


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

Chantal Backman ^{1,2,3}, Melissa Demery-Varin,¹ Danielle Cho-Young,¹ Michelle Crick,¹ Janet Squires^{1,2}

To cite: Backman C, Demery-Varin M, Cho-Young D, *et al.* Impact of sensory interventions on the quality of life of long-term care residents: a scoping review. *BMJ Open* 2021;**11**:e042466. doi:10.1136/bmjopen-2020-042466

► Prepublication history and additional material for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-042466>).

Received 06 July 2020

Revised 09 February 2021

Accepted 10 February 2021



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹School of Nursing, University of Ottawa Faculty of Health Sciences, Ottawa, Ontario, Canada

²Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

³Care of the Elderly, Bruyère Research Institute, Ottawa, Ontario, Canada

Correspondence to

Dr Chantal Backman;
chantal.backman@uottawa.ca

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 2020.¹ 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.¹

Strengths and limitations of this study

- We considered a wide range of sensory interventions published in the literature.
- Only studies that specifically mentioned at least one of the five senses were included.
- The screening and data extraction were performed in duplicate.
- We could have missed evidence of possible interventions because the authors did not specifically mention one of the senses.

As people age, their senses (hearing, sight, taste, smell and touch) decline.²⁻³ Previous research has associated sensory loss with decreased quality of life in older adults.⁴⁻¹³ 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,¹⁴ appropriate environmental temperatures,¹⁵ removal of unpleasant noises,¹⁶ presence of pleasant sounds (music)¹⁷ and installation of multisensory environments including sensory gardens or Snoezelen rooms.¹⁸ Other studies have focused on sensory interventions such as: physical contact,¹⁹⁻²² animal therapy,²³ aromatherapy and essential oils,²⁴⁻²⁵ and nutrition.²⁶⁻³²

Although, research on older adults and sensory decline exists, this is the first review that focuses on the relationship between sensory interventions and the quality of life of residents living in long-term care settings. To our knowledge, no reviews to date have critically analysed the impact of sensory interventions on the quality of life of older adults

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'Malley³³ 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.³⁴ 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.³⁵ 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.³⁶ 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.³⁷ 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'.³⁸ (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 a minimum 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).⁴⁰
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)⁴¹ 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.

