Effectiveness of multisensory stimulation in managing neuropsychiatric symptoms in older adults with major neurocognitive disorder: a systematic review protocol

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Review question/objective: This review aims to identify and synthesize the effectiveness of multisensory stimulation in managing neuropsychiatric symptoms in older adults with major neurocognitive disorder.

More specifically, this review focuses on the following questions: what are the effects of multisensory stimulation in managing neuropsychiatric symptoms such as delusion, hallucination, agitation, aggression, mood liability, anxiety, apathy, motor disturbances, night-time behavior and eating disorders in elderly patients with major neurocognitive disorder?

Keywords Neurocognitive disorder; multisensory stimulation; neuropsychiatric symptoms; older adults

Background

Major neurocognitive disorder (major NCD), which corresponds to the condition referred to as dementia1,2 in the recently published fifth edition of the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders (DSM-5), is a clinical syndrome caused by neurodegeneration with the following etiological subtypes: Alzheimer’s disease, frontotemporal lobar degeneration, Lewy body disease and vascular disease, among others.¹

Prevalence of major NCD increases exponentially with age.²,³ In 2010, there were an estimated 35.6 million people with dementia worldwide. By 2030, it is estimated that there will be 65.7 million people with major NCD.³ At the moment, major NCD is considered a pandemic in developed countries.³

Major NCD affects more often older adults and the DSM-5 describes six cognitive domains that may be affected: complex attention, executive function, learning and memory, language, perceptual-motor function and social cognition.¹

Major NCD requires evidence of significant cognitive decline from a previous level of performance in one or more of the cognitive domains outlined earlier.¹,² Therefore, it is characterized by a progressive deterioration in cognitive ability and capacity for independent living.¹,³ The neuropsychiatric symptoms (NPS) affect patients with major NCD almost across all stages and etiologies.⁴ Most patients have one or more concomitant symptoms, such as agitation or aggressive behavior, depression, apathy, psychosis, hallucinations and disinhibition.⁴ These NPS are associated with poor outcomes, decreased quality of life and increased caregiver burden.⁴,⁵

In patients with major NCD, the pharmacological treatment of the NPS focuses on the use of sedatives, neuroleptics or antidepressants, but the result is unsatisfactory in many patients and side-effects are common.⁵,⁶ So, in the past decades, evidence has shown that pharmacological treatments have been ineffective in controlling all symptoms.⁶–⁹ As a result, nonpharmacological interventions have attracted more investigation.⁴,⁶,⁷,⁹ Encouraging the use of nonpharmacological therapies is related to pharmacological safety concerns, especially in advanced stages of major NCD.⁴,⁷,¹⁰

As an example, the multisensory stimulation (MSS) environment known as Snoezelen was developed in the 1970s in the Netherlands.⁹–¹¹ It was initially developed as a therapy for young people with learning difficulties,¹² but since the beginning of the 1990s, it was introduced in the
care of people with dementia.\textsuperscript{9,10} This technique is applied in a darkened and comfortable room, where all senses are stimulated using aromatherapy, water columns of different colors, fiber-optic cables and tactile objects, among others.\textsuperscript{9,10} This room is known as “MSS room” or “Snoezelen room”. There is also the “sensory garden”, where patients can experience different forms of sensory stimulation such as sunshine, warmth, fresh air and birdsong.\textsuperscript{13} The idea is to use resources found in nature to stimulate senses such as sight, hearing, smell and touch.\textsuperscript{14} At the moment, “Snoezelen” is a registered trademark.\textsuperscript{9,15} Therefore, we will use the term “MSS” not just for this reason, but also because this concept is much more comprehensive.\textsuperscript{12,15–17}

Multisensory stimulation has been applied as a nonpharmacological therapy in older adults with major NCD (or dementias).\textsuperscript{16} It is based on a non-directive approach that does not focus on cognitive stimulation, but encourages older people to engage with sensory stimuli of their choice.\textsuperscript{9,10,15} Its use is based on the biopsychosocial model, as NPS are influenced not only by the disease itself, but also by the physical and psychosocial environment surrounding the elderly.\textsuperscript{9}

Older adults with major NCD, especially those who are in nursing homes or housebound, suffer from environmental understimulation. However, sensory stimulation can often be as excessive as in a hospital ward.\textsuperscript{9,10,12,17} Balancing the pace of sensory-stimulation or sensory-calming activities is necessary for all people, but particularly elderly people.\textsuperscript{9–12} Multisensory stimulation aims to stimulate the primary senses to achieve a balance between sensory-stimulating and sensory-calming activities.\textsuperscript{9,11,18} Therefore, the professional works one-on-one with patients to stimulate different senses, such as visual, auditory, proprioceptive and olfactory, through a variety of sensory activities, such as different types of food, clothes, tactile objects, light and music.\textsuperscript{11,15}

