Impact of sensory interventions on the quality of life of long-term care residents: a scoping review

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ABSTRACT

Introduction and purpose Residents in long-term care exhibit diminishing senses (hearing, sight, taste, smell or touch). The purpose of this study was to examine the available literature on the impact of sensory interventions on the quality of life of residents living in long-term care settings.

Methods We conducted a mixed-methods scoping review using Arksey and O’Malley’s framework. Seven databases (Medline (Ovid), PubMed (non-Medline-Ovid), CINAHL (EBSCO), Embase (Ovid), Ageline, PsycINFO (Ovid), Cochrane Central Register of Controlled Trials until 1 December 2020) were searched. Two reviewers independently screened the studies for sensory interventions using a two-step process. Eligible studies underwent data extraction and results were synthesised descriptively.

Results We screened 5551 titles and abstracts. A total of 52 articles met our inclusion criteria. Some interventions involved only one sense: hearing (n=3), sight (n=12), smell (n=4) and touch (n=15). Other interventions involved multiple senses (n=18). We grouped the interventions into 16 categories (music programmes, environmental white noise, bright light interventions, visual stimulations, olfactory stimulations, massages, therapeutic touch, tactile stimulations, physical activity plus night-time programmes, pet therapies, various stimuli interventions, Snoezelen rooms, motor and multisensory based strategies, Namaste care, environmental modifications and expressive touch activities).

Conclusion This preliminary review summarised some of the available sensory interventions that will help inform a series of future systematic reviews on each of the specific interventions. The evidence-based knowledge for sensory interventions will also inform a future audit programme for assessing the presence of sensory interventions in long-term care.

INTRODUCTION

Our population is ageing. According to new data from the UN, by 2050, one in six people worldwide will be over age 65, up from 1 in 11 in 2020. In Europe and North America, by 2050, one in four people will be 65 or over, and the number of people 80 and older worldwide is projected to triple by 2050, from 143 million to 426 million.

As people age, their senses (hearing, sight, taste, smell and touch) decline. Previous research has associated sensory loss with decreased quality of life in older adults. As the population gets older, many more people will be living in long-term care communities. These sensory impairments are not always considered in the design of these environments.

Many studies have investigated methods of modifying the physical environment to create a more enriching sensory environment for older adults living in long-term care settings. Such interventions have included: adequate lighting, appropriate environmental temperatures, removal of unpleasant noises, presence of pleasant sounds (music) and installation of multisensory environments including sensory gardens or Snoezelen rooms. Other studies have focused on sensory interventions such as: physical contact, animal therapy, aromatherapy and essential oils, and nutrition.
living in long-term care. This study aimed to examine the available literature on the impact of sensory interventions on the quality of life of residents living in long-term care settings. Specific objectives were: (1) to summarise the current knowledge of sensory interventions on the quality of life of residents living in long-term care and (2) to assess the impact of these sensory interventions on quality of life and/or individual concepts of quality of life of residents.

**METHODS**

**Research design and methodology**

We followed the five-stage process by Arksey and O’Malley for conducting this scoping review: (1) identify a research question, (2) identify studies relevant to the research question, (3) review and select a subset of studies for inclusion in the final review, (4) chart the information and data for the selected studies and (5) collate, summarise, and present the results. We also adhered to the Preferred Reporting Items for Systematic Reviews, Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) reporting guideline. The PRISMA-ScR checklist is available in online supplemental table S1.

**Patient and public involvement**

No patients involved.

**Deviations from the protocol**

Originally, we had planned to conduct a mixed-methods systematic review and had published our methods in a protocol. However, given the broad nature of the topic and our findings, we decided to first conduct a scoping review that will then guide a future series of focused systematic reviews on each of the sensory interventions identified in this scoping review.

**Identify a research question**

Our research question for the scoping review was: What is known from the existing literature about the impact of sensory interventions on the quality of life of residents living in long-term care settings?

**Identify studies relevant to the research question**

The search strategy was devised in consultation with a specialist health sciences librarian (JS), and a second health sciences librarian peer reviewed the search strategies using the Peer Review for Electronic Search Strategies. The following databases were searched from inception to 1 December 2020: Medline (Ovid), PubMed (non Medline-Ovid), CINAHL (EBSCO), Embase (Ovid), Ageline, PsycINFO (Ovid) and the Cochrane Central Register of Controlled Trials. The search strategy used in the MEDLINE database is available in online supplemental table S2. No restrictions were applied to language, publication type or year.

Inclusion and exclusion criteria were applied to all studies, enabling a transparent and focused selection of articles of interest.

We included:

1. Studies with older adult residents living in long-term care settings. We adapted the definition of ‘older person’ depending on the settings where the studies were conducted. For example, the WHO’s definition for ‘older people’ in Africa is 60 years of age or older. Long-term care settings were defined as: ‘domestic-styled environment[s] that provides 24-hour functional support and care for persons who require assistance with activities of daily living and who often have complex health needs and increased vulnerability’. (36, P 183)

2. Studies focused on any of the five senses (sight, hearing, taste, touch and smell) implemented by an organisation. Interventions had to be implemented at the facility or unit level and had to include at least one of the five senses. Examples of such interventions include but are not limited to auditory stimulation (used to enhance mood, promote relaxation and cognition), pet therapy (used to reduce agitation and provide social stimulation, particularly in older people with dementia) and modification of the physical layout of the environment (allowing residents to see and smell food as it is being prepared).

3. Studies focused on the following outcomes: health-related quality of life or any of the six individual components of quality of life (mental health, energy/fatigue, emotional well-being, bodily pain, social functioning and satisfaction). Health-related quality of life was defined as ‘a multidimensional concept that includes domains related to physical, mental, emotional and social functioning. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life’. (39, P1) The individual components of quality of life were based on the 36-Item Short Form Survey (V.1.0).

4. Randomised and non-randomised studies, controlled before-and-after studies, retrospective or prospective cohort studies, mixed-methods studies and qualitative studies (that included an intervention).

We excluded:

1. Studies combining long-term care and non long-term care populations (eg, acute care, community-dwelling elders) where outcomes were not reported separately by population.

2. Review and select a subset of studies for inclusion in the final review:

All records were exported into Covidence (an online systematic review software) for removal of duplicates and reference management. We used a two-step process to screen the results of the literature search as follows: (1) title and abstract screening and (2) full-text screening. Screening was performed independently by reviewers (DC-Y, MD-V and MC). Another reviewer (CB) was consulted in the case of inclusion and exclusion conflicts.
Chart the information and data for the selected studies
Two reviewers (MD-V and DC-Y) independently extracted data from each study using a standardised data abstraction form. Data included: study characteristics (year of publication, authors, country), study objectives, study design, target population, sample size, description of the practice, outcome measures and study results. Authors of the studies were contacted to request missing or additional data where required and were given 30 days to respond.

Collate, summarise and present the results
The data extracted from the eligible studies were grouped by intervention type and analysed according to each of the senses (hearing, sight, taste, touch, smell). Studies that included more than one sense were aggregated and analysed separately. Due to the wide range of sensory interventions found in the included studies, the results are presented descriptively.

RESULTS
Study selection
Results of the search strategy were documented within the PRISMA flow diagram (figure 1). We obtained 10,878 records from our searches. After removal of duplicates, 5,551 records were screened for inclusion. Application of the inclusion criteria to titles and abstracts resulted in the exclusion of 5,238 records. We retrieved 313 full-text articles; following application of inclusion criteria to full-text articles, we retained 52 studies (18, 20, 22, 24, 42–90) (see table 1).

Excluded full-text articles (n=261), and reasons for exclusion are found in online supplemental table S3.

Characteristics of the included studies
Twenty-three (44.2%) of the 52 articles were conducted in the USA (20, 24, 45, 46, 49, 54, 57, 61, 62, 65, 66, 68/69, 71, 74–77, 79, 84–87, 90), four (7.7%) in Australia (18, 22, 25, 44), three (5.8%) in Turkey (60, 72, 73), two (3.8%) in Japan (50, 59), two (3.8%) in Canada (62, 67), two (3.8%) in the Netherlands (53, 88/89), two (3.8%) in Belgium (43, 86) and two (3.8%) in...
Table 1  Characteristics of the included studies (n=52)

| Reference | Study design | Country       | Setting                                      | Population                                             | Intervention categories                                                                 | Quality of life outcomes                                      |
|-----------|--------------|---------------|----------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------|
| **Studies involving hearing-related interventions** | | | | | | |
| Burgio (1996) | Non-controlled before-and-after study | England | 2 nursing homes | n=13, residents with severe cognitive impairment | Environmental “white noise”  
A specific environmental sound tape for use on the unit | Emotional well-being (agitation) |
| Goddaer (1994) | Non-controlled before-and-after study | Belgium | 2 nursing homes | n=29, dementia residents | Relaxing music during meals | Emotional well-being (agitation) |
| Travers (2011) | Non-controlled before-and-after study | Australia | Community-dwelling persons and residents of residential care facilities | n=72, dementia residents | Radio/music programme  
Listening to a daily radio programme | Quality of Life – Alzheimer’s disease  
Mental health (mood) |
| **Studies involving sight-related interventions** | | | | | | |
| Figueiro (2014) | Non-controlled before-and-after study | USA | Long-term care facilities | n=14, dementia residents | Bright light interventions  
Exposed to varying light conditions | Energy/fatigue (sleep)  
Mental health (depression)  
Emotional well-being (agitation) |
| Figueiro (2019) | Cross-over trial | USA | 4 assisted-living facilities and 4 long-term care facilities | n=46, dementia residents | Bright light interventions | Energy/fatigue (sleep)  
Mental health (depression)  
Emotional well-being (agitation)  
Overall quality of life measure using Minimum Data Set Activities of Daily Living |
| Giggins (2019) | Pilot RCT | Ireland | 1 nursing home | n=10, cognitive status not reported | Bright light interventions | Energy/fatigue (sleep)  
Mental health (mood) |
| Hopkins (2017) | Cross-over trial | UK | 7 care homes | n=80, cognitive status not reported | Bright light interventions | Energy/fatigue (sleep)  
Mental health (mood) |
| Konis (2018) | Pilot non-RCT | USA | 8 dementia care communities | n=77, dementia residents | Bright light interventions | Mental health (depression) |
| Koyama (1999) | Case series | Japan | 2 nursing homes | n=6, cognitive status not reported | Bright light interventions | Energy/fatigue (sleep) |
| Linander (2020) | Cross-over trial | Denmark | 1 municipality-based care home | n=34, cognitive status not reported | Bright light interventions | Energy/fatigue (sleep) |
| Munch (2017) | Non-RCT | Switzerland | Nursing home | n=89, dementia residents | Bright light interventions | Quality of Life for Severe Dementia scale  
Mental health (pleasure)  
Emotional well-being (agitation)  
Energy/fatigue (sleep) |

