



Investigating the Impact of Multi-Sensory Environments on Behavior for People with Dementia

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Introduction

Dementia is a pervasive cognitive condition that impacts a significant portion of the global population.

People estimated to be living with dementia

(Prince et al., 2013)

2010 | 35.6 million

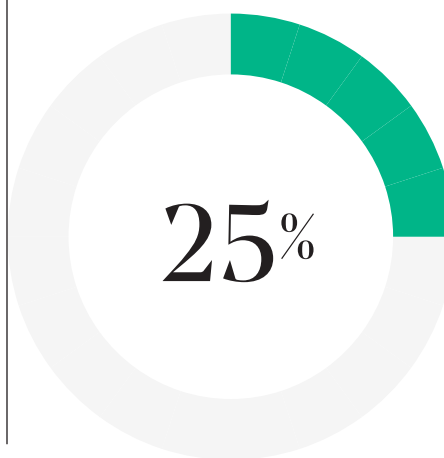


2050 | 115.4 million



Percentage of dementia-care service needs centered on behavior problems

(Borson, et al., 2014)



1 in 9 Americans over 65 have Alzheimer's Disease

**Approximately 5.4 million
Americans of all ages have
Alzheimer's Disease**

(Alzheimer's Association, 2016)

**14% of people aged 71+ in
the US are diagnosed with
some form of dementia**

(Plassman, et al., 2007)

What's wrong with medication?

Drug-based interventions are costly and dangerous.

(Gitlin, Kales, & Lyketsos, 2012)

Powerful, black box, psychotropic medications are not FDA-approved and yet prescribed as sedatives for dementia.

(Tinklenberg et al., 2007; Borson et al., 2013)

The Omnibus Budget Reconciliation Act of 1987 requires non-pharmacological management interventions exhausted prior to chemical restraint.

(Shorr, Fought, Ray, 1994; Baker et al., 2006)



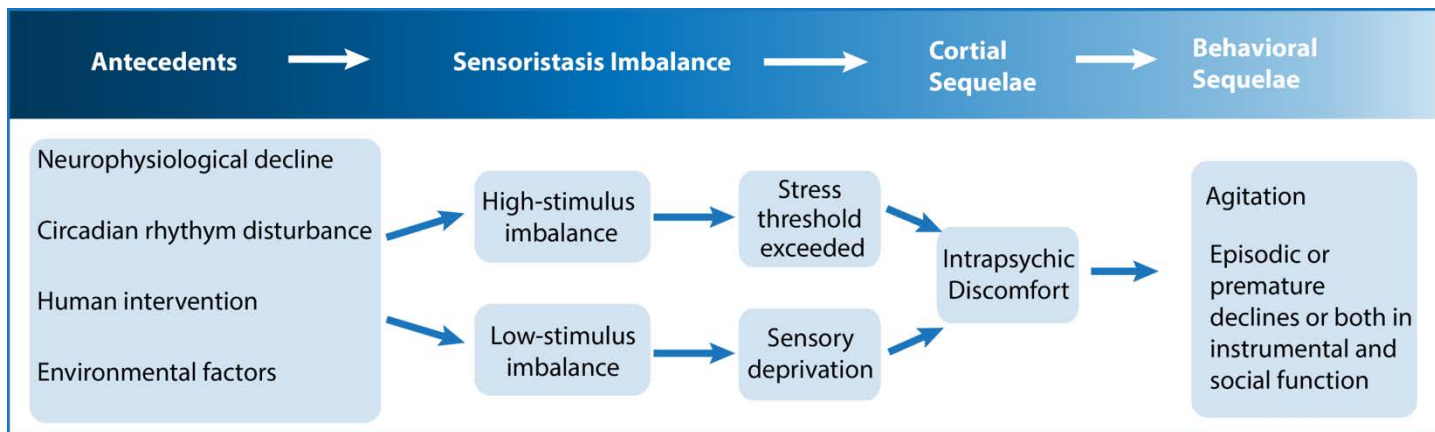
Model of Imbalances in Sensoristasis (Kovach, 2000)

PROBLEM BEHAVIORS:

Life altering levels of agitation, aggression, anger, anxiety and disengagement due to cognitive decline.

And the inability to adapt to stressful environmental experiences.

(Cipriani, Vedovello, Nuti, & Di Fiorino, 2011; Baker, Hanley, & Mathews, 2006; Sloane et al., 2004; Cohen-Mansfield & Parpura-Gill, 2007; Padilla, 2011; Dubois et al., 2016; Kales, Gitlin & Lyketsos, 2015)



Impact of the Built Environment on Behavior:

The built environment, [the architectural environment people inhabit], is capable of modifying the role of human genes and impacting cognition.

(Academy of Neuroscience for Architecture, 2015; Zeisel, 2006)

An enriched environment can contribute up to a 25% increase in the number of brain connections.

(Peterson, O'Donnell, Wicklund, Pigozzi, & Mau, 2010)

Research has demonstrated advantages of the built environment for people living with dementia.

(Calkins, 1988; Elliot, 2013; Gesine Marquardt et al., 2014; Tilly & Reed, 2008; Zeisel et al., 2003; Zeisel, Hyde, & Levkoff, 1994)





Multi-Sensory Environments

Flexible, purposefully designed environments to help people reach sensory equilibrium.

Use visual, auditory, tactile and olfactory stimuli: Ergonomic vibro-acoustic furniture, bubble tubes, color-changing LED lighting solutions, music, fiber optics and aromatherapy.

Shown to have positive impact on behavior for people with dementia.

(Yao & Algase, 2006; Baker et al., 2001; Collier, McPherson, Ellis-Hill, Staal, & Bucks, 2010; Brennan, Su, & Horowitz, 2006)

Statement of the Problem

Practitioners support the impact of MSE on behavior for people with dementia, but more evidence-based research is needed.

The Department of Veterans Affairs (VA) has implemented MSE therapy for Veterans with dementia since 2010 and it remains to be systematically evaluated.

AIMS AND OBJECTIVES:

This research focuses on an evaluation of Multisensory Environments for dementia behavioral therapy at VA Community Living Centers (*VA equivalent to assisted living facilities*).



Research Questions and Overall Study Framework



Study 1

Impact of Multi-Sensory Environments on Behavior for People with Dementia: A Systematic Literature Review

RQ1

What evidence exists in the literature regarding the effectiveness of MSE and variations in its application?

Study 2

Understanding Barriers to Uptake of Multi-Sensory Environments for Veterans with Dementia

RQ2

What are the barriers to uptake and Staff perceptions regarding the effectiveness of MSE at VA CLCs?

Study 3

Effects of MSE Intervention on Behavior in Assisted Bathing for Veterans with Dementia

RQ3

What is the impact of MSE on behavior during assisted bathing for Veterans with dementia?

Study 1

Impact of Multi-Sensory
Environments on Behavior
for People with Dementia: A
Systematic Literature Review

RQ1