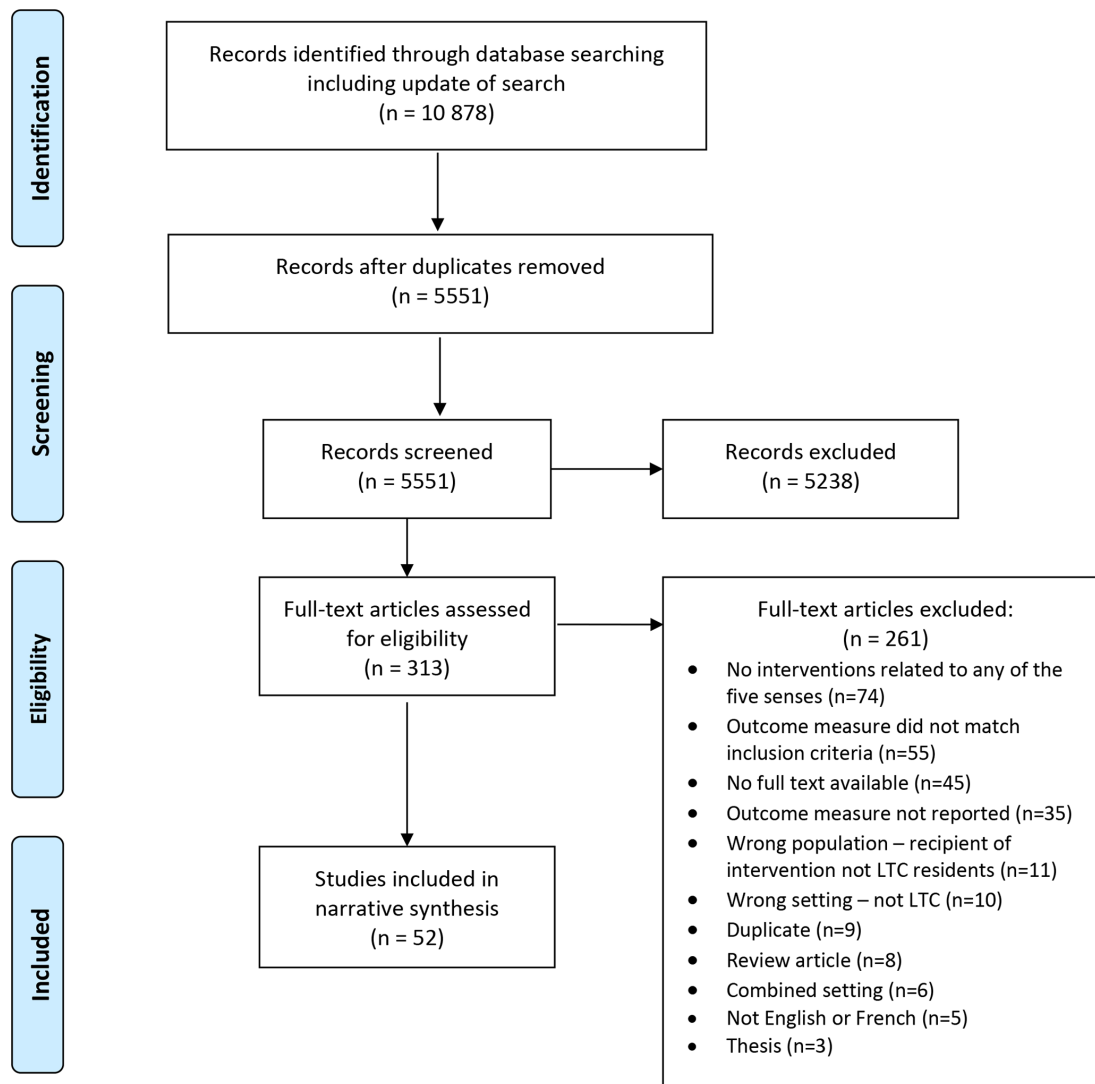


Figure 1 PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses. LTC, long-term care.

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, 5551 records were screened for inclusion. Application of the inclusion criteria to titles and abstracts resulted in the exclusion of 5238 records. We retrieved 313 full-text articles; following application of inclusion criteria to full-text articles, we retained 52 studies^{18 20 22 24 25 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 80} two (3.8%)

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) ⁴²	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)
Studies involving sight-related interventions						
Goddaer (1994) ⁴³	Non-controlled before-and-after study	Belgium	2 nursing homes	n=29, dementia residents	Relaxing music during meals	Emotional well-being (agitation)
Travers (2011) ⁴⁴	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						
Figureiro (2014) ⁴⁵	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)
Figureiro (2019) ⁴⁶	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) ⁴⁷	Pilot RCT	Ireland	1 nursing home	n=10, cognitive status not reported	Bright light interventions	Energy/fatigue (sleep) Mental health (mood)
Hopkins (2017) ⁴⁸	Cross-over trial	UK	7 care homes	n=80, cognitive status not reported	Bright light interventions	Energy/fatigue (sleep) Mental health (mood)
Konis (2018) ⁴⁹	Pilot non-RCT	USA	8 dementia care communities	n=77, dementia residents	Bright light interventions	Mental health (depression)
Koyama (1999) ⁵⁰	Case series	Japan	2 nursing homes	n=6, cognitive status not reported	Bright light interventions	Energy/fatigue (sleep)
Linander (2020) ⁵¹	Cross-over trial	Denmark	1 municipality-based care home	n=34, cognitive status not reported	Bright light interventions	Energy/fatigue (sleep)
Munch (2017) ⁵²	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
Riemsma-vanderLek (2008) ⁵³	RCT	Netherlands	12 homes for the elderly/assisted care facilities	n=189, dementia residents	Bright light interventions	Mental health (affect) Energy /fatigue (sleep) Emotional well-being (agitation)
Sumaya (2001) ⁵⁴	Cross-over trial	USA	1 long term care facility	n=10, cognitive status not reported	Bright light interventions	Mental health (depression)
Wahnschaffe (2017) ⁵⁵	Non-controlled before-and-after study	Germany	1 nursing home	n=15, dementia residents	Bright light interventions	Emotional well-being (agitation)
Wikstrom (1993) ⁵⁶	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) Engaging in topics of conversation by observing works of art	Mental health (happy)
Studies involving smell-related interventions						
Bae (2020) ⁵⁷	RCT	USA	2 long-term care facilities	n=58, no dementia residents	Olfactory stimulation with lavender	Emotional well-being (anxiety) Mental health (depression) Mental health (mood)
Lin (2007) ⁵⁸	Cross-over trial	China	Care and attention homes	n=70, dementia residents	Olfactory stimulation with lavender	Emotional well-being (agitation)
Sakamoto (2012) ⁵⁹	RCT	Japan	3 nursing homes	n=145, dementia residents	Olfactory stimulation with lavender	Emotional well-being (agitation)
Snow (2004) ²⁴	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)
Studies involving touch-related interventions						
Alp (2020) ⁶⁰	RCT	Turkey	1 nursing home	n=60, no dementia patients	Therapeutic touch	Bodily pain (comfort levels) Emotional well-being (anxiety)
Butts (2001) ²⁰	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) ⁶¹	RCT	USA	1 private institution +1 federal long-term care facility	n=19, cognitive status not reported	Massage	Mental health (mood)

Continued

Table 1 Continued

Reference	Study design	Country	Setting	Population	Intervention categories	Quality of life outcomes
Gregory (2005) ²²	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) ⁶²	RCT	Canada	1 long-term care facility	n=51, dementia residents	Therapeutic touch	Emotional well-being (agitation)
Howard (1988) ⁶³	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) ⁶⁴	Non-controlled before-and-after study	Korea	1 home for the aged	n=29, dementia residents	Physical touch	Emotional well-being (anxiety)
Kolcaba (2006) ⁶⁵	RCT	USA	2 nursing homes	n=60, no dementia residents	Massage	Bodily pain (comfort levels) Satisfaction (satisfaction with care)
Sansone (2000) ⁶⁶	Case series	USA	1 nursing centre	n=59, cognitive status not reported	Massage	Emotional well-being (anxiety) Pain
Simington (1993) ⁶⁷	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) ^{68 69}	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) ⁷⁰	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) ⁷¹	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) ⁷²	RCT	Turkey	1 nursing home	n=25, no dementia patients	Therapeutic touch	Energy/fatigue (sleep)
Yucel (2020) ⁷³	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						