Continued
Table 1

Continued

| Reference                   | Study design           | Country     | Setting                                           | Population                                      | Intervention categories                                      | Quality of life outcomes                        |
|-----------------------------|------------------------|-------------|--------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|
| Riemersma-vanderLek (2008)  | RCT                    | Netherlands | 12 homes for the elderly/assisted care facilities | n=189, dementia residents                       | Bright light interventions                                    | Mental health (affect)                           |
| Sumaya (2001)               | Cross-over trial       | USA         | 1 long term care facility                        | n=10, cognitive status not reported             | Bright light interventions                                    | Mental health (depression)                      |
| Wahnschaffe (2017)          | Non-controlled before-and-after study | Germany    | 1 nursing home                                   | n=15, dementia residents                       | Bright light interventions                                    | Emotional well-being (agitation)                 |
| Wikstrom (1993)             | Controlled before-and-after | Sweden     | 1 senior citizen apartment (moderate needs of assistance) | n=40, no dementia residents                    | Visual stimulation with pictures (works of art) | Mental health (happy)                           |
| RCT                         |                        |             |                                                   |                                                 |                                                               |                                                 |
| Bae (2020)                  | RCT                    | USA         | 2 long-term care facilities                      | n=58, no dementia residents                   | Olfactory stimulation with lavender                           | Emotional well-being (anxiety)                  |
| Lin (2007)                  | Cross-over trial       | China       | Care and attention homes                         | n=70, dementia residents                      | Olfactory stimulation with lavender                           | Emotional well-being (agitation)                 |
| Sakamoto (2012)             | RCT                    | Japan       | 3 nursing homes                                  | n=145, dementia residents                     | Olfactory stimulation with lavender                           | Emotional well-being (agitation)                 |
| Snow (2004)                 | Non-controlled before-and-after study | USA        | 1 nursing home                                   | n=7, dementia residents                         | Olfactory stimulation with lavender Smelling of lavender oils | Emotional well-being (agitation)                 |
| RCT                         |                        |             |                                                   |                                                 |                                                               |                                                 |
| Alp (2020)                  | RCT                    | Turkey      | 1 nursing home                                   | n=60, no dementia patients                     | Therapeutic touch                                             | Bodily pain (comfort levels)                    |
| Butts (2001)                | RCT                    | USA         | 2 nursing homes                                  | n=45, dementia residents                       | Massage Regular massage of back, neck and/or shoulders to promote relaxation | Satisfaction (life satisfaction/self-actualisation) |
| Corley (1995)               | RCT                    | USA         | 1 private institution +1 federal long-term care facility | n=19, cognitive status not reported           | Massage                                                       | Mental health (mood)                            |
|                            |                        |             |                                                   |                                                 |                                                               |                                                 |
| Reference        | Study design                      | Country   | Setting                          | Population                  | Intervention categories                                                                 | Quality of life outcomes                                      |
|------------------|-----------------------------------|-----------|----------------------------------|-----------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Gregory (2005)   | Non-controlled before-and-after study | Australia | Aged care facilities             | n=121, cognitive status not reported | Therapeutic touch A structured and standardised healing practice performed by practitioners trained to be sensitive to the receiver's energy field that surrounds the body; no touching is required. | Emotional well-being (behavioural symptoms) Pain                  |
| Hawranik (2008)  | RCT                               | Canada    | 1 long-term care facility        | n=51, dementia residents    | Therapeutic touch                                                                         | Emotional well-being (agitation)                                 |
| Howard (1988)    | RCT                               | USA       | 1 nursing home                   | n=30, cognitive status not reported | Tactile stimulation Touch by the instructor while participating in a craft project         | Mental health (mood)                                             |
| Kim (1999)       | Non-controlled before-and-after study | Korea     | 1 home for the aged              | n=29, dementia residents    | Physical touch                                                                             | Emotional well-being (anxiety)                                  |
| Kolcaba (2006)   | RCT                               | USA       | 2 nursing homes                  | n=60, no dementia residents | Massage                                                                                   | Bodily pain (comfort levels) Satisfaction (satisfaction with care) |
| Sansone (2000)   | Case series                       | USA       | 1 nursing centre                 | n=59, cognitive status not reported | Massage                                                                                   | Emotional well-being (anxiety) Pain                              |
| Simington (1993) | RCT                               | Canada    | 2 small +2 large urban long term care facilities | n=105, cognitive status not reported | Therapeutic touch                                                                         | Emotional well-being (anxiety)                                  |
| Wardell (2012)   | Mixed methods: randomised control trial, descriptive qualitative | USA       | 5 long-term care facilities      | n=20, dementia residents    | Therapeutic touch                                                                         | Overall quality of life measure using EuroQol 5 Dimension Satisfaction |
| Wesenberg (2019) | Non-RCT                           | Germany   | 2 nursing homes                  | n=17, dementia residents    | Pet therapy Use of pet visitation                                                       | Mental health (pleasure) Social functioning (non-verbal behaviour and verbal communication) Emotional well-being (agitation) (behavioural symptoms) |
| Woods (2005)     | RCT                               | USA       | 3 special care units in 3 long-term care facilities | n=57, dementia residents    | Therapeutic touch                                                                         | Emotional well-being (behavioural symptoms)                      |
| Bagci (2020)     | RCT                               | Turkey    | 1 nursing home                   | n=25, no dementia patients  | Therapeutic touch                                                                         | Energy/fatigue (sleep)                                           |
| Yucel (2020)     | RCT                               | Turkey    | 1 nursing home                   | n=30 no dementia patients   | Therapeutic touch and hand massage                                                       | Bodily pain (comfort levels) Emotional well-being (anxiety)      |

**Studies involving more than one sense-related interventions**
Table 1

| Reference                          | Study design           | Country | Setting                  | Population                      | Intervention categories                                                                 | Quality of life outcomes                                      |
|-----------------------------------|------------------------|---------|--------------------------|---------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Alessi (1999)                     | RCT                    | USA     | 1 community nursing home | n=29, dementia residents        | Physical activity program+nighttime programme intervention                              | Energy/fatigue (sleep)                                        |
|                                    |                        |         |                          |                                 | Fitness sessions throughout the day combined with a quiet environment at night            | Emotional well-being (agitation)                              |
| Bautrant (2019)                    | Non-controlled before- | USA     | 1 long-term care home    | n=19, dementia residents        | Environmental modifications                                                              | Mental health (depression)                                    |
| and-after study                    |                        |         |                          |                                 | Skylike ceiling tiles, decrease of the illuminance at night with soothing music,        | Emotional well-being (agitation) (behavioural symptoms)       |
|                                    |                        |         |                          |                                 | increase illuminance during the day, light beige walls, oversized clocks, night team    |                                                                |
|                                    |                        |         |                          |                                 | clothes dark blue and day team sky blue                                                 |                                                                |
| Bernstein (2000)                   | Cross-sectional        | USA     | 2 long-term care facilities | n=33, dementia residents        | Pet therapy                                                                             | Social functioning (social behaviours)                       |
| JoyBowles (2002)                   | Cross-over trial       | Australia | 1 nursing home          | n=36, dementia residents        | Massage and essential oils                                                               | Emotional well-being (agitation) (behavioural symptoms)       |
| Cohen-Mansfield (2012)             | Cross-over trial       | USA     | 7 nursing homes          | n=193, dementia residents       | Various stimuli interventions                                                            | Mental health (pleasure)                                      |
|                                    |                        |         |                          |                                 | Introduction of four stimuli per day (live human social, live pet social, simulated    |                                                                |
|                                    |                        |         |                          |                                 | social, inanimate social, reading, manipulative, music, task and work-related,          |                                                                |
|                                    |                        |         |                          |                                 | self-identity)                                                                          |                                                                |
### Table 1 Continued