Furthermore, MSS is one of the interventions that can be applied at any stage of major NCD (dementia), including the severe or very severe stage.\textsuperscript{9,10,19} For that reason, it can be targeted at patients with memory impairment, personality change, and limited social and verbal communication skills.\textsuperscript{9,10} Multisensory stimulation provides an atmosphere of trust and relaxation without the need for intellectual activity of one-on-one attention.\textsuperscript{9,10,12} The ultimate goal of MSS is to improve the patients’ well being and quality of life, which are assessed through changes in the following behaviors or mood status, among others: apathetic, aggressive, adaptive and agitated behaviors, and depression, happiness, enjoyment and sadness.\textsuperscript{20,21}

The use of MSS in the field of dementia has seen rapid development,\textsuperscript{6,15,16} although the effectiveness of this intervention still seems to be limited.\textsuperscript{9,16,22} The results of some studies in this area have indicated that MSS can have a positive short- and long-term impact on the NPS of older adults with major NCD.\textsuperscript{7,9,10,17–19} Hence MSS is effective in reducing some NPS such as apathy or agitation, attention/concentration, mood status, communication and cognitive status.\textsuperscript{7,9,17–19,21}

A preliminary search of the JBI Database of Systematic Reviews and Implementation Reports, the Cochrane Database of Systematic Reviews, Prospero, CINAHL and MEDLINE has revealed that there are some systematic reviews on nonpharmacological interventions that make reference to the effectiveness of MSS in their results. However, in these systematic reviews, the effects of MSS in all stages\textsuperscript{25} or in all etiologic subtypes\textsuperscript{26} of dementias (major NCD) have not been fully explored. These reviews have only examined the effectiveness of nonpharmacological interventions on specific outcomes, such as apathy and agitation.\textsuperscript{14,25,26} There are currently no systematic reviews (neither published nor in progress) on the use of MSS in older adults with dementia (major NCD). It is necessary to examine the effectiveness of MSS in people with major NCD in managing NPS, which involves an intense evidence-based critical analysis. Therefore, the main objective of this study is to identify the effects of MSS, in the short and long term, on NPS such as behavior, mood, cognitive status and functional status in activities of daily living (ADLs) in older adults with major NCD (or dementia).

**Inclusion criteria**

**Types of participants**

This review will consider studies that include older adults (female and male) aged ≥65 years in any type of setting, with diagnosis of major NCD (or dementia), meeting the criteria of the DSM 4th edition.
(DSM-IV) or 5th edition (DSM-5), or the International Classification of Diseases-10.

Studies that do not specify methods of clinical diagnosis or that include adults (<65 years old) in their samples will be excluded.

Types of intervention(s)
This review will consider studies that assess the effects of MSS in the short term (assessment during and after each session) and long term (any follow-up) on the NPS in older adults with major NCD (dementia). This type of stimulation must include two or more therapies, that is, music therapy, aromatherapy, light therapy, therapeutic or massage touch, stimulation of taste or another sensory intervention, and different settings, that is, the Snoezelen room and MSS room, sensory gardens or any other setting.

We will include any structured program of MSS provided or supervised by any health professional and of any duration per session. We will exclude studies that only report results from single-session interventions.

This review will consider studies that assess the effectiveness of MSS versus usual care or another intervention. Usual care will be defined as no intervention/stimulation (e.g. no occupational therapy, no cognitive training and no art therapy, but with possible control of activities such as looking at photographs or doing quizzes). Another intervention will be defined as an intervention/stimulation (e.g. occupational therapy, cognitive training and art therapy).

Outcomes
Primary outcomes
Primary outcomes will be neuropsychiatric symptoms such as delusion, hallucination, agitation, aggression, mood liability, anxiety, apathy, motor disturbances, night-time behavior and eating disorders, measured by any validated scale or measurement or index, such as Cohen-Mansfield Agitation Inventory, Neuropsychiatric Inventory, Geriatric Depression Scale, and Cornell Scale for Depression in Dementia.

Secondary outcomes
Secondary outcomes will be quality of life, ADLs (basic ADLs and instrumental ADLs), caregiver burden and functional capacity assessed by any validated scale or measurement or index.

Types of studies
The quantitative component of this review will consider experimental study designs, including randomized controlled trials, non-randomized controlled trials, quasi-experimental and before and after studies.

In the absence of research studies, other text such as opinion articles and reports will be considered in this review.

Search strategy
The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE via PubMed and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Third, the reference list of all identified reports and articles will be searched for additional studies. Studies published in English, Spanish and Portuguese will be considered for inclusion in this review.

Since MSS was introduced as an intervention for people with dementia in the beginning of the 1990s, studies published after 1990 will be included in this review.

The databases to be searched include MEDLINE via PubMed; CINAHL via EBSCOHost; Scopus; Cochrane Central Register of Controlled Trials and Scielo.

