Significant time effects were found for the training/ support condition and the training condition. Intervention reduced the frequency of the referred behaviour, perceived disruptiveness, staff stress, and CMAI frequency, and more generic staff measures.	When the protocol was available but clinical support was not offered, there was improvement in behaviour (CMAI) up to three months, but this was not maintained. Sustained improvement in staff self-efficacy in dementia care including ability to manage challenging behavior. In the clinical support only condition, staff were less stressed by the behaviour, perceived it as less challenging. In the training only condition, no effect on other variables Could be that the mere benefits of being in an intervention are wearing off on the CMAI score.
Meillor et al., 2015	Investigate if the addition of clinical support in the McCabe study improved compliance with structured protocol, and if compliance was related to greater long-term reductions in BPSD.	Methods: Compliance study based on previous larger study Outcomes/Measures: Compliance ratings; adherence to the protocol and challenging behaviour	4 staff training conditions: (1) training in the use of a BPSD-structured clinical protocol, plus external clinical support, (2) a workshop on BPSD, plus external clinical support, (3) training in the use of the structured clinical protocol alone, and (4) care as usual.	101; 8 Facilities	Significant higher ratings of compliance were found in the clinical support condition, compared to none. Compliance was not significantly associated with CMAI score, stress or disruption, but an interaction effect-higher compliance ratings associated with higher CMAI scores, inverse occurred with no clinical condition. Higher compliance ratings were significantly associated with higher stress levels and perceived disruption at T2 but not T3. Absence of regular support resulted in very low compliance levels.	Compliance effects are likely to be linked to clinical support; proactive approach, guidance and ongoing support. Absence of mental health consultations and instrumental support can seriously impede implementation. Increase in stress and disruption may have resulted from purposeful focus on identifying challenging behaviour as part of clinical protocol. Higher levels of stress may be caused too by higher workload from implementation. Interventions may have led to greater understanding of BPSD and increased sensitivity/ awareness.
Pieper et al., 2016	Assess whether implementation of a stepwise multicomponent intervention is effective at reducing challenging behavior/depression in NH residents with advanced dementia	Methods: Clustered RCT Outcomes/Measures: Agitation (CMAI), psychotropic medication use, NPS (NPI-NH), and symptoms of depression (CSDD, MDS-DRS)	Comprehensive stepwise multidisciplinary training, STA OP! protocol; the control condition received training on general nursing skills, dementia management and pain without the stepwise component.	288	Overall effect of intervention on challenging behavior & depression; decreased CMAI (avg. of 4.07pts), decreased NPI-NH (avg. of 3.57 pts), decreased CSDD (avg. of 1.59pts) and MDS-DRS (avg. of 1.4pts). Scores were significantly lower in IG than CG. Significant reduction in anti-depressants; non-significant reduction in anti-psychotics, anxiolytics and hypnotic sedatives. The effect was experienced at 3 and six months, stronger at six months.	One reason for non-significant findings in medication reduction might be that the physicians were not coached enough in decreasing psychotropic medication when starting the STA OP! protocol.

Resnick et al., 2016	Test feasibility and preliminary efficacy of the EIT-4-BPSD using parts of the Reach, Effectiveness, Adoption, Implementation & Maintenance model	Methods: Single group repeated-measures study Outcomes/Measures: Pain, agitation, function, resistive behaviour, QOL, depressive symptoms, antidepress-ants, anxiolytics, antipsychotics, care plans	Evidence Integration Triangle for BPSD, implemented by research nurse with internal champion and stakeholders using 4 step approach; (1) assessment of policies and environment; (2) staff education; (3) PCC plans; and, (4) mentoring/motivating of staff.	21	Significant decrease in agitation and increase in QOL. Nonsignificant decrease in depressive symptoms from baseline to follow-up. No significant changes in pain or function, or in use of psychotropic medications. Significant increase of symptoms that had behavioural interventions incorporated into the care plan. Active and full participation among stakeholder teams at each of the monthly meetings.	Revisions to program should include the incorporation of prescribers of psychotropic medications on the stakeholder team, consideration of additional measures that may be more appropriate for residents with moderate to severe dementia with regard to function and quality of life, and inclusion of an observation measure of staff to indicate that care plan approaches are being implemented as intended.
Ryan et al., 2018	Evaluate the utility of the structured clinical protocol in both residential aged care facilities (RAC) and specialist disability accommodation	Methods: Pilot study Outcomes/Measures: Changes in resident BPSD and changes in staff coping; NPI-NH	Structured clinical protocol; emphasizes PCC, bio-psychosocial approach. Staff attended two 90-minute training sessions. Clinical neuro-psychologist provided 9-week training package for behaviour champions.	13 PWD, 51 Staff	No significant reduction effect on BSPSDs in the RAC as well as no significant reduction in perceived level of organizational disruption associated with the behaviours. In SDA rating revealed significant reduction in BPSD.	Finding provide preliminary support for feasibility and efficacy of a PND-specific structured clinical protocol. Findings suggest BPSD are amenable to change via context-sensitive behaviourally focused approaches that aim to respond to the individuals unmet psychological, social and emotional needs.
Testad et al., 2016	Evaluate the effectiveness of a tailored 7-month training intervention "Trust Before Restraint "in reducing use of restraints, agitation, antipsychotic medications in PWD in NH	Methods: Cluster randomized controlled trial; Standardized Interviews Outcomes/Measures: Use of restraint and agitation, SMAI	Trust before restraint intervention; 7 step guidance group Manual was provided to all staff. Two phases; (1) education and coaching to support 4 teams of facilitators consisting of 8 clinical research nurses, (2) delivery of the intervention within 2-4 weeks.	274	Statistically significant differences between IG and CG for age, ADL score, SMAI score, and NPI sum score. Use of any restraint reduced significantly in both the intervention and control group, with a greater reduction trend in the control group. Number of episodes decreased from 33 at baseline to 23 at follow up There was significant reduction in SMAI score in both the intervention group and the follow-up group with a slightly higher reduction CG.	Statistically significant reduction in the use of restraint in all homes over the 7- month study period. Use of restraint was almost unchanged in treatment group. Findings may be indicatory of a treatment response by care staff, having received the TFT intervention had increased awareness of the issues associated with restraint use and were highly motivated to identify and report restraint compared to control counterparts.