| Reference | Study design | Country | Setting | Population | Intervention categories | Quality of life outcomes |
|-----------|--------------|---------|---------|------------|-------------------------|--------------------------|
| Cox et al. (2011) | Mixed methods: cross-over trial, descriptive qualitative | Australia | 1 nursing home | n=24, dementia residents | Snoezelen rooms A controlled multisensory environment, a soothing and stimulating environment | Emotional well-being (anxiety) satisfaction |
| Cruz (2011) | Non-controlled before-and-after study | Portugal | 1 long-term care home | n=6, dementia residents | Motor and multisensory based strategies Multisensory stimulation such as using a pleasant fragrance, use of relaxing music, gentle massage, flowers. | Emotional well-being (behavioural symptoms) |
| Francis (1986) | Non-controlled before-and-after study | USA | 1 intermediate skilled care nursing home | n=37, cognitive status not reported | Motor and multisensory based strategies ( plush animals) | Mental health (depression) Emotional well-being (agitation) (behavioural symptoms) Social functioning (social behaviours) Satisfaction (life satisfaction/self-actualisation) |
| Gillis (2019) | Non-controlled before-and-after study | Belgium | 3 nursing homes | n=65, dementia residents | Various stimuli interventions Sessions of therapeutic touch, group music or individual sessions | Mental health (depression) Emotional well-being (agitation) |
| Magee (2017) | Cross-sectional | Ireland | 1 nursing home | n=9, dementia residents | Namaste care | Mental health (depression) Emotional well-being (agitation) (behavioural symptoms) |
| Maseda (2014) | RCT | Spain | 1 specialised elderly centre | n=26, dementia residents | Snoezelen rooms | Mental health (depression) Emotional well-being (agitation) (behavioural symptoms) |
| Moghaddasifar (2019) | RCT | Iran | Nursing homes | n=28, cognitive status not reported | Motor and multisensory based strategies | Mental health (depression) Emotional well-being (anxiety) |
| Roenneke (1998) | Grounded theory | USA | 1 long term care facility | n=4, no dementia residents | Pet therapy | Satisfaction |
| Reference          | Study design          | Country | Setting                        | Population            | Intervention categories                                                                 | Quality of life outcomes                                                                 |
|--------------------|-----------------------|---------|--------------------------------|-----------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Simard (2010)      | Non-controlled before-| USA     | 6 senior living healthcare     | n=86, dementia        | Namaste Care                                                                            | Mental health (depression)                                                                |
|                    | and-after study      |         | centres                       | residents             | Activities of daily living in an unhurried manner, with a “loving touch” approach to care | Emotional well-being (agitation)                                                            |
|                    |                       |         |                                |                       |                                                                                        | (behavioural symptoms)                                                                     |
| Buschmann (1999)   | RCT                   | USA     | 1 nursing home                 | n=24, no dementia     | Expressive physical touch (in combination with talking)                                 | Mental health (depression)                                                                |
|                    |                       |         |                                | residents             | A voluntary action that occurs spontaneously and is affective usually on the hand, arm, should or back | Satisfaction (life satisfaction/self-actualisation)                                        |
| Taylor (1993)      | Cross-over trial     | USA     | 1 long-term care facility      | n=18, dementia        | Pet therapy                                                                             | Social functioning (Eye contact and vocalisations)                                       |
|                    |                       |         |                                | residents             |                                                                                        |                                                                                           |
| vanWeert (2005)    | RCT                   | Netherlands | 6 nursing homes               | n=253, dementia       | Snoezelen rooms                                                                         | Social functioning (Non-verbal behaviour and verbal communication)                         |
|                    |                       |         |                                | residents             |                                                                                        |                                                                                           |
| Witucki (1997)     | Cross-sectional      | USA     | 3 long-term care facilities    | n=15, dementia        | Motor and multisensory based strategies                                                 | Emotional well-being (behavioural symptoms)                                              |
|                    |                       |         |                                | residents             |                                                                                        |                                                                                           |

RCT, randomised controlled trial.
A variety of study designs were used including: randomised controlled trials (RCTs) (n=19) (20, 47, 53, 57, 59–63, 65, 67, 71–74, 82, 83, 86, 88/89), non-randomised controlled before and after (n=13), 22 24 42–45 55 64 75 78–80 85 cross-over (n=8), 25 46 48 51 54 58 77 87 non-RCTs (n=3), 39 92 70 cross-sectional (n=3), 76 81 90 case series (n=2), 50 56 mixed methods (n=2) (18, 68/69), controlled before-and-after (n=1) 56 and grounded theory (n=1). 84 A total of 32 methods (n=2) (18, 68/69), controlled before and after (n=13), 22 24 42–45 55 64 75 78–80 85 non-RCTs (n=3), 39 92 70 A total of 15 studies looked at the sense of touch and focused on bright light interventions. Of the 12, six (50%) studies showed a significant improvement in mental health, and two of those studies also showed a significant improvement in energy/fatigue, and emotional well-being. One other study showed a significant results in emotional well-being (see details in table 2).

**Sensory interventions**

Overall, 34 interventions (n=34) targeted only one sense: hearing (n=3), sight (n=12), smell (n=4) and touch (n=15). Eighteen studies (n=18) used a combination of at least two of the senses. No interventions were found specifically addressing taste; however, four interventions involved multiple senses and included taste (n=4). The interventions were grouped into 16 categories (music programmes, environmental white noise, bright light interventions, visual stimulations, olfactory stimulations, massages, therapeutic touch, tactile stimulations, physical activity plus nighttime programmes, pet therapies, various stimuli interventions, Snoezelen rooms, motor and multisensory-based strategies, Namaste care, environmental modifications and expressive touch activities) (see details in table 1).

**Outcome measures by senses**

The outcome measures were grouped into categories (overall quality of life, is one category and the individual components of quality of life are represented in six categories: mental health, energy/fatigue, emotional well-being, bodily pain, social functioning and satisfaction). Results of the outcomes measures by senses are presented below.

**Hearing**

Three studies looked at the sense of hearing and used different interventions. One study 44 found that their radio programme intervention using the Quality of Life-Alzheimer’s disease significantly improved quality of life for long-term care residents (n=72) (p-value not reported). Their intervention also showed improvement on mental health (mood) (p value and magnitude not reported). The other two studies showed significant improvement in emotional well-being (see details in table 2).

**Sight**

A total of 12 studies looked at the sense of sight and focused on bright light interventions. Of the 12, six (50%) studies showed a significant improvement in mental health, and two of those studies also showed a significant improvement in energy/fatigue, and emotional well-being. One other study showed a significant results in emotional well-being (see details in table 3).

**Smell**

Four studies looked at the sense of smell and focused on olfactory stimulation with lavender. Two studies showed significant results (p=0.04, p<0.0001), while the other two study showed non-significant results for emotional well-being and mental health, respectively. See details in table 4.

**Touch**

A total of 15 studies looked at the sense of touch and used a variety of interventions. Eight (53%) studies implemented therapeutic touch, with five studies showing significant improvement, one study showing mixed results for emotional well-being, one showing non-significant improvement in overall quality of life and one showing non-significant improvement in energy/fatigue. Another four (27%) studies implemented a massage intervention with mixed results. Only one study implemented physical touch, showing a significant results in emotional well-being (p<0.0001), whereas two other studies implemented a tactile stimulation and a pet therapy intervention respectively, but their findings were non-significant (see details in table 5).

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**Table 2 Interventions for the sense of hearing (n=3)**

| Interventions                        | N  | Mental health | Emotional well-being | Direction and magnitude of effect                           |
|--------------------------------------|----|---------------|----------------------|-------------------------------------------------------------|
| Environmental ‘white noise’          | 13 | –             | S                    | Emotional well-being (agitation): –, p<0.001, magnitude not reported |
| Relaxing music during meals          | 29 | –             | S                    | Emotional well-being (agitation): –, F\(_{3, \, 78}\) = 8.52; p<0.0001 |
| Radio/music programme                | 72 | NS            | –                    | Quality of Life-Alzheimer’s disease: +, p value and magnitude not reported Mental health (depression): NS |

NS, not significant.
Multiple senses
A total of 18 studies looked at multiple senses and used a variety of interventions including a physical activity combined with a nighttime intervention programme (n=1), a massage intervention (n=1), various stimuli interventions (n=2), motor and multisensory-based strategies (n=4), Snoezelen rooms (n=3), Namaste care (n=2), expressive physical touch (in combination with talking) (n=1), pet therapy (n=3) and environmental modifications (n=1). For the four studies implementing motor and multisensory-based strategies, three showed significant results. For the three studies implementing Snoezelen rooms, and the three studies implementing pet therapy, all showed mixed results (see details in table 6).

### Table 3 Interventions for the sense of sight (n=12)

| Interventions                        | N  | Mental health | Energy/fatigue | Emotional well-being | Direction and magnitude of effect                                                                 |
|--------------------------------------|----|---------------|----------------|----------------------|--------------------------------------------------------------------------------------------------|
| Bright light intervention            | 14 | S             | S              | S                    | Energy/fatigue (sleep): +, p=0.03, magnitude not reported                                       |
|                                      |    |               |                |                      | Mental health (depression): −, p=0.03, magnitude not reported                                    |
|                                      |    |               |                |                      | Emotional well-being (agitation): −, p=0.03, magnitude not reported                               |
| Bright light interventions           | 46 | S             | S              | S                    | Energy/fatigue (sleep quality): +, F1, 40=14.37; p<0.001                                      |
|                                      |    |               |                |                      | Mental health (depression): −, F1, 40=4.47; p=0.04                                              |
|                                      |    |               |                |                      | Emotional well-being (agitation): −, F1, 40=6.19; p=0.02                                          |
|                                      |    |               |                |                      | Overall quality of life measure using MDS-ADL: F1, 40=1.41; p=0.24 NS                          |
| Bright light interventions           | 10 | NS            | NS             | –                    | Energy/fatigue (sleep): NS                                                                       |
|                                      |    |               |                |                      | Mental health (mood): NS                                                                         |
| Bright light interventions           | 80 | NS            | NS             | –                    | Energy/fatigue (sleep): NS                                                                       |
|                                      |    |               |                |                      | Mental health (mood): NS                                                                         |
| Bright light interventions           | 77 | S             | –              | –                    | Mental health (depression): −, p=0.01, magnitude not reported                                    |
| Bright light intervention            | 6  | –             | Mixed          | –                    | Energy/fatigue (sleep): Not reported                                                            |
| Bright light interventions           | 34 | –             | NS             | –                    | Energy/fatigue (sleep): NS                                                                       |
| Bright light interventions           | 89 | NS            | NS             | NS                   | Quality of Life for Severe Dementia scale: NS                                                   |
|                                      |    |               |                |                      | Mental health (pleasure): NS                                                                    |
|                                      |    |               |                |                      | Emotional well-being (agitation): NS                                                           |
|                                      |    |               |                |                      | Energy/fatigue (sleep): NS                                                                       |
| Bright light intervention            | 189| S             | Mixed          | Mixed                | Mental health (affect): Light: −, p=0.02, magnitude not reported                                |
|                                      |    |               |                |                      | Energy/fatigue (sleep): Light: NS                                                                |
|                                      |    |               |                |                      | Light and melatonin: +, p=0.01, magnitude not reported                                           |
|                                      |    |               |                |                      | Emotional well-being (agitation): Light: NS, Light and melatonin: −, p=0.01, magnitude not reported |
| Bright light intervention            | 10 | S             | –              | –                    | Mental health (depression): +, p<0.01, magnitude not reported                                 |
| Bright light interventions           | 15 | –             | –              | S                    | Emotional well-being (agitation): −, p≤0.05, magnitude not reported                              |
| Visual stimulation with pictures     | 40 | S             | –              | –                    | Mental health (happy): +, p=0.0001, magnitude not reported                                       |

MDS-ADL, Minimum Data Set Activities of Daily Living; NS, not significant.
DISCUSSION

Key findings

In this scoping review, we identified 52 primary studies exploring the relationship between sensory interventions and the quality of life of residents living in long-term care settings. Four studies (44, 46, 52, 68/69) assessed an overall quality of life measure and 48 studies (n=48) examined individual components of quality of life.