Continued

Table 1 Continued

Reference	Study design	Country	Setting	Population	Intervention categories	Quality of life outcomes
Alessi (1999) Hearing, Sight, Touch ⁷⁴	RCT	USA	1 community nursing home	n=29, dementia residents	Physical activity program+nighttime programme intervention Fitness sessions throughout the day combined with a quiet environment at night	Energy/fatigue (sleep) Emotional well-being (agitation)
Bautrant (2019) Hearing, Sight ⁷⁵	Non-controlled before-and-after study	USA	1 long-term care home	n=19, dementia residents	Environmental modifications Skylike ceiling tiles, decrease of the illuminance at night with soothing music, increase illuminance during the day, light beige walls, oversized clocks, night team clothes dark blue and day team sky blue	Mental health (depression) Emotional well-being (agitation) (behavioural symptoms)
Bernstein (2000) Sight, Touch ⁷⁶	Cross-sectional	USA	2 long-term care facilities	n=33, dementia residents	Pet therapy	Social functioning (social behaviours)
JoyBowles (2002) Smell, Touch ²⁵	Cross-over trial	Australia	1 nursing home	n=36, dementia residents	Massage and essential oils	Emotional well-being (agitation) Social functioning (resistance to nursing care)
Cohen-Mansfield (2012) Hearing, Sight, Touch ⁷⁷	Cross-over trial	USA	7 nursing homes	n=193, dementia residents	Various stimuli interventions 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)	Mental health (pleasure)

Continued

Table 1 Continued

Reference	Study design	Country	Setting	Population	Intervention categories	Quality of life outcomes
Cox Hearing, Sight, Smell, Touch ⁷⁸	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) Hearing, Sight, Smell, Taste, Touch ⁷⁸	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) Hearing, Sight, Touch ⁷⁹	Non-controlled before- and-after study	USA	1 intermediate skilled crse 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) Hearing, Touch ⁸⁰	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) Hearing, Sight, Smell, Taste, Touch ⁸¹	Cross-sectional	Ireland	1 nursing home	n=9, dementia residents	Namaste care	Mental health (depression) Emotional well-being (agitation) (behavioural symptoms)
Maseda (2014) Hearing, Sight, Smell, Touch ⁸²	RCT	Spain	1 specialised elderly centre	n=26, dementia residents	Snoezelen rooms	Mental health (depression) Emotional well-being (agitation) (behavioural symptoms)
Moghaddasifar (2019) Hearing, Sight, Touch ⁸³	RCT	Iran	Nursing homes	n=28, cognitive status not reported	Motor and multisensory based strategies	Mental health (depression) Emotional well-being (anxiety)
Roenke (1998) Hearing, Sight, Smell, Touch ⁸⁴	Grounded theory	USA	1 long term care facility	n=4, no dementia residents	Pet therapy	Satisfaction

Continued

Table 1 Continued

Reference	Study design	Country	Setting	Population	Intervention categories	Quality of life outcomes
Simard (2010) Hearing, Sight, Smell, Taste, Touch ⁸⁵	Non-controlled before- and-after study	USA	6 senior living healthcare centres	n=86, dementia residents	Namaste Care Activities of daily living in an unhurried manner, with a “loving touch” approach to care	Mental health (depression) Emotional well-being (agitation) (behavioural symptoms)
Buschmann (1999) Hearing, Touch ⁸⁶	RCT	USA	1 nursing home	n=24, no dementia residents	Expressive physical touch (in combination with talking) A voluntary action that occurs spontaneously and is affective usually on the hand, arm, shoulder, or back	Mental health (depression) Satisfaction (life satisfaction/self- actualisation)
Taylor (1993) Hearing, Sight, Smell, Touch ⁸⁷	Cross-over trial	USA	1 long-term care facility	n=18, dementia residents	Pet therapy	Social functioning (Eye contact and vocalisations)
vanWeert (2005) Hearing, Sight, Smell, Taste, Touch ^{88,89}	RCT	Netherlands	6 nursing homes	n=253, dementia residents	Snoezelen rooms	Social functioning (Non-verbal behaviour and verbal communication)
Witucki (1997) Hearing, Smell, Touch ⁹⁰	Cross-sectional	USA	3 long-term care facilities	n=15, dementia residents	Motor and multisensory based strategies	Emotional well-being (behavioural symptoms)

RCT, randomised controlled trial.

in Germany^{55 70} and one (1.9%) each in England,⁴² Ireland,⁴⁷ UK,⁴⁸ Denmark,⁵¹ Switzerland,⁵² Sweden,⁵⁶ China,⁵⁸ Korea,⁶⁴ Portugal,⁷⁸ Ireland,⁸¹ Spain⁸² and Iran.⁸³ 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-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),^{49 52 70} cross-sectional (n=3),^{76 81 90} case series (n=2),^{50 66} mixed methods (n=2) (18, 68/69), controlled before-and-after (n=1)⁵⁶ and grounded theory (n=1).⁸⁴ A total of 32 studies (61.5%) reported the inclusion of participants with cognitive impairment. The study characteristics are found in [table 1](#).

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 study⁴⁴ 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 studies 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](#)).