The search for unpublished studies will include RCAAP – Repositório Científico de Acesso Aberto de Portugal; ProQuest – Theses and Dissertations; OpenGrey; Banco de teses da CAPES (www.capes.gov.br) and Dissertation Abstracts Online (e-Thos).

Assessment of methodological quality
Quantitative articles selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the JBI Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

In the absence of research studies, textual articles selected for retrieval will be assessed by two independent reviewers for authenticity prior to inclusion in the review using standardized critical appraisal instruments from the JBI Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

Data extraction
Quantitative data will be extracted from articles included in the review using the standardized data extraction tool from JBI-MAStARI (Appendix II). The extracted data will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives. The authors of the primary studies will be contacted to provide missing or additional data. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer.

In the absence of research studies, textual data will be extracted from articles included in the review using the standardized data extraction tool from JBI-NOTARI (Appendix II). The extracted data will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Data synthesis
Quantitative articles, wherever possible, will be pooled in statistical meta-analysis using JBI System for the Unified Management, Assessment and Review of Information (JBI_SUMARI). The meta-analysis will be performed using the random-effects model. All results will be subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated.

The $I^2$ statistic can be used to quantify the amount of dispersion and $I^2$ values of 25%, 50%, and 75% are interpreted as representing small, moderate and high levels of heterogeneity. Heterogeneity and inconsistency will be explored using subgroup analyses based on the different quantitative study designs, short- or long-term interventions and differences in intervention programs of MSS included in this review. Where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation wherever appropriate.

In the absence of research studies, textual articles, wherever possible, will be pooled using JBI-NOTARI. This will involve the aggregation or synthesis of conclusions to generate a set of statements that represent that aggregation, through assembling and categorizing these conclusions on the basis of similarity in meaning. These categories will then be subjected to a meta-synthesis to produce a single comprehensive set of synthesized findings that could be used as a basis for evidence-based practice. Where textual pooling will not be possible, the conclusions will be presented in narrative form.

Acknowledgements
The authors would like to acknowledge the support provided by the Health Sciences Research Unit: Nursing (UICISA: E), hosted by the Nursing School of Coimbra (ESEnfC).

References


Appendix I: Appraisal instruments

**MASTARI appraisal instrument**

### JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

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<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>Not Applicable</th>
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<td>1. Was the assignment to treatment groups truly random?</td>
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<td>2. Were participants blinded to treatment allocation?</td>
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<td>3. Was allocation to treatment groups concealed from the allocator?</td>
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<td>4. Were the outcomes of people who withdrew described and included in the analysis?</td>
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<td>5. Were those assessing outcomes blind to the treatment allocation?</td>
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<td>6. Were the control and treatment groups comparable at entry?</td>
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<td>7. Were groups treated identically other than for the named interventions</td>
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<td>8. Were outcomes measured in the same way for all groups?</td>
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<td>9. Were outcomes measured in a reliable way?</td>
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<td>10. Was appropriate statistical analysis used?</td>
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**Overall appraisal:**  

- Include [ ]  
- Exclude [ ]  
- Seek further info. [ ]

**Comments (Including reason for exclusion)**

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**NOTARI appraisal instrument**

**JBI Critical Appraisal Checklist for Narrative, Expert opinion & text**

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<td>1. Is the source of the opinion clearly identified?</td>
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<td>4. Is the opinion’s basis in logic/experience clearly argued?</td>
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<td>5. Is the argument developed analytical?</td>
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<td>6. Is there reference to the extant literature/evidence and any incongruency with it logically defended?</td>
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<td>7. Is the opinion supported by peers?</td>
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Overall appraisal: Include □ Exclude □ Seek further info □

Comments (including reason for exclusion)

________________________________________________________________________
Appendix II: Data extraction instruments

MAStARI data extraction instrument

JBI Data Extraction Form for Experimental / Observational Studies

Reviewer __________________________ Date __________________________

Author __________________________ Year __________________________

Journal __________________________ Record Number __________________________

Study Method

RCT □ Quasi-RCT □ Longitudinal □
Retrospective □ Observational □ Other □

Participants

Setting

Population

Sample size

Group A __________________________ Group B __________________________

Interventions

Intervention A

Intervention B

Authors Conclusions:

Reviewers Conclusions:
### Study results

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### Continuous data

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NOTARI data extraction instrument

JBI Data Extraction for Narrative, Expert opinion & text

Reviewer ___________________________ Date ___________________________
Author ___________________________ Year ______________ Record Number __________

Study Description
Type of Text:

Those Represented:

Stated Allegiance/ Position:

Setting

Geographical

Cultural

Logic of Argument

Data analysis

Authors Conclusions

Reviewers Comments

Data Extraction Complete Yes ☐ No ☐
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