We found that there were many interventions that relate to the five senses. We grouped these interventions into 16 categories as follows: music programmes, environmental white noise, bright light interventions, visual stimulations, olfactory stimulations, massages, therapeutic touch, tactile stimulations, physical activity plus nighttime programmes, pet therapies, various stimuli interventions, Snoezelen rooms, motor and multisensory-based strategies, Namaste care, environmental modifications and expressive touch activities. These categories will be helpful to inform the design of a future series of systematic reviews related to the five senses.

In our current scoping review, we identified some promising interventions that showed improvement in one of the quality of life components based on the senses: (1) Hearing: One study implemented a radio/music programme intervention that showed improvement in overall quality of life; 44 two other studies implementing white noise,42 and relaxing music during meals,43 both showed improvement in emotional well-being. (2) Sight: 6 out of 12 (50%) studies showed an improvement in mental health45 46 49 55 54 56 and two of these studies also showed an improvement in energy/fatigue and emotional well-being.45 46 (3) Smell: Two out of four studies showed a significant improvement in emotional well-being.38 39 (4) Touch: 5 of 15 studies (33%) implementing a therapeutic touch intervention showed a significant improvement in emotional well-being.22 60 67 71 73 (5) Taste: No interventions were found to address taste specifically. Furthermore, a total of 18 studies examined multiple senses. Of these studies, four studies implemented motor and multisensory-based strategies, three showing significant results;79 83 90 three studies implemented Snoezelen rooms (18, 82, 88/89) and three studies implemented pet therapy;76 84 87 all showing mixed results. Overall, the studies were of poor quality demonstrating the need for further, more robust research in this area.

Strengths and limitations

Despite the rigorous methods used in this review, there were limitations. First, there was a major limitation in the search strategy. Only studies that mentioned one of the five senses specifically were identified in the search. This was done to increase the sensitivity and specificity of the search; however, the results may not be reflective of all interventions that are designed to impact the senses. For example, pet therapy, or massage therapy were not included as terms in the search strategy. Second, we only searched a few databases, and as such, this review may not contain all the work completed on this topic. Third, since this was a scoping review, the reference lists of included articles as well as grey literature were not hand-searched. Finally, in the analysis, we used a vote counting approach to synthesise the data. Vote counting has its limitations as it does not take into account the difference in weights given to each study and it does not take into account estimates of the effect size.91 Thus, a series of systematic reviews for all the sensory interventions identified could be conducted to further explore these areas.

Comparison with previous research

Although previous studies have looked at sensory decline and decreased quality of life,4–13 and at interventions related to the senses,14–32 this is the first review specifically looking at sensory interventions for older adults with a general decline of the senses living in long-term care.

Previous work in hospital settings by Maria Ugolini et al92 support the importance of incorporating the five senses in the care of patients. Their proposed model identified the important role that the physical environment has on the healing process of patients and the need for improvement actions focused on the sensory perception of their patients. Similarly, a narrative review by Iyendo et al93 of 195 studies also acknowledged the importance of the physical hospital environment and its impact on wellness. The authors reported that a calm well-designed hospital interior with natural lighting,
landscaped gardens and colourful art can reduce stressful conditions and creates a better healing environment.

Overall, research findings acknowledge the importance of the environment on supporting residents with sensory impairments to perform safely their activities of daily living. A scoping review of 51 studies in long-term care settings identified key barriers to managing two of the five senses, hearing and vision losses (ie, lack of staff knowledge, poor management of assistive aids, unsuitable environment) and the need to implement best practices. They identified six themes including knowledge, assistive devices, screening tools, external organisations, the environment and cognition. Yet, the implementation of sensory interventions require time and cost to long-term care organisations, which may create some challenges in their broad uptake. Specific guidelines are needed for

| Interventions | N | Mental health | Energy/Fatigue | Emotional well-being | Pain | Satisfaction | Direction and magnitude of effect |
|---------------|---|---------------|----------------|----------------------|------|--------------|----------------------------------|
| Massage       | 45 | -             | -              | -                    | -    | S            | Satisfaction (life satisfaction/self-actualisation): +, p value not reported, magnitude not reported |
| Massage       | 19 | NS            | -              | -                    | -    | -            | Bodily pain (mood): NS |
| Massage       | 60 | -             | -              | NS                   | NS   | NS           | Emotional well-being (comfort levels): NS |
| Massage       | 59 | -             | -              | S                    | S    | -            | Emotional well-being (anxiety): +, p value not reported, magnitude not reported |
| Therapeutic touch | 121 | -            | -              | S                    | S    | -            | Emotional well-being (behavioural symptoms): +, p value not reported, magnitude not reported |
| Therapeutic touch | 60 | -            | -              | S                    | S    | -            | Bodily pain (comfort levels): +, +X²=107.00, p=0.001 |
| Therapeutic touch | 51 | -            | -              | Mixed                | -    | -            | Emotional well-being (agitation): Time 0 to Time 5: S, +, p<0.05, Time six to Time 8: NS |
| Therapeutic touch | 105 | -        | -              | S                    | -    | -            | Emotional well-being (anxiety): +, p=0.001, magnitude not reported |
| Therapeutic touch | 20 | -            | -              | -                    | -    | -            | Overall quality of life measure using EuroQoL 5 Dimension: NS |
| Therapeutic touch | 57 | -            | -              | S                    | -    | -            | Emotional well-being (behavioural symptoms): -, p=0.033, magnitude not reported |
| Therapeutic touch | 25 | -            | NS             | -                    | -    | -            | Energy/fatigue (sleep): NS |
| Therapeutic touch and hand massage | 30 | -            | -              | S                    | S    | -            | Bodily pain (comfort levels): +, p≤0.05, magnitude not reported |
| Physical Touch | 29 | -            | -              | S                    | -    | -            | Emotional well-being (anxiety): +, p<0.0001, magnitude not reported |
| Pet therapy | 17 | -            | -              | -                    | -    | -            | Mental health (pleasure): +, p<0.01, magnitude not reported |
| Tactile stimulation | 30 | NS          | -              | -                    | -    | -            | Mental health (mood): NS |

NS, not significant.
### Table 6 Interventions for multiple senses (n=18)

| Interventions (senses) | N | Mental health | Energy/Fatigue | Emotional well-being | Social functioning | Satisfaction | Direction and magnitude of effect |
|------------------------|---|---------------|----------------|----------------------|-------------------|-------------|----------------------------------|
| Massage                | 36 | –             | –              | S                    | S                 | –           | Emotional well-being (agitation): +, p=0.0364, magnitude not reported Social functioning (resistance to nursing care): –, p=0.0026, magnitude not reported |
| Physical activity program +night-time programme intervention | 29 | –             | S              | S                    | –                 | –           | Energy/fatigue (sleep): +, p=0.045, magnitude not reported Emotional well-being (agitation): +, p=0.009, magnitude not reported |
| Various stimuli interventions | 193 | Mixed | –             | –              | –                 | –           | Mental health (pleasure): Live human social: +, p<0.001 Real pet: +, p<0.001 Simulated social: +, p<0.001 Self-identity: +, p<0.001 Inanimate social: +, p<0.001 Music: +, p<0.05, magnitude not reported Manipulative: NS Reading: NS Task/work related: NS |
| Various stimuli interventions | 65 | S             | –              | S                    | –                 | –           | Mental health depression: –, p=0.008 Emotional well-being (agitation): –, p<0.001 |
| Motor and multisensory based strategies | 28 | S             | –              | S                    | –                 | –           | Mental health (depression): –, p<0.049, magnitude not reported Emotional well-being (agitation): –, p<0.001, magnitude not reported Social functioning (behavioural symptoms): +, p<0.006, magnitude not reported Satisfaction (life satisfaction/self-actualisation): +, p<0.030, magnitude not reported |
| Motor and multisensory based strategies (Plush animals) | 40 | S             | –              | S                    | S                 | S           | Mental health depression: –, p<0.049, magnitude not reported Emotional well-being (anxiety): –, p=0.001, magnitude not reported Social functioning (behavioural symptoms): –, p, magnitude not reported |
| Motor and multisensory based strategies | 15 | –             | –              | S                    | –                 | –           | Emotional well-being (behavioural symptoms): –, p, magnitude not reported |
| Snoezeleen rooms | 24 | –             | –              | NS                   | –                 | –           | Emotional well-being (anxiety): NS |
| Snoezeleen rooms | 26 | NS            | –              | Mixed                | –                 | –           | Mental health depression: NS Emotional well-being (agitation): +, p=0.023, magnitude not reported (behavioural symptoms): NS |
| Snoezeleen rooms | 253 | –           | –              | –                    | S                 | –           | Social functioning (Non-verbal behaviour and verbal communication): +, p<0.05, magnitude not reported |
| Namaste Care | 9 | NS            | –              | NS                   | –                 | –           | Mental health depression: NS Emotional well-being (agitation): NS Emotional well-being (behavioural symptoms): NS |

Continued
designing long-term care homes to support residents with sensory losses, and specifically to improve the quality of life of residents living in long-term care settings.

**CONCLUSION**

Understanding sensory interventions in long-term care settings remains a relatively new research topic, and there is a paucity of literature that investigates all five senses. This scoping review summarised some of the available sensory interventions, that will help inform a series of future systematic reviews on each of the specific interventions.

The scoping review findings will inform the development of the preliminary content of an audit tool for long-term care organisations to use in assessing their sensory environment and in determining the relationship between sensory interventions and the quality of life of their residents. These results are relevant for policy makers, decision-makers, clinicians and residents/families in long-term care settings.