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

Interventions	N	Outcomes		Direction and magnitude of effect
		Mental health	Emotional well-being	
Environmental 'white noise' ⁴²	13	–	S	Emotional well-being (agitation): –, p<0.001, magnitude not reported
Relaxing music during meals ⁴³	29	–	S	Emotional well-being (agitation): –, $F_{3,78} = 8.52$; p<0.0001
Radio/music programme ⁴⁴	72	NS	–	Quality of Life-Alzheimer's disease: +, p value and magnitude not reported Mental health (depression): NS

NS, not significant.

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

Interventions	N	Outcomes			Direction and magnitude of effect
		Mental health	Energy/fatigue	Emotional well-being	
Bright light intervention ⁴⁵	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	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 ⁴⁷	10	NS	NS	-	Energy/fatigue (sleep): NS Mental health (mood): NS
Bright light interventions ⁴⁸	80	NS	NS	-	Energy/fatigue (sleep): NS Mental health (mood): NS
Bright light interventions ⁴⁹	77	S	-	-	Mental health (depression): -, p=0.01, magnitude not reported
Bright light intervention ⁵⁰	6	-	Mixed	-	Energy/fatigue (sleep): Not reported
Bright light interventions ⁵¹	34	-	NS	-	Energy/fatigue (sleep): NS
Bright light interventions ⁵²	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 ⁵³	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 ⁵⁴	10	S	-	-	Mental health (depression): +, p<0.01, magnitude not reported
Bright light interventions ⁵⁵	15	-	-	S	Emotional well-being (agitation): -, p≤0.05, magnitude not reported
Visual stimulation with pictures (works of art) ⁵⁶	40	S	-	-	Mental health (happy): +, p=0.0001, magnitude not reported

MDS-ADL, Minimum Data Set Activities of Daily Living; 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 4 Interventions for the sense of smell (n=4)

Interventions	N	Outcomes		Direction and magnitude of effect
		Mental health	Emotional well-being	
Olfactory stimulation with lavender ²⁴	7	–	NS	Emotional well-being (agitation): NS
Olfactory stimulation with lavender ⁵⁷	58	NS	–	Mental health (depression): NS
Olfactory stimulation with lavender ⁵⁸	70	–	S	Emotional well-being (agitation): –, p<0.001, magnitude not reported
Olfactory stimulation with lavender ⁵⁹	145	–	S	Emotional well-being (agitation): –, p=0.04, magnitude not reported

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 night-time 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 noise⁴² 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 health^{45 46 49 53 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,^{58 59} (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 al*⁹² 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 al*⁹³ 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,

Table 5 Interventions for the sense of touch (n=15)

Interventions	N	Outcomes					Direction and magnitude of effect
		Mental health	Energy/Fatigue	Emotional well-being	Pain	Satisfaction	
Massage ²⁰	45	–	–	–	–	S	Satisfaction (life satisfaction/self-actualisation): +, p value not reported, magnitude not reported
Massage ⁶¹	19	NS	–	–	–	–	Mental health (mood): NS
Massage ⁶⁵	60	–	–	–	NS	NS	Bodily pain (comfort levels): NS Satisfaction (satisfaction with care): NS
Massage ⁶⁶	59	–	–	S	S	–	Emotional well-being (anxiety): +, p value not reported, magnitude not reported Pain: –, p value not reported, magnitude not reported
Therapeutic touch ²²	121	–	–	S	S	–	Emotional well-being (behavioural symptoms): +, p value not reported, magnitude not reported Pain: –, p value not reported, magnitude not reported
Therapeutic touch ⁶⁰	60	–	–	S	S	–	Bodily pain (comfort levels): +, $X^2=107.00$, $p=0.001$ Emotional well-being (anxiety): –, $X^2=97.171$, $p<0.05$
Therapeutic touch ⁶²	51	–	–	Mixed	–	–	Emotional well-being (agitation): Time 0 to Time 5: S, +, $p<0.05$, Time six to Time 8: NS
Therapeutic touch ⁶⁷	105	–	–	S	–	–	Emotional well-being (anxiety): +, $p=0.001$, magnitude not reported
Therapeutic Touch ^{68 69}	20	–	–	–	–	–	Overall quality of life measure using EuroQoL 5 Dimension: NS Qualitative findings: 12 vignettes (one patient each) with quotes were reported, ordered from no perceived benefit to more clear indicators of change
Therapeutic touch ⁷¹	57	–	–	S	–	–	Emotional well-being (behavioural symptoms): –, $p=0.033$, magnitude not reported
Therapeutic touch ⁷²	25	–	NS	–	–	–	Energy/fatigue (sleep): NS
Therapeutic touch and hand massage ⁷³	30	–	–	S	S	–	Bodily pain (comfort levels): +, $p<0.05$, magnitude not reported Emotional well-being (anxiety): –, $p<0.05$, magnitude not reported
Physical Touch ⁶⁴	29	–	–	S	–	–	Emotional well-being (anxiety): –, $p<0.0001$, magnitude not reported
Pet therapy ⁷⁰	17	–	–	–	–	–	Mental health (pleasure): +, $p<0.01$, magnitude not reported Social functioning (Non-verbal behaviour and verbal communication) : NS Emotional well-being (agitation) (behavioural symptoms): NS
Tactile stimulation ⁶³	30	NS	–	–	–	–	Mental health (mood): NS

NS, not significant.