Tija et al., 2017	Quantify the influence of a large-scale communication training program on NH antipsychotic use called OASIS	Methods: Quasi-experimental longitudinal Outcomes/Measures: Prevalence of antipsychotic use, behaviour problems	OASIS program uses an innovative training curriculum built on a hierarchy of needs by MaslowOASIS reframes challenging behaviour as the communication of unmet biological and psychological needs.		A decreased trend in prevalence of antipsychotic use in the baseline period was found for both Oasis NHs and the comparison NHs. Estimates of the antipsychotic use trend in the post-intervention implementation period revealed that while both OASIS NHs and the comparisons NHs were experiencing decreases, OASIS NHs experienced greater declines.	OASIS program was associated with a reduction in antipsychotic use prevalence during implementation, but it was not sustained. Intervention had most measurable influence in 6-month period of implementation after a 3-month training period. Program to understand resident communication and treat the personhood without an overt focus on antipsychotics can effectively reduce risky medication use.
Zwijsen et al., 2014	Determine the effects of the Grip on Challenging Behavior care program	Methods: Cluster Randomized Controlled Trial Outcomes/Measures: Challenging behaviour; CMAI, NPI-NH	Grip on Challenging behaviour, an evidence and practice-based care program Consists of 4 steps: detection, analysis, treatment, and evaluation, Full training for staff on program10 min sessions 3 times per week .	659 17 dementia special care units across 17 different nursing homes	None of the analyses showed significant differences in CMAI scores at baseline. Intervention effect on CMAI scores was 3.2 between the intervention-intervention and the control-control group when implementation was good. A significant decrease in clinically relevant symptoms of delusions, depression, apathy, disinhibition, and AMB was found. No significant effects were found in any of the restraint categories.	Significant decrease of challenging behavior was found in DSCU care program group for over 8 months compared to control, but smaller than expected. The frequency of the use of the detection tool, which was administered semi- annually, might have resulted in the delayed effect in CMAI scores. A decrease was found for several individual NPI items but for the total number of clinically relevant NPS a decrease was only found for residents with severe dementia.

Table C8. Environmental modifications

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Figueiro et al., 2014	Test if lighting will improve objective/subjective sleep levels, reduce depression & agitation in ADRD.	Methods: Quasi-experimental; Observations Outcomes/Measures: Depression Agitation ADLs Quality of sleep; PSQI, MDS-ADL, CSDD, CMAI	Custom luminaires, timer was programmed to automatically turn on all luminaires close when resident woke up (generally between 6–8 am) and off at 6 pm.	14	The present results showed white light significantly improved sleep efficiency and global PSQI scores, and decreased depression (CSDD) and agitation (CMAI) scores. The lighting intervention also increased phasor magnitude, suggesting an increase in circadian entrainment.	NR
Konis et al., 2018	Examine effect of daylight exposure (indoor) on depression/ neuropsychiatric symptoms in PWD in LTC communities	Methods: Pilot study, non-randomized cluster trial Outcomes/Measures: Depression (CSDD & NPI-NH), two neuro-vegetative types of changes; appetite/eating disorders, sleep/nighttime behavior disorders	Increasing indoor exposure to day light, 12-week study, 2 additional hours a day of daylight exposure.	77	LuxAVG measures at daylight group were significantly higher than in CG. IG showed an average decrease over the trial in both NPI-NH and CSDD, CG showed an average increase in NPI-NH and CSDD. Average CSDD score in IG reduced for those with probable major depression by over 11 points, to 5.6 (below threshold of 6 indicating absence of significant depressive symptoms).	Significant differences between groups (CSDD mean values) at baseline and endpoint. Findings may be due to chance. Does not discuss specific elements that might lead to success.
Tartarini et al., 2017	Gather quantitative evidence on possible correlation between indoor air temperature and agitation of PWD	Methods: Longitudinal prospective cohort study, Observational Outcomes/Measures: Agitated behaviours, indoor air temperature, time spent by each resident in various areas in NH	Indoor temperature adjustment Temperature ranged from 33.6°C to 16.2°C.	330	CMAI total frequency scores increased when residents were exposed to either relatively cold or warm indoor temperatures at a statistically significant level. Agitation was significantly correlated with the amount of hours residents were exposed to temperatures higher than 26°C and lower than 20°C.	Exposure of resident's to temperatures outside of the comfort range did not only have negative impact on their comfort but also negatively affected their behaviours, specifically agitation. Best results when temperatures were between 26 and 20°C.