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## S1 Table. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

| SECTION                | ITEM | PRISMA-ScR CHECKLIST ITEM                                                                                                                                                                                                 | REPORTED ON PAGE # |
|------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| **TITLE**              |      |                                                                                                               |                    |
| Title                  | 1    | Identify the report as a scoping review.                                                                                                                              | 1                  |
| **ABSTRACT**           |      |                                                                                                               |                    |
| Structured summary     | 2    | Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives. | 2                  |
| **INTRODUCTION**       |      |                                                                                                               |                    |
| Rationale              | 3    | Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.             | 3                  |
| Objectives             | 4    | Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives. | 3                  |
| **METHODS**            |      |                                                                                                               |                    |
| Protocol and registration | 5   | Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number. | 4                  |
| Eligibility criteria   | 6    | Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.                                      | 5                  |
| Information sources*   | 7    | Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.             | 5                  |
| Search                 | 8    | Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.                                                                                       | 5                  |
| Selection of sources of evidence† | 9 | State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.                                                                                       | 6                  |
| Data charting process‡ | 10   | Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators. | 6                  |
| Data items             | 11   | List and define all variables for which data were sought and any assumptions and simplifications made.                                                               | 6                  |
| Critical appraisal of individual sources of evidence§             | 12   | If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate). | n/a                |
| SECTION                      | ITEM | PRISMA-ScR CHECKLIST ITEM                                                                 | REPORTED ON PAGE # |
|------------------------------|------|------------------------------------------------------------------------------------------|--------------------|
| Synthesis of results         | 13   | Describe the methods of handling and summarizing the data that were charted.               | 7                  |
| RESULTS                      |      |                                                                                          |                    |
| Selection of sources of evidence | 14   | Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram. | 7                  |
| Characteristics of sources of evidence | 15   | For each source of evidence, present characteristics for which data were charted and provide the citations. | 8                  |
| Critical appraisal within sources of evidence | 16   | If done, present data on critical appraisal of included sources of evidence (see item 12). | n/a                |
| Results of individual sources of evidence | 17   | For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives. | 8                  |
| Synthesis of results         | 18   | Summarize and/or present the charting results as they relate to the review questions and objectives. | 8                  |
| DISCUSSION                   |      |                                                                                          |                    |
| Summary of evidence          | 19   | Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups. | 18                 |
| Limitations                  | 20   | Discuss the limitations of the scoping review process.                                    | 19                 |
| Conclusions                  | 21   | Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps. | 20                 |
| FUNDING                      |      |                                                                                          |                    |
| Funding                      | 22   | Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review. | n/a                |

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where sources of evidence (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with information sources (see first footnote).
‡ The frameworks by Arksey and O’Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarins W, O’Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.
S2 Table. Search Strategies for LTC + 5 Senses – Updated Search
Written by: Lindsey Sikora / Melissa Demery Varin
Performed: July 2, 2017 + Updated: December 1, 2020

PubMed: 645 + 0*
Medline (Ovid): 1024 + 1244
CENTRAL (Ovid): 92 + 240
PsycINFO (Ovid): 724 + 858
EMBASE (Ovid): 1562 + 2109
CINAHL (EBSCOhost): 58 + 1531
AgeLine (EBSCOhost): 61 + 730

All: 4166 + 6712 = 10 878
After removal of duplicates: 5551

*All of PubMed is now found in Medline, and the MESH terms are now the same therefore only Medline updated.

Medline & CENTRAL Search Strategy (note: tw = title & abstract in Medline)
1. Assisted Living Facility/tw.
2. (assist* adj3 living facilit*).tw.
3. exp Residential Facilities/tw.
4. exp Homes for the Aged/tw.
5. exp Nursing Homes/tw.
6. exp Group Homes/tw.
7. (group adj2 home*).tw.
8. (extended care adj2 facilit*).tw.
9. (long-term care adj2 facilit*).tw.
10. (care adj2 (home* or facilit*)).tw.
11. (rest adj2 home*).tw.
12. (residential adj2 (home* or care or facilit*)).tw.
13. (geriatric adj2 (home* or unit* or facilit* or institution*)).tw.
14. (nursing adj2 (home*1 or unit*1 or center*1 or centre*1)).tw.
15. or/1-14
16. sensation*.tw.
17. organoleptic*.tw.
18. hearing.tw.
19. audition.tw.
20. smell.tw.
21. (scent* or odo?r*).tw.
22. olfaction.tw.
23. taste*.tw.
24. gustation*.tw.
25. touch.tw.
26. taction*.tw.
27. (tactile adj2 sense*).tw.
Sensation/ sight.tw.

Hearing/ or Vision, Ocular/ or Smell/ or Taste/ or Touch/

Sound/ or Noise/ or Lighting/
or/16-31

15 and 32

**PsycINFO**

1. (assist* adj3 living facilit*).tw.
2. exp Residential Care Institutions/
3. exp Nursing Homes/
4. exp Group Homes/
5. (group adj2 home*).tw.
6. (extended care adj2 facilit*).tw.
7. (long-term care adj2 facilit*).tw.
8. (care adj2 (home* or facilit*)).tw.
9. (rest adj2 home*).tw.
10. (residential adj2 (home* or care or facilit*)).tw.
11. (geriatric adj2 (home* or unit* or facilit* or institution*)).tw.
12. (nursing adj2 (home*1 or unit*1 or center*1 or centre*1)).tw.
or/1-12

14. sensation*.tw.
15. organoleptic*.tw.
16. hearing.tw.
17. audition.tw.
18. smell.tw.
19. (scent* or odo?r*).tw.
20. olfaction.tw.
21. taste*.tw.
22. gustation*.tw.
23. touch.tw.
24. taction*.tw.
25. (tactile adj2 sense*).tw.
26. Sensation/
27. sight.tw.
28. Hearing/ or Vision, Ocular/ or Smell/ or Taste/ or Touch/
29. Sound/ or Noise/ or Lighting/
or/14-29

13 and 30

**EMBASE**

1. Assisted Living Facility/
2. (assist* adj3 living facilit*).tw.
3. exp Residential Facilities/
4. exp Homes for the Aged/
5. exp Nursing Homes/
6. exp Group Homes/
7. (group adj2 home*).tw.
8. (extended care adj2 facilit*).tw.
9. (long-term care adj2 facilit*).tw.
10. (care adj2 (home* or facilit*)).tw.
11. (rest adj2 home*).tw.
12. (residential adj2 (home* or care or facilit*)).tw.
13. (geriatric adj2 (home* or unit* or facilit* or institution*)).tw.
14. (nursing adj2 (home*1 or unit*1 or center*1 or centre*1)).tw.
15. or/1-14
16. sensation*.tw.
17. organoleptic*.tw.
18. hearing.tw.
19. audition.tw.
20. smell.tw.
21. (scent* or odo*r*).tw.
22. olfaction.tw.
23. taste*.tw.
24. gustation*.tw.
25. touch.tw.
26. taction*.tw.
27. (tactile adj2 sense*).tw.
28. Sensation/
29. sight.tw.
30. Hearing/ or Vision, Ocular/ or Smell/ or Taste/ or Touch/
31. Sound/ or Noise/ or Lighting/
32. or/16-31
33. 15 and 32

CINAHL – all that are not subject lines searched in title OR abstract OR subject
S1 (MH "Nursing Homes+") OR (MH "Long Term Care")
S2 (MH "Residential Care")
S3 (assist* N3 living facility*)
S4 (group N2 home*)
S5 (extended care N2 facilit*)
S6 (long-term care N2 facilit*)
S7 (care N2 (home* or facilit*))
S8 (rest N2 home*)
S9 (residential N2 (home* or care or facilit*))
S10 (geriatric N2 (home* or unit* or facilit* or institution*))
S11 (nursing N2 (home or homes or unit or units or center or centers or centre or centres))
S12 (MH "Hearing") OR (MH "Touch") OR (MH "Vision") OR (MH "Taste") OR (MH "Smell") OR (MH "Sound") OR (MH "Noise") OR (MH “Lighting”) OR (MH “Sensation”)
S13 sensation*
S14 organoleptic*
S15 hearing
S16 sight
S17 audition
S18 smell
S19 (scent* or odor* or odour*)
S20 olfaction
S21 tast*
S22 gustat*
S23 touch
S24 taction*
S25 (tactile N2 sense*)
S26 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11
S27 S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR
S22 OR S23 OR S24 OR S25
S28 S26 AND S27

AgeLine – is keywords only (no MESH headings) – all lines searched in title OR abstract OR
subject
S1 (assist* N3 living facility*)
S2 (group N2 home*)
S3 (extended care N2 facili*)
S4 (long-term care N2 facilit*)
S5 (care N2 (home* or facilit*))
S6 (rest N2 home*)
S7 (residential N2 (home* or care or facili*))
S8 (geriatric N2 (home* or unit* or facilit* or institution*))
S9 (nursing N2 (home or homes or unit or units or center or centers or centre or centres))
S10 sensation*
S11 organoleptic*
S12 hearing
S13 sight
S14 audition
S15 smell
S16 (scent* or odor* or odour*)
S17 olfaction
S18 tast*
S19 gustat*
S20 touch
S21 taction*
S22 (tactile N2 sense*)
S23 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9
S24 S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR
S20 OR S21 OR S22
S28 S23 AND S24
### S3 Table. Full Text Articles Excluded with Reasons (n=261)

| Reason                                                                 | N  |
|-----------------------------------------------------------------------|----|
| No interventions related to any of the five senses                    | 74 |
| Outcome measure does not match inclusion criteria                     | 55 |
| Full text not available                                               | 45 |
| Outcome measure not reported                                          | 35 |
| Wrong population                                                      | 11 |
| Wrong setting                                                         | 10 |
| Duplicate                                                             |  9 |
| Review article                                                        |  8 |
| Combined setting                                                       |  6 |
| Not English or French                                                 |  5 |
| Thesis                                                                |  3 |