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 review⁹⁴ 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

Table 6 Interventions for multiple senses (n=18)

Interventions (senses)	N	Outcomes					Direction and magnitude of effect
		Mental health	Energy/Fatigue	Emotional well-being	Social functioning	Satisfaction	
Massage ²⁵	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 ⁷⁴	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 ⁷⁷	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 ⁸⁰	65	S	–	S	–	–	Mental health (depression): –, p=0.008 Emotional well-being (agitation): –, p<0.001
Motor and multisensory based strategies ⁷⁸	6	–	–	NS	–	–	Emotional well-being (behavioural symptoms): NS
Motor and multisensory based strategies (Plush animals) ⁷⁹	40	S	–	S	S	S	Mental health (depression): –, p<0.049, magnitude not reported Emotional well-being: +, p<0.001, magnitude not reported (behavioural symptoms) Social functioning (social behaviours): +, p<0.006, magnitude not reported Satisfaction (life satisfaction/self-actualisation): +, p<0.030, magnitude not reported
Motor and multisensory based strategies ⁸³	28	S	–	S	–	–	Mental health (depression): +, p>0.001, magnitude not reported Emotional well-being (anxiety): –, p=0.001, magnitude not reported
Motor and multisensory based strategies ⁹⁰	15	–	–	S	–	–	Emotional well-being (behavioural symptoms): –, p, magnitude not reported
Snoezelen rooms ¹⁸	24	–	–	NS	–	–	Emotional well-being (anxiety): NS
Snoezelen rooms ⁸²	26	NS	–	Mixed	–	–	Mental health (depression): NS Emotional well-being (agitation): +, p=0.023, magnitude not reported (behavioural symptoms): NS
Snoezelen rooms ^{88 89}	253	–	–	–	S	–	Social functioning (Non-verbal behaviour and verbal communication): +, p<0.05, magnitude not reported
Namaste Care ⁸¹	9	NS	–	NS	–	–	Mental health (depression): NS Emotional well-being (agitation): NS Emotional well-being (behavioural symptoms): NS

Continued

Table 6 Continued

Interventions (senses)	N	Outcomes					Direction and magnitude of effect
		Mental health	Energy/Fatigue	Emotional well-being	Social functioning	Satisfaction	
Namaste Care ⁸⁵	86	NS	–	NS	–	–	Mental health (depression): NS Emotional well-being (agitation): NS (behavioural symptoms): NS
Expressive physical touch (in combination with talking) ⁸⁶	24	S	–	–	–	S	Mental health (depression): –, t=–3.07, p=0.005 Satisfaction (life satisfaction/self-actualisation): +, p<0.004, magnitude not reported
Pet therapy ⁷⁶	33	–	–	–	S	–	Social functioning (social behaviours): +, p<0.01, magnitude not reported
Pet therapy ⁸⁴	4	–	–	–	–	–	The four themes were: (1) humanness (the human component) (2) anticipation and continuity (3) ability to facilitate reminiscence: (4) social aspects.
Pet therapy ⁸⁷	18	–	–	–	NS	–	Social functioning (eye contact and vocalisations): NS
Environmental modifications ⁷⁵	19	NS	–	S	–	–	Mental health (depression): NS Emotional well-being (agitation): –, p=0.039, magnitude not reported Emotional well-being (behavioural symptoms): –, p<0.026, magnitude not reported

NS, not significant.

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.

Acknowledgements We would like to thank Lindsey Sikora (LS) for developing the search strategy.

Contributors All authors (CB, MD-V, DC-Y, MC and JS) contributed to conceptualising and designing the study. MD-V, DC-Y and MC independently performed screening. MD-V and DC-Y independently performed data extraction. CB performed initial data synthesis and JS refined it. CB drafted the manuscript. All authors (MD-V, DC-Y, MC, JS) critically appraised and edited the manuscript. All authors read and approved the final manuscript. CB is the guarantor of the review.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as online supplemental information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Chantal Backman <http://orcid.org/0000-0001-7431-8159>

REFERENCES

- 1 United Nations. World population prospects 2019. Available: <https://population.un.org/wpp/>
- 2 Novak M. Aging and society: a Canadian perspective. Nelson, Canada; 2013.