Table C9. Nursing interventions

Author/ Year	Aim	Methods & Outcomes/Measures	Intervention(s)	Sample	Results/ Key Findings	Contextual factors
Appelhof et al, 2019	Evaluate the effect of multi-disciplinary intervention for management of NPS with young-onset dementia YOD	Methods: Cluster RCT/stepped wedge Outcomes/Measures: Agitation, Aggression, NPS, (apathy delusions, irritability, etc.); CMAI, NPI-NH	"Grip on NPS in Institutionalized People with YOD" NH staff received an educational program, structure the process of detection, analysis, treatment, and evaluation of NPS.	274	No significant effects of the intervention on physically aggressive behaviors, physically nonaggressive behaviors, or verbally agitated behaviors. After being more exposed to the intervention for a longer period of time, it became more effective in decreasing delusions (potentially the result of multiple testing).	Reason for lack of symptom reduction may be that they already developed some degree of effective working methods for NPS management in YOD before intervention. Process evaluation showed some NH staff had overlap between the intervention and current working methods, rated some steps of the interventions as irrelevant.
de Pooter-Stijnman et al., 2018	Investigate effect of caffeine reduction on sleep and challenging behavioural symptoms in NH PWD	Methods: Quasi-experimental, pre/post comparison Outcomes/Measures: Behavioural symptoms, Sleep, Psychotropic medication	During the wash-out period, caffeine intake was gradually reduced Post-intervention phase participants took caffeinated coffee in the morning (6 am to 12 pm) and decaf coffee (from 12 pm on)	21	The total sleep score significantly improved in the post-intervention period, and increased number of times quietly sleeping was scored. Domain score for apathy in the afternoon & evening significantly decreased post-intervention. No pre-post change in other behavioural domain scores or in average number of times as-needed psychotropic medication was given.	There were no adverse effects or comments about the taste of the decaffeinated coffee, which makes the introduction relatively simple.
Kromhout et al., 2014	Explore the relation between caffeine and behavioural symptoms in a group of elderly PWD	Methods: Observational pilot study; Questionnaires Outcomes/Measures: Sleep, apathy aggression, depression, anxiety, irritability, and AMB; NPI-NH, consumption	Reducing caffeine consumption at different time intervals- during a 96h observation period	29	Negative correlation between caffeine and aberrant motor behavior and apathy, and number of times participants got up at night (when drank after 6 p.m.) 6 showed no behavioural symptoms at all during observation, 5 had behavioural symptoms at least once a day. Irritability was the most frequent (n=20), then AMB (n=12). Aggression observed in 9 participants, 5 of which had more than one episode.	Sleeping difficulties cannot be explained by the stimulating effects of caffeine may be due to diuretic effects of caffeine. Negative correlation between apathy and caffeine might be a result of coffee consumption, may also imply that caffeine can be used as a therapeutic measure. A possible mechanism for the inverse correlation between caffeine, apathy and AMB is through the acetylcholinesterase pathway.
Erdman & Schnepp 2014	(1) Study how Integrative Validation Therapy (IVA) is practiced in an LTCF; (2) generate hypotheses about	Methods: Descriptive, exploratory, Interviews Outcomes/Measures: (1) Attitude toward PWD; (2) Perception of skill involved in IVA; (3)	IVA Steps: 1. Perceive feelings (e.g. Anxiety) and motivation (e.g. diligence). ((2) Validate feelings and motivation (3) Generalize feelings	17	Attitude: unconditional appreciation of and respect for PWD; Skills: collection of biographical data; Validation: validating motivation, life themes and feelings; Documentation: biography of each residents; Outcomes: residents experience a sense of	Specific characteristics which can exert an important influence on the application of IVA; the knowledge and skills of the employees, an organizational culture of appreciation and trust between management and employees, - specialized dementia care units --the