### No Interventions Related to Any of the Five Senses (n=74)

| #  | First Author | Year | Full Citation                                                                                                                                 |
|----|--------------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Adams        | 2013 | Adams, K., Anderson, J., Archuleta, M., & Kudin, J. (2013). Defining skilled nursing facility residents' dining style preferences. *Journal of Nutrition in Gerontology and Geriatrics*, 32(3), 213-232. |
| 2  | Allaert      | 2016 | Allaert, F., Guérin-Deremaux, A., Mauray-Soulier, L., & Saniez-Degrave, M. (2016). Evaluation of adherence by elderly nursing home patients to regular consumption of apple compote enriched with protein and soluble fiber. *Aging Clinical and Experimental Research*, 28(2), 189-195. |
| 3  | Alden        | 2004 | Alden, A.L., & Weisman, G. D. (2014). Closing the circle. The evaluation of Brewster Village. *Nursing Homes Long Term Care Management*, 53(6):29. |
| 4  | Allen        | 2008 | Allen, D. (2008). Standard life. Older people deserve more than weak tea, bad smells and bingo, says Daniel Allen. *Nursing Standard*, 23(11):29-29 |
| 5  | Anderson     | 2001 | Anderson, P. (2001). Tickling patients' taste buds. *Nursing Times*, 96(50):24-26 |
| 6  | Andreoli     | 2007 | Andreoli, N. A., Breuer, L., Marbury, D., Williams, S., & Rosenblut, M. N. (2007). Serving culture change at mealtimes. *Nursing Homes Long Term Care Management*, 56(9):48. |
| No. | Author(s)                | Year | Title                                                                 | Journal/Reference                                                                 |
|-----|--------------------------|------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 7   | Anonymous                | 2013 | LED lighting in senior living: Friend or foe?                        | *Long-Term Living: For the Continuing Care Professional*, 17-19.                    |
| 8   | Anonymous                | 2001 | Shhhhhhh -- healing zone...sounds that typify the nursing home experience for both staff and residents. | *People's Medical Society Newsletter*, 20(3):6-7.                                 |
| 9   | Ashurst                  | 2019 | How to ... assist residents living with visual impairment.          | *Nursing & Residential Care*, 21(6):357-357.                                       |
| 10  | Ashurst                  | 2019 | How to ... support residents who have hearing loss.                 | *Nursing & Residential Care*, 21(3):135-135.                                       |
| 11  | Bicket                   | 2010 | The physical environment influences neuropsychiatric symptoms and other outcomes in assisted living residents. | *International Journal of Geriatric Psychiatry*, 25(10), 1044-1054.               |
| 12  | Black                    | 2015 | Supporting people to live well with dementia.                       | *Nursing & Residential Care*, 17(1):34-37.                                         |
| 13  | Brawley                  | 2001 | Strategies for upgrading senior care environments: Attention to certain key details can go a long way. | *Nursing Homes: Long Term Care Management*, 50(6):28-33.                           |
| 14  | Brush                    | 2008 | Cognitive impairment, wayfinding, and the long-term care environment. | *Perspectives on Gerontology*, 13(2):65-73.                                        |
| 15  | Brush                    | 2008 | Environmental interventions and dementia: Enhancing mealtimes in group dining rooms. | *ASHA Leader*, 13(8):24-25.                                                      |
| 16  | Buckinx                  | 2017 | Influence of environmental factors on food intake among nursing home residents: A survey combined with a video approach. | *Clinical Interventions in Aging*, 12(10):1055-1064.                              |
| 17  | Calkins                  | 2009 | Improving quality of life in long-term care.                       | *Perspectives on Gerontology*, 14(2):37-41.                                        |
| 18  | Calkins                  | 2011 | Evidence-based design for dementia: Findings from the past five years. | *Long-Term Living: For the Continuing Care Professional*, 60(1):42-45.             |
| 19  | Caris-Verhallen          | 1999 | Non-verbal behaviour in nurse–elderly patient communication.         | *Journal of Advanced Nursing*, 29(4), 808-818.                                     |
| 20  | Carey-Smith              | 2013 | A user-centred design process to develop technology to improve sleep quality in residential care homes. | *Technology and Disability*, 25(1), 49-58.                                         |
| 21  | Chaperon                 | 2007 | Sleep disturbance of residents in a continuing care retirement community. | *Journal of Gerontological Nursing*, 33(10), 21-8.                                |
|   | Author        | Year | Title                                                                                           | Source                                      |
|---|---------------|------|-------------------------------------------------------------------------------------------------|---------------------------------------------|
| 22| Chidester     | 2016 | Chidester, A.S., Sautter S., Aravich P., & Ord A. (2016). Transforming dementia care and quality of life using innovative touch screen computer engagement: A research study—the birdsong initiative. **Alzheimer's and Dementia**, 12(7 Supplement):P259-P260. |
| 23| Cohen-Mansfield| 2017 | Cohen-Mansfield, J. (2017). The impact of environmental factors on engagement and mood of persons with dementia attending recreational groups. **Alzheimer's and Dementia**, 13(7):P171. |
| 24| Cook          | 2006 | Cook, G., Brown-Wilson, C., & Forte, D. (2006). Impact of sensory impairment on social interaction between residents in care homes. **International Journal of Older People Nursing**, 1(4):216-224. |
| 25| Curto         | 2017 | Curto, D., Cano, P., Garcia, C., Tomas, J.F., & Cuesta, M. (2017). Impact of environmental modifications on the quality of life of residents with dementia. **European Geriatric Medicine**, 8(Supplement 1):S201-S202. |
| 26| DeLepeleire   | 2007 | De Lepeleire, J., Bouwen, A., De Coninck, L., & Buntinx. F. (2007). Insufficient lighting in nursing homes. **Journal of the American Medical Directors Association**, 8(5), 314-317. |
| 27| Devos         | 2019 | Devos, P., Aletta, F., Thomas, P., Petrovic, M., Mynsbrugge, T.V., Van De Velde, D., . . . Botteldooren D. (2019). Designing supportive soundscapes for nursing home residents with dementia. **International Journal of Environmental Research and Public Health**, 16(24):4904. |
| 28| Ercan-Sahin   | 2018 | Ercan-Sahin, N., & Nuran Emiroglu, O. (2018). Quality of life of nursing home residents before and after reminiscence therapy. **Educational Gerontology**, 44(2/3):99-107. |
| 29| Flynn         | 2002 | Flynn, M.C., Kennedy, E.J., Johns, J., & Stanbridge, R. (2002). Hearing and vision loss within residential care facilities -- the need for improved service delivery. **Australasian Journal on Ageing**, 21(3):141-144. |
| 30| Foltz-Gray    | 1996 | Foltz-Gray, D. (1996). Pleasing the palate. **Contemporary Long Term Care**, 19(8):54. |
| 31| Fu            | 2020 | Fu, S. R., Lee, M.F., & Ou, S.J. (2020). Effects of reminiscing about nostalgic smells on the physiological and psychological responses of older people in long-term care facilities. **Ageing and Society**, 40(3):501-511. |
| 32| Garahan       | 1992 | Garahan, M., Waller, J., Houghton, M., Tisdale, W., & Runge, C. (1992). Hearing loss prevalence and management in nursing home residents. **Journal of the American Geriatrics Society**, 40(2), 130-134. |
| 33| Garre-Olmo    | 2012 | Garre-Olmo, J., López-Pousa, S., Turon-Estrada, A., Juvinýa, D., Ballester, D., & Vilalta-Franch, J. (2012). Environmental determinants of quality of life in nursing home residents with severe dementia. **Journal of the American Geriatrics Society**, 60(7), 1230-1236. |
| 34| Hartwell      | 2016 | Hartwell, H., Johns, N., & Edwards, J. S. A. (2016). E-menus—Managing choice options in hospital foodservice. **International Journal of Hospitality Management**, 53, 12-16. |
| 35| Hall          | 2008 | Hall, G., & Wendin, K. (2008). Sensory design of foods for the elderly. **Annals of Nutrition & Metabolism Supplement**, 52(25):25-28. |
|   |   |   |
|---|---|---|
| 36 | Hoban | 2002 | Hoban, S. (2002). Softer side of therapy. *Nursing Homes Long Term Care Management*, 51(3):26. |
| 37 | Höbler | 2018 | Höbler, F., Argueta-Warden, X., Rodríguez-Monforte, M., Escrig-Pinol, A., Wittich, W., & McGilton, K.S. (2018). Exploring the sensory screening experiences of nurses working in long-term care homes with residents who have dementia: A qualitative study. *BMJ Geriatrics*, 18(1):1-14. |
| 38 | Hollinger | 1993 | Hollinger, L. M., & Buschmann, M. B. (1993). Factors influencing the perception of touch by elderly nursing home residents and their health caregivers. *International Journal of Nursing Studies*, 30(5), 445-461. |
| 39 | Huang | 2008 | Huang, H.-C., & Shanklin, C. W. (2008). An integrated model to measure service management and physical constraints' effect on food consumption in assisted-living facilities. *Journal of the American Dietetic Association*, 108(5), 785-792. |
| 40 | Juul | 2019 | Juul, A., Wilding, R., & Baldassar, L. (2019). The best day of the week: New technology enhancing quality of life in a care home. *International Journal of Environmental Research and Public Health*, 16(6): 1000. |
| 41 | Kayser-Jones | 1991 | Kayser-Jones, J.S. (1991). The impact of the environment on the quality of care in nursing homes: A social-psychological perspective. *Holistic Nursing Practice*, 5(3):29-38. |
| 42 | Kontos | 2017 | Kontos, P., Miller, K.-L., & Kontos, A.P. (2017). Relational citizenship: Supporting embodied selfhood and relationality in dementia care. *Sociology of Health & Illness*, 39(2):182-198. |
| 43 | Lakin | 2013 | Lakin, J.R., & Doe, E.W. (2012). Something just doesn't smell quite right... *Journal of the American Geriatrics Society*, 61(2):313-313. |
| 44 | Lankford | 2000 | Lankford, J., & Hopkins, C. (2000). Ambient noise levels in nursing homes: Implications for audiometric assessment. *American Journal of Audiology*, 9(1), 30-35. |
| 45 | Lengyel | 2004 | Lengyel, C.O., Smith, J.T., Whiting, S.J., & Zello, G.A. (2004). Questionnaire to examine food service satisfaction of elderly residents in long-term care facilities. *Journal of Nutrition for the Elderly*, 24(2):5-18. |
| 46 | Marchand | 2009 | Marchand, M., Halimi-Falkowicz, S., & Joule, R.-V. (2009). How to help the residents of an old age home to freely decide to take part in a social activity? Touch, "but you are free of ..." and foot-in-the-door. *European Review of Applied Psychology*, 59(2):153-161. |
| 47 | McCabe | 2019 | McCabe, M., Favilla, S., Pedell, S., Beh, J., Murphy, A., & Petrovitch, T. (2019). Designing a better visit: Touch screen app for people living with dementia and their visitors. *Alzheimer's and Dementia*, 15(7 Supplement):P167-P169. |
| 48 | Mendes | 2017 | Mendes, A., Papiola, A., Carreiro-Martins, P., Aguiar, L., Bonassi, S., Caires, I., . . . Teixeira, J. (2017). The influence of thermal comfort on the quality of life of nursing home residents. *Journal of Toxicology and Environmental Health, Part A*, 80(13-15), 729-739. |
|   | Author                        | Year | Title                                                                 | Journal Name                                      |
|---|-------------------------------|------|----------------------------------------------------------------------|--------------------------------------------------|
| 49| Milte, R., Ratcliffe, J., Chen, G., Miller, M., & Crotty, M. | 2018 | Taste, choice and timing: Investigating resident and carer preferences for meals in aged care homes. | Nursing & Health Sciences, 20(1):116-124.         |
| 50| Mingioni, M., Mehinagic, E., Laguna, L., Sarkar, A., Pirttijärvi, T., Van Wymelbeke, V., . . . Maitre, I. | 2016 | Fruit and vegetables liking among European elderly according to food preferences, attitudes towards food and dependency. | Food Quality and Preference, 50(C), 27-37.       |
| 51| Mital, A., Ayer, L., & Gorman, J. | 1991 | A lighting evaluation of a facility for the elderly.                  | J Hum Ergol (Tokyo), 20(2), 171-180.              |
| 52| O'Hara, P., Harper, D., Kangas, M., Dubéau, J., Borsutzky, C., & Lemire, N. | 1997 | Taste, temperature, and presentation predict satisfaction with foodservices in a Canadian continuing-care hospital. | Journal of the American Dietetic Association, 97(4), 401-405. |
| 53| Ogawa, T., Uota, M., Ikebe, K., Notomi, Y., Iwamoto, Y., Shiroyabashi, I., . . . Maeda, Y. | 2016 | Taste detection ability of elderly nursing home residents.            | Journal of Oral Rehabilitation, 43(7), 505-510.   |
| 54| Potera, C. | 2008 | Eyeglasses lift the moods of nursing home residents.                  | American Journal of Nursing, 108(3):21.           |
| 55| Ribeiro, P.C.P.S.V., Marques, R.M.D., & Ribeiro, M.P. | 2017 | Geriatric care: Ways and means of providing comfort.                  | Revista Brasileira de Enfermagem, 70(4):830-837.  |
| 56| Roets-Merken, L.M, Zuidema, S.U, Vernooij-Dassen, M.J.F.J., Teerenstra, S., Hermsen, P.G.J.M., Kempen, G.I.J.M., & Graff, M.J.L. | 2018 | Effectiveness of a nurse-supported self-management programme for dual sensory impaired older adults in long-term care: A cluster randomised controlled trial. | BMJ Open, 8(1):e016674.                         |
| 57| Routasalo, P. | 1996 | Non-necessary touch in the nursing care of elderly people.            | Journal of Advanced Nursing, 23(5), 904-911.     |
| 58| Routasalo, P., & Lauri, S. | 1996 | Developing an instrument for the observation of touching.             | Clinical Nurse Specialist, 10(6), 293-299.       |
| 59| Schnelle, J., Cruise, P., Alessi, C., Ludlow, K., Al-Samarrai, N., & Ouslander, J. | 1998 | Sleep hygiene in physically dependent nursing home residents: Behavioral and environmental intervention implications. | Sleep, 21(5), 515-523.                         |
| 60| Scilley, K., & Owslpy, C. | 2002 | Vision-specific health-related quality of life: Content areas for nursing home residents. | Quality of Life Research, 11(5), 449-462.        |
|   | Author(s)       | Year  | Title and Details |
|---|-----------------|-------|-------------------|
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# Outcome Measure does not Match Inclusion Criteria (n=55)