- 3 Pohl PS, Dunn W, Brown C. The role of sensory processing in the everyday lives of older adults. *OTJR* 2003;23:99–106.
- 4 Fischer ME, Cruickshanks KJ, Klein BEK, et al. Multiple sensory impairment and quality of life. *Ophthalmic Epidemiol* 2009;16:346–53.
- 5 Pinto JM, Wroblewski KE, Kern DW, et al. Olfactory dysfunction predicts 5-year mortality in older adults. *PLoS One* 2014;9:e107541.
- 6 Wilson RS, Yu L, Bennett DA. Odor identification and mortality in old age. *Chem Senses* 2011;36:63–7.
- 7 Wang JJet al. Visual impairment, age-related cataract, and mortality. *Arch Ophthalmol* 2001;119:1186–90.
- 8 Rovner BW, Ganguli M. Depression and disability associated with impaired vision: the movies project. *J Am Geriatr Soc* 1998;46:617–9.
- 9 Klaver CCWet al. Age-Specific prevalence and causes of blindness and visual impairment in an older population. *Arch Ophthalmol* 1998;116:653–8.
- 10 Li L, Simonsick EM, Ferrucci L, et al. Hearing loss and gait speed among older adults in the United States. *Gait Posture* 2013;38:25–9.
- 11 Genthner DJ, Betz J, Pratt S, et al. Association of hearing impairment and mortality in older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 2015;70:85–90.
- 12 Schiffman SS, Graham BG. Taste and smell perception affect appetite and immunity in the elderly. *Eur J Clin Nutr* 2000;54 Suppl 3:S54–63.
- 13 Besné I, Descombes C, Breton L. Effect of age and anatomical site on density of sensory innervation in human epidermis. *Arch Dermatol* 2002;138:1445–50.
- 14 De Leppeleire J, Bouwen A, De Coninck L, et al. Insufficient lighting in nursing homes. *J Am Med Dir Assoc* 2007;8:314–7.
- 15 Mendes A, Papoila AL, Carreiro-Martins P, et al. The influence of thermal comfort on the quality of life of nursing home residents. *J Toxicol Environ Health A* 2017;80:729–39.
- 16 Dijkstra K, Pieterse M, Pruyt A. Physical environmental stimuli that turn healthcare facilities into healing environments through psychologically mediated effects: systematic review. *J Adv Nurs* 2006;56:166–81.
- 17 Fredriksson A-C, Hellström L, Nilsson U. Patients' perception of music versus ordinary sound in a postanesthesia care unit: A randomised crossover trial. *Intensive and Critical Care Nursing* 2009;25:208–13.
- 18 Cox H, Burns I, Savage S. Multisensory environments for leisure: promoting well-being in nursing home residents with dementia. *J Gerontol Nurs* 2004;30:37–45.
- 19 Weisberg J, Haberman MR. A therapeutic Hugging week in a geriatric facility. *J Gerontol Soc Work* 1989;13:181–6.
- 20 Butts JB. Outcomes of comfort touch in institutionalized elderly female residents. *Geriatr Nurs* 2001;22:180–4.
- 21 Fraser J, Ross Kerr J. Psychophysiological effects of back massage on elderly institutionalized patients. *J Adv Nurs* 1993;18:238–45.
- 22 Gregory S, Verdouw J. Therapeutic touch: its application for residents in aged care. *Aust Nurs J* 2005;12:23–5.
- 23 Baun MM, Bergstrom N, Langston NF, et al. Physiological effects of human/companion animal bonding. *Nurs Res* 1984;33:126–9.
- 24 Snow LA, Hovanec L, Brandt J. A controlled trial of aromatherapy for agitation in nursing home patients with dementia. *J Altern Complement Med* 2004;10:431–7.
- 25 Joy Bowles E, Bowles J, Griffiths Q. Effects of essential oils and touch on resistance to nursing care procedures and other dementia-related behaviours in a residential care facility. *International Journal of Aromatherapy* 2002;12:22–9.
- 26 Adams K, Anderson JB, Archuleta M, et al. Defining skilled nursing facility residents' dining style preferences. *J Nutr Gerontol Geriatr* 2013;32:213–32.
- 27 Bautista EN, Tanchoco CC, Tajan MG, et al. Effect of flavor enhancers on the nutritional status of older persons. *J Nutr Health Aging* 2013;17:390–2.
- 28 Cassens D, Johnson E, Keelan S. Enhancing taste, texture, appearance, and presentation of Pureed food improved resident quality of life and weight status. *Nutr Rev* 1996;54:S51–4.
- 29 Hartwell H, Johns N, Edwards JSA. E-menus—Managing choice options in hospital foodservice. *Int J Hosp Manag* 2016;53:12–16.
- 30 O'hara PA, Harper DW, Kangas M, et al. Taste, temperature, and presentation predict satisfaction with foodservices in a Canadian continuing-care Hospital. *J Am Diet Assoc* 1997;97:401–5.
- 31 Ohno T, Uematsu H, Nozaki S, et al. Improvement of taste sensitivity of the nursed elderly by oral care. *J Med Dent Sci* 2003;50:101–7.
- 32 Baur V, Abma T. 'The Taste Buddies': participation and empowerment in a residential home for older people. *Ageing Soc* 2012;32:1055–78.
- 33 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