	effects of IVA on PWD (3) explore if IVA is accepted by nurses/relatives of PWD	Validation; (4) Evaluation of IVA; (4) Documentation; (5) Outcomes	and motivation (4) Validate the person with short sentences about biographical themes.		trust, belonging, attachment and perception of own identity.	inclusion of other interventions like music and dance therapy, milieu therapy, --information and support of the relatives.
Folkerts et al., 2018	To test the feasibility and potential effects of cognitive stimulation in persons with Parkinson's disease dementia.	Methods: RCT Outcomes/Measures: Cognitive function NPS ADLs QOL; CERAD, NPI GSD CSDD, QOL EQ-5D-5L. QUALIDEM	NEUROvitalis senseful is offered to small groups (3- 5 persons) over a period of 8 weeks, 2x week for 60 minutes; Exercises were adapted to the typical cognitive and psycho-motor profile of PD patients.	12	Findings indicate that CS is a safe therapy option for patients with PDD and has possible positive short-term effects on cognition and neuropsychiatric symptoms for residents with PDD in long-term care. Preliminary long-term CS benefits were found at the six-week FU for depressive symptoms, again with a strong effect size.	The residents attended between 11 and 16 CS sessions. Nursing staff was very interested in the study process and supported its organization. The impression of the trainer was that the residents were also pleased to participate, and several individuals mentioned that they enjoyed the CS sessions.
Huang et al., 2015	Investigate the immediate and long-term (6 to 10 months) effects of RT on cognitive functions and depressive symptoms	Methods: Meta-Analysis Outcomes/Measures: Cognitive Function	Reminiscence therapy, inducing a vocal or silent recall of past activities, events, and experiences in the life of a person by using tangible prompts.	1325 participants across 12 studies	Reminiscence therapy had a small-size effect on cognitive functions and a moderate size effect on depressive symptoms in elderly people with dementia.	One possible mechanism underlying effectiveness of RT in improved CF is the increased use of remote memory. Continuity theory; elderly people maintain continuity by recalling their past using familiar skills, knowledge and strategies. Through this, PWD can review/evaluate memories and thus improve general cognitive functions.
Karel et al., 2016	Describe the implementation of the program and evaluation of clinical outcomes for Veterans and staff feedback.	Methods: Observational Pilot Study Outcomes/Measures: Measured behaviours clustered into 6 types: care refusal or resistance, agitation, aggression, vocalization, wandering, and other.	STAR-VA- an interdisciplinary behavioral approach for managing challenging dementia-related behaviors in its Community Living Center.	71	Frequency/severity of target behaviors and depression, anxiety, and agitation all significantly decreased. Mean frequency score, across all behaviours, reduced from 3.4 to 1.8 (45.4%). Mean severity score, across all behaviours, reduced from 3.1 to 1.1 (63.8%). Highest (most positive) mean scores amongst BCs and NCs were in outcomes of Veteran Benefit and compatibility of intervention with ongoing cultural transformation efforts. Staff rated both benefits and program feasible for Veterans.	Broad consensus among BCs & NCs, most successful intervention elements; are attitude, enthusiasm about STAR-VA, training, strong interpersonal skills, listening/ communication, team player empathy etc. Nurse Champion role helped address the need to promote buy-in and engagement of care staff, health professionals/administrators. Helped understanding of Veteran exhibiting distressed behavior, empowering the team to adjust interpersonal/ environmental care approaches to meet patients' needs and preferences.

Kovach et al., 2018	Determine the feasibility of mindfulness interventions for older adults in LTC setting and examine differences in outcomes between mindfulness/cognitive activity	Methods: Cross-over design of a pilot study, experimental design Outcomes/Measures: Agitation (CMAI), affect (OERS), stress (SC), engagement ASDS, sleep (Basic Motion logger), discomfort (DAT), communication of need (CON-DAT)	Mindfulness intervention; Present in the Now (PIN) Intervention was used; 3 components; attentional skill exercises, compassion meditation, and body awareness activities.	36	Intervention feasible for continued practice in cognitive impairment. Short-term changes in agitation, discomfort, anger, and anxiety were statistically significant. Agitation scores decreased during and 20 minutes after PIN, long term agitation did not change in PIN condition but did in cognitive activity. No changes at night in either the PIN or COG groups for total sleep time, sleep efficiency, WASO, sleep latency or fragmentation index. Decreased their daytime sleep by an average of 27 minutes. Discomfort scores decreased in PIN group 193 points and increased by 19 points in COG.	Mindfulness found suggests that participants may have either become more aware of feelings of comfort; thus, were able to physically relax, causing feelings of physical discomfort to decrease; or had decreased emotional reactivity to their discomfort.

NORTH AMERICAN
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