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Outcome Measures not Reported (n=35)
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|21 | Madison   | 1995 | Madison, R. (1995). The value of the 'comforting touch'... Elderly residents: Perception of nurses' comforting touch. Journal of Gerontological Nursing, 21(7):2-2. |                                                                          |
|22 | Mazer     | 2008 | Mazer, S.E. (2008). Turning in to the 'sound' environment. Long-Term Living, 57(6):30. |                                                                          |
|   | Last Name | Year | Title                                                                 | Journal Title                                                                 |
|---|-----------|------|----------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 23| Meyer     | 2020 | Meyer, C., & Hickson, L. (2020). Nursing management of hearing impairment in nursing facility residents. | Journal of Gerontological Nursing, 46(7):15-25.                                 |
| 24| Morganett | 1987 | Morganett, B.A. (1987). Nature hikes for nursing home residents.      | Geriatric Nursing, 8(4):178-179.                                              |
| 25| Noell-Waggoner | 2004 | Noell-Waggoner, E. (2004). Aging matters. Lighting solutions for contemporary problems of older adults. | Journal of Psychosocial Nursing & Mental Health Services, 42(7):14-20.          |
| 26| Pollock   | 2013 | Pollock, A., & Fuggle, L. (2013). Designing for dementia: Creating a therapeutic environment. | Nursing & Residential Care, 15(6):438-442.                                     |
| 27| Rappe     | 2007 | Rappe, E., & Topo, P. (2007). Contact with outdoor greenery can support competence among people with dementia. | Journal of Housing for the Elderly, 21(3-4):229-248.                           |
| 28| Stone     | 2014 | Stone, L. (2014). Eating/feeding issues in dementia: Improving the dining experience. | End of Life Journal, 4(1):1-7.                                               |
| 29| Struglinski | 2009 | Struglinski, S. (2009). Nurturing residents' spirits: Designing activities to satisfy individuals' preferences is at the heart of enhancing quality of life. | Provider, 35(5):22-32.                                                      |
| 30| Swann     | 2009 | Swann, J. (2009). Gardens: Inclusive designs for care homes.          | Nursing & Residential Care, 11(12):624-627.                                   |
| 31| Vance     | 2002 | Vance, D.E. (2002). Implications of olfactory stimulation in activities for adults with age-related dementia. | Activities, Adaptation & Aging, 27(2):17-25.                                  |
| 32| West      | 2003 | West, S., Friedman, D., Muoz, B., Roche, K., Park, W., Deremeik, J., ... German, P. (2003). A randomized trial of visual impairment interventions for nursing home residents: Study design, baseline characteristics and visual loss. | Neuro-ophthalmology, 10(3), 193-209.                                          |
| 33| White     | 2018 | White, M.L., & Verdusco, L.M. (2018). Communicating with older adults. | Home Healthcare Now, 36(3):181-184.                                           |
| 34| York      | 2009 | York, S.L. (2009). Residential design and outdoor area accessibility. | Neuro Rehabilitation, 25(3):201-208.                                         |
| 35| Zinn      | 2000 | Zinn, L. (2000). Alzheimer's care: Family affair.                     | Nursing Homes Long Term Care Management, 49(10):36.                           |
| #  | First Author | Year | Full Citation |
|----|--------------|------|---------------|
| 1  | Aguilera     | 1967 | Relationship between physical contact and verbal interaction between nurses and patients. *J Psychiatr Nurs Ment Health Serv*, 5(1), 5-21. |
| 2  | Carson       | 1997 | Evaluation of the to hear again project. *Journal of Speech-Language Pathology & Audiology*, 21(3):160-166. |
| 3  | Collier      | 2017 | The Multisensory Environment (MSE) in dementia care: Examining its role and quality from a user perspective. *Health Environments Research & Design Journal*, 10(5):39-51. |
| 4  | Cooke        | 2017 | The impact of therapeutic massage on adult residents living with complex and high level disabilities: A brief report: Erratum. *Disability and Health Journal*, 10(2):367. |
| 5  | McNiel       | 2018 | Namaste Care: A person-centered care approach for Alzheimer's and advanced dementia. *Western Journal of Nursing Research*, 40(1):37-51. |
| 6  | Morris       | 2008 | Analysis of touch used by occupational therapy practitioners in skilled nursing facilities. *Occupational Therapy International*, 15(2):133-142. |
| 7  | Mosley       | 2020 | Enhancing student-pharmacists' professional development through community outreach with dementia population. *The Mental Health Clinician*, 10(1):6-11. |
| 8  | Murphy       | 2017 | Evaluation of innovative nutrition education and training for care staff supporting people living with dementia. *Alzheimer's and Dementia*, 13(7):P828. |
| 9  | Shaw         | 2018 | Enhancing dementia care and building empathy through the integration of virtual reality technology and art therapy. *Alzheimer's and Dementia*, 14(7 Supplement):P934-P935. |
| 10 | VanGelder    | 2016 | Experiences of patients with Huntington’s disease on home cooked hot meals in a long term care facility. *Journal of Neurology, Neurosurgery and Psychiatry*, 87(Supplement 1):A88-A89. |
| 11 | Ventura      | 2012 | Senses respond to scenting. *Long-Term Living*, 61(2):35. |
**Wrong Setting (n=10)**