- 34 Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- 35 Backman C, Crick M, Cho-Young D, et al. What is the impact of sensory practices on the quality of life of long-term care residents? A mixed-methods systematic review protocol. *Syst Rev* 2018;7:115.
- 36 McGowan J, Sampson M, Salzwedel DM, et al. Press peer review of electronic search strategies: 2015 guideline statement. *J Clin Epidemiol* 2016;75:40–6.
- 37 World Health Organization. Proposed working definition of an older person in Africa for the MDS project. Available: <http://www.who.int/healthinfo/survey/ageingdefnolder/en/>
- 38 Sanford AM, Orrell M, Tolson D, et al. An international definition for "nursing home". *J Am Med Dir Assoc* 2015;16:181–4.
- 39 Office of Disease Prevention and Health Promotion. Health-Related Quality of Life & Well-Being. Available: <https://www.healthypeople.gov/2020/topics-objectives/topic/health-related-quality-of-life-well-being>
- 40 Rand Health Care. 36-Item short form survey (SF-36). Available: https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/scoring.html
- 41 Covidence. A Cochrane technology program. Available: <https://www.covidence.org/>
- 42 Burgio L, Scilley K, Hardin JM, et al. Environmental "white noise": an intervention for verbally agitated nursing home residents. *J Gerontol B Psychol Sci Soc Sci* 1996;51:P364–73.
- 43 Goddaer J, Abraham IL. Effects of relaxing music on agitation during meals among nursing home residents with severe cognitive impairment. *Arch Psychiatr Nurs* 1994;8:150–8.
- 44 Travers C, Bartlett HP. *Silver memories*: implementation and evaluation of a unique radio program for older people. *Ageing Ment Health* 2011;15:169–77.
- 45 Figueiro MG, Plitnick BA, Lok A, et al. Tailored lighting intervention improves measures of sleep, depression, and agitation in persons with Alzheimer's disease and related dementia living in long-term care facilities. *Clin Interv Aging* 2014;9:1527.
- 46 Figueiro MG, Plitnick B, Roohan C, et al. Effects of a tailored lighting intervention on sleep quality, Rest-Activity, mood, and behavior in older adults with Alzheimer disease and related dementias: a randomized clinical trial. *J Clin Sleep Med* 2019;15:1757–67.
- 47 Giggins OM, Doyle J, Hogan K, et al. The impact of a cycled lighting intervention on nursing home residents: a pilot study. *Gerontol Geriatr Med* 2019;5:233372141989745.
- 48 Hopkins S, Morgan PL, Schlangen LJM, et al. Blue-Enriched lighting for older people living in care homes: effect on activity, Actigraphic sleep, mood and alertness. *Curr Alzheimer Res* 2017;14:1053–62.
- 49 Konis K, Mack WJ, Schneider EL. Pilot study to examine the effects of indoor daylight exposure on depression and other neuropsychiatric symptoms in people living with dementia in long-term care communities. *Clin Interv Aging* 2018;13:1071–7.
- 50 Koyama E, Matsubara H, Nakano T. Bright light treatment for sleep-wake disturbances in aged individuals with dementia. *Psychiatry Clin Neurosci* 1999;53:227–9.
- 51 Linander CB, Kallelose T, Joergensen LM, et al. The effect of circadian-adjusted LED-based lighting on sleep, daytime sleepiness and biomarkers of inflammation in a randomized controlled crossover trial by pragmatic design in elderly care home dwellers. *Arch Gerontol Geriatr* 2020;91:104223.
- 52 Münch M, Schmieder M, Bieler K, et al. Bright light delights: effects of daily light exposure on emotions, Restactivity cycles, sleep and melatonin secretion in severely demented patients. *Curr Alzheimer Res* 2017;14:1063–75.
- 53 Riemersma-van der Lek RFet al. Effect of bright light and melatonin on cognitive and noncognitive function in elderly residents of group care facilities. *JAMA* 2008;299:2642–55.
- 54 Sumaya IC, Rienzi BM, Deegan JF, et al. Bright light treatment decreases depression in institutionalized older adults: a placebo-controlled crossover study. *J Gerontol A Biol Sci Med Sci* 2001;56:M356–60.
- 55 Wahnschaffe A, Nowozin C, Haedel S, et al. Implementation of dynamic lighting in a nursing home: impact on agitation but not on Rest-Activity patterns. *Curr Alzheimer Res* 2017;14:1076–83.
- 56 Wikström B-M, Theorell T, Sandström S. Medical health and emotional effects of art stimulation in old age. *Psychother Psychosom* 1993;60:195–206.
- 57 Bae S, Asojo AO. Ambient scent as a positive distraction in long-term care units: theory of supportive design. *HERD* 2020;13:158–72.
- 58 Lin PW-ki, Chan W-chi, Ng BF-leung, et al. Efficacy of aromatherapy (*Lavandula angustifolia*) as an intervention for agitated behaviours in

- Chinese older persons with dementia: a cross-over randomized trial. *Int J Geriatr Psychiatry* 2007;22:405–10.
- 59 Sakamoto Y, Ebihara S, Ebihara T, *et al.* Fall prevention using olfactory stimulation with lavender odor in elderly nursing home residents: a randomized controlled trial. *J Am Geriatr Soc* 2012;60:1005–11.
- 60 Alp FY, Yucel SC. The effect of therapeutic touch on the comfort and anxiety of nursing home residents. *J Relig Health* 2020;7. doi:10.1007/s10943-020-01025-4. [Epub ahead of print: 15 May 2020].
- 61 Corley MC, Ferriter J, Zeh J, *et al.* Physiological and psychological effects of back rubs. *Appl Nurs Res* 1995;8:39–42.
- 62 Hawranik P, Johnston P, Deatrich J. Therapeutic touch and agitation in individuals with Alzheimer's disease. *West J Nurs Res* 2008;30:417–34.
- 63 Howard DM. The effects of touch in the geriatric population. *Phys Occup Ther Geriatr* 1988;6:35–50.
- 64 Kim EJ, Buschmann MT. The effect of expressive physical touch on patients with dementia. *Int J Nurs Stud* 1999;36:235–43.
- 65 Kolcaba K, Schirm V, Steiner R. Effects of hand massage on comfort of nursing home residents. *Geriatr Nurs* 2006;27:85–91.
- 66 Sansone P, Schmitt L. Providing tender touch massage to elderly nursing home residents: a demonstration project. *Geriatr Nurs* 2000;21:303–8.
- 67 Simington JA, Laing GP. Effects of therapeutic touch on anxiety in the institutionalized elderly. *Clin Nurs Res* 1993;2:438–50.
- 68 Wardell DW, Decker SA, Engebretson JC. Healing touch for older adults with persistent pain. *Holist Nurs Pract* 2012;26:194–202.
- 69 Decker S, Wardell DW, Cron SG. Using a healing touch intervention in older adults with persistent pain: a feasibility study. *J Holist Nurs* 2012;30:205–13.
- 70 Wessenberg S, Mueller C, Nestmann F, *et al.* Effects of an animal-assisted intervention on social behaviour, emotions, and behavioural and psychological symptoms in nursing home residents with dementia. *Psychogeriatrics* 2019;19:219–27.
- 71 Woods DL, Craven RF, Whitney J. The effect of therapeutic touch on behavioral symptoms of persons with dementia. *Altern Ther Health Med* 2005;11:66–74.
- 72 Bağcı H, Çınar Yücel Şebnem. Effect of therapeutic touch on sleep quality in elders living at nursing homes. *J Relig Health* 2020;59:1304–18.
- 73 Yücel Şebnem Çınar, Arslan GG, Bağcı H. Effects of hand massage and therapeutic touch on comfort and anxiety living in a nursing home in turkey: a randomized controlled trial. *J Relig Health* 2020;59:351–64.
- 74 Alessi CA, Yoon EJ, Schnelle JF, *et al.* A randomized trial of a combined physical activity and environmental intervention in nursing home residents: do sleep and agitation improve? *J Am Geriatr Soc* 1999;47:784–91.
- 75 Bautrant T, Grino M, Peloso C, *et al.* Impact of environmental modifications to enhance day-night orientation on behavior of nursing home residents with dementia. *J Am Med Dir Assoc* 2019;20:377–81.
- 76 Bernstein PL, Friedmann E, Malaspina A. Animal-assisted therapy enhances resident social interaction and initiation in long-term care facilities. *Anthrozoös* 2000;13:213–24.
- 77 Cohen-Mansfield J, Marx MS, Freedman LS, *et al.* What affects Pleasure in persons with advanced stage dementia? *J Psychiatr Res* 2012;46:402–6.
- 78 Cruz J, Marques A, Barbosa AL, *et al.* Effects of a motor and multisensory-based approach on residents with moderate-to-severe dementia. *American J Alzheimers Dis Other Demen* 2011;26:282–9.
- 79 Francis G, Baly A. Plush animals--do they make a difference? *Geriatr Nurs* 1986;7:140–2.
- 80 Gillis K, Lahaye H, Dom S, *et al.* A person-centred team approach targeting agitated and aggressive behaviour amongst nursing home residents with dementia using the senses framework. *Int J Older People Nurs* 2019;14:e12269.
- 81 Magee M, McCorkell G, Guille S, *et al.* Feasibility of the Namaste care programme to enhance care for those with advanced dementia. *Int J Palliat Nurs* 2017;23:368–76.
- 82 Maseda A, Sánchez A, Marante MP, *et al.* Effects of multisensory stimulation on a sample of institutionalized elderly people with dementia diagnosis: a controlled longitudinal trial. *Am J Alzheimers Dis Other Demen* 2014;29:463–73.
- 83 Moghaddasifar I, Fereidooni-Moghadam M, Fakharzadeh L, *et al.* Investigating the effect of multisensory stimulation on depression and anxiety of the elderly nursing home residents: a randomized controlled trial. *Perspect Psychiatr Care* 2019;55:42–7.
- 84 Roenke L, Mulligan S. The therapeutic value of the human-animal connection. *Occup Ther Health Care* 1998;11:27–43.
- 85 Simard J, Volicer L. Effects of Namaste care on residents who do not benefit from usual activities. *Am J Alzheimers Dis Other Demen* 2010;25:46–50.
- 86 Buschmann MT, Hollinger-Smith LM, Peterson-Kokkas SE. Implementation of expressive physical touch in depressed older adults. *J Clin Geropsychol* 1999;5:291–300.
- 87 Taylor E, Maser S, Yee J, *et al.* Effect of animals on eye contact and vocalizations of elderly residents in a long term care facility. *Phys & Ther Geriatr* 1994;11:61–71.
- 88 van Weert JCM, van Dulmen AM, Spreeuwenberg PMM, *et al.* Effects of snoezelen, integrated in 24h dementia care, on nurse-patient communication during morning care. *Patient Educ Couns* 2005;58:312–26.
- 89 van Weert JCM, van Dulmen AM, Spreeuwenberg PMM, *et al.* Behavioral and mood effects of snoezelen integrated into 24-hour dementia care. *J Am Geriatr Soc* 2005;53:24–33.
- 90 Witucki JM, Twibell RS. The effect of sensory stimulation activities on the psychological well being of patients with advanced Alzheimer's disease. *Am J Alzheimers Dis* 1997;12:10–15.
- 91 Grimshaw J, McAuley LM, Bero LA, *et al.* Systematic reviews of the effectiveness of quality improvement strategies and programmes. *Qual Saf Health Care* 2003;12:298–303.
- 92 Maria Ugolini M, Rossato C, Baccarani C. A five-senses perspective to quality in hospitals. *The TQM Journal* 2014;26:284–99.
- 93 Iyendo TO, Uwajeh PC, Ikenna ES. The therapeutic impacts of environmental design interventions on wellness in clinical settings: a narrative review. *Complement Ther Clin Pract* 2016;24:174–88.
- 94 Andrusjak W, Barbosa A, Mountain G. Identifying and managing hearing and vision loss in older people in care homes: a scoping review of the evidence. *Gerontologist* 2020;60:e155–68.