| #  | First Author | Year | Full Citation |
|----|--------------|------|---------------|
| 1  | Dahl         | 1997 | Dahl, M.O. (1997). To hear again: A volunteer program in hearing health care for hard-of-hearing seniors. *Journal of Speech-Language Pathology & Audiology*, 21(3):153-159. |
| 2  | Fredriksson  | 2009 | Fredriksson, A.-C., Hellström, L., & Nilsson, U. (2009). Patients’ perception of music versus ordinary sound in a postanaesthesia care unit: A randomised crossover trial. *Intensive & Critical Care Nursing*, 25(4), 208-213. |
| 3  | Giménez      | 2017 | Giménez, M., Geerdinck, L., Versteylen, M., Leffers, P., Meekes, G., Herremans, H., . . . Schlangen, L. (2017). Patient room lighting influences on sleep, appraisal and mood in hospitalized people. *Journal of Sleep Research*, 26(2), 236-246. |
| 4  | Goto         | 2017 | Goto, S., Gianfagia, T., Munafo, J., Fujii, E., Shen, X., Sun, M., . . . Herrup, K. (2017). The power of traditional design techniques: The effects of viewing a Japanese garden on individuals with cognitive impairment. *HERD: Health Environments Research & Design Journal*, 10(4), 74-86. |
| 5  | Haupt        | 2012 | Haupt, B. (2012). Instituting quiet hour improves patient satisfaction. *Nursing*, 42(4):14-15. |
| 6  | Hedges       | 2018 | Hedges, C., Wolak, E., Smith-Miller, C.A., & Brown, T. (2018). The path to a quieter unit: Get staff engaged in evidence-based practice and quality-improvement projects. *American Nurse Today*, 13(9):40-46. |
| 7  | Iyendo       | 2016 | Iyendo, T.O., Uwajeh, P. C., & Ikenna, E. S. (2016). The therapeutic impacts of environmental design interventions on wellness in clinical settings: A narrative review. *Complementary Therapies in Clinical Practice*, 24:174-188. |
| 8  | McCann       | 1993 | McCann, K., & McKenna, H. (1993). An examination of touch between nurses and elderly patients in a continuing care setting in Northern Ireland. *Journal of Advanced Nursing*, 18(5), 838-846. |
| 9  | Murphy       | 2013 | Murphy, G., Bernardo, A., & Dalton, J. (2013). Quiet at night: Implementing a Nightingale principle. *AJN American Journal of Nursing*, 113(12):43-51. |
| 10 | Suter        | 2007 | Suter, E. & Baylin.D. (2007). Choosing art as a complement to healing. *Applied Nursing Research*, 20(1), 32-38. |
### Duplicate (n=9)

| # | First Author | Year | Full Citation |
|---|--------------|------|---------------|
| 1 | Anonymous    | 2012 | Anonymous. (2012). Erratum. Fall prevention using olfactory stimulation with lavender odor in elderly nursing home residents: A randomized controlled trial. *Journal of the American Geriatrics Society*, 60(11):2193. |
| 2 | Buckinx      | 2017 | Buckinx, F., Reginster, J., Morelle, A., Paquot, N., Labeye, N., Locquet, M., ... Bruyère, O. (2017). Influence of environmental factors on food intake among nursing home residents: A survey combined with a video approach. *Clinical Interventions in Aging*, 12, 1055-1064. |
| 3 | Figueiro     | 2018 | Figueiro, M.G., Kalsher, M., Plitnick, B., Rohan, C., & Rea, M.S. (2018). Tailored lighting intervention for Alzheimer's patients and its effects on sleep, mood and agitation. *Sleep*, 41(Supplement 1):A113-A114 |
| 4 | Figueiro     | 2018 | Figueiro, M.G., & Rea, M.S. (2018). Tailored lighting intervention to improve sleep, mood and behavior in Alzheimer’s disease patients. *Alzheimer's and Dementia*, 14(7 Supplement):P1022-P1023 |
| 5 | Figueiro     | 2019 | Figueiro, M. & Rea, M. (2019). Tailored lighting intervention to improve sleep in patients with dementia. *Sleep Medicine*, 64(Supplement 1):S115. |
| 6 | Lakin        | 2013 | Lakin, J.R., & Doe, E.W. (2013). Something just doesn't smell quite right... *Journal of the American Geriatrics Society*, 61(2):313. |
| 7 | Lengyel      | 2004 | Lengyel, C., Smith, J., Whiting, S., & Zello, G. (2004). A questionnaire to examine food service satisfaction of elderly residents in long-term care facilities. *Journal of Nutrition for the Elderly*, 24(2), 5-18. |
| 8 | Tanaka       | 2014 | Tanaka, M., & Hoshiyama, M. (2014). Effects of environmental stimulation on recognition of mealtimes in patients with dementia. *Physical & Occupational Therapy in Geriatrics*, 32(2):112-122 |
| 9 | Yucel        | 2020 | Yucel, S.C., Arslan, G.G., & Bagci, H. (2020). Effects of hand massage and therapeutic touch on comfort and anxiety living in a nursing home in Turkey: A randomized controlled trial. *Journal of Religion and Health*, 59(1):351-364. |
## Review Study (n=8)

| #  | First Author | Year | Full Citation                                                                                                                                 |
|----|--------------|------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Abraha       | 2017 | Abraha, I., Rimland, J.M., Trotta, F.M., Dell'Aquila, G., Cruz-Jentoft, A., Petrovic, M., . . . Cherubini, A. (2017). Systematic review of systematic reviews of non-pharmacological interventions to treat behavioural disturbances in older patients with dementia. The SENATOR-OnTop series. BMJ Open, 7(3):e012759. |
| 2  | Andrusjak    | 2020 | Andrusjak, W., Barbosa, A., & Mountain, G. (2020). Identifying and managing hearing and vision loss in older people in care homes: A scoping review of the evidence. *Gerontologist*, 60(3):e155-e168. |
| 3  | Bray         | 2019 | Bray, J., Brooker, D.J., & Garabedian, C. (2019). What is the evidence for the activities of Namaste Care? A rapid assessment review. *Dementia*, [Online ahead of print]. |
| 4  | Cabrera      | 2015 | Cabrera, E., Sutcliffe, C., Verbeek, H., Saks, K., Soto-Martin, M., Meyer, G., . . . Zabalegui, A. (2015). Non-pharmacological interventions as a best practice strategy in people with dementia living in nursing homes. A systematic review. *European Geriatric Medicine*, 6(2):134-150. |
| 5  | Day          | 2000 | Day, K., Carreon, D., & Stump, C. (2000). The therapeutic design of environments for people with dementia: A review of the empirical research. *Gerontologist*, 40(4):397-416. |
| 6  | Livingston   | 2014 | 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):1-226, v. |
| 7  | Verkaik      | 2005 | Verkaik, R., van Weert, J.C., & Francke, A.L. (2005). The effects of psychosocial methods on depressed, aggressive and apathetic behaviors of people with dementia: A systematic review. *International Journal of Geriatric Psychiatry*, 20(4):301-14. |
| 8  | Watson       | 2010 | Watson, K., Chang, E., & Johnson, A. (2010). The efficacy of complementary therapies for agitation among older persons in residential aged care: A systematic review. *JBI Database of Systematic Reviews and Implementation Reports*, 8(34 Supplement):S230-S24. |
### Combined Setting (n=6)

| #  | First Author | Year | Full Citation                                                                                                                                 |
|----|--------------|------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Baillon      | 2004 | Baillon, S., van Diepen, E., Prettyman, R., Redman, J., Rooke, N., & Campbell, R. (2004). Comparison of the effects of Snoezelen and reminiscence therapy on the agitated behaviour of patients with dementia. *International Journal of Geriatric Psychiatry*, 19(11):1047-1052. |
| 2  | Barrick      | 2010 | Barrick, A., Sloane, P., Williams, C., Mitchell, C., Connell, B., Wood, W., . . . Zimmerman, S. (2010). Impact of ambient bright light on agitation in dementia. *International Journal of Geriatric Psychiatry*, 25(10), 1013-1021. |
| 3  | Edelman      | 2011 | Edelman, P. & Ma, T. (2011). Using technology to maximize the quality of life of people with dementia in adult day centers, assisted living facilities and nursing homes. *Alzheimer's and Dementia*, 7(4 SUPPL. 1):S499-S500. |
| 4  | Goto         | 2020 | Goto, S., Suzuki, H., Nakagawa, T., & Shimizu, K. (2020). The effect of eucalyptol on nursing home residents. *Scientific Reports*, 10(1):3996. |
| 5  | Lin          | 1998 | Lin, Y. S. & Taylor, A. G. (1998). Effects of therapeutic touch in reducing pain and anxiety in an elderly population. *Integrative Medicine*, 1(4), 155-162. |
| 6  | Lu           | 2013 | Lu, D.-F., Hart, L.K., Lutgendorf, S.K., & Perkhounkova, Y. (2013). The effect of healing touch on the pain and mobility of persons with osteoarthritis: A feasibility study. *Geriatric Nursing*, 34(4):314-322. |

### Not English or French (n=5)

| #  | First Author | Year | Full Citation                                                                                                                                 |
|----|--------------|------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Beullens     | 2002 | Beullens, J. & Schols, J. (2002). Treatment of insomnia in demented nursing home patients: A review *Tijdschrift voor Gerontologie en Geriatrie*, 33(1):15-20. |
| 2  | Ionela       | 2014 | Ionela, T.M., Ioana, I.E., Constantin, C., & Ionela, G.L. (2014). Rolul stimulării multisenzoriale în ameliorarea calității vie? Ii la vârstnicii cu demență vasculară. *Romanian Journal of Physical Therapy*, 20(34):61-66. |
| 3  | Jensen       | 2001 | Jensen, T.L. (2001). Use of touch in nursing related to elderly in nursing homes. *Norsk Tidsskrift For Sykepleieforskning*, 3(3):131-143. |
| 4  | Lezock       | 2014 | Lezock, M., & Klewer, J. (2014). Subjective assessment and objective measurement of the lighting situation in a nursing home. *Pflegewissenschaft*, 16(11):639-645. |
| # | First Author | Year | Full Citation |
|---|--------------|------|---------------|
| 1 | Ezell        | 2017 | Ezell, C.M. (2017). Touch painting: An art therapy intervention on anxiety in older adults. [PhD Dissertation, Lesley University] |
| 2 | Peacock      | 2017 | Danger, S. L. (2017). “The music is still there”: Hearing from individuals with dementia who sing together. [Master’s Dissertation, University of Saskatchewan] |
| 3 | Scott        | 1999 | Scott, G.J. (1999). Spiritual moments with precious people: look at music and transformation in a long-term care center. [PhD Dissertation, The Fielding Institute] |

Tung, H., & Chen, K. (2007). Effects of music therapy on cognition, behavior problems, and depression among demented older adults in long-term care facilities. *Journal of Evidence-Based Nursing*, 3(4):309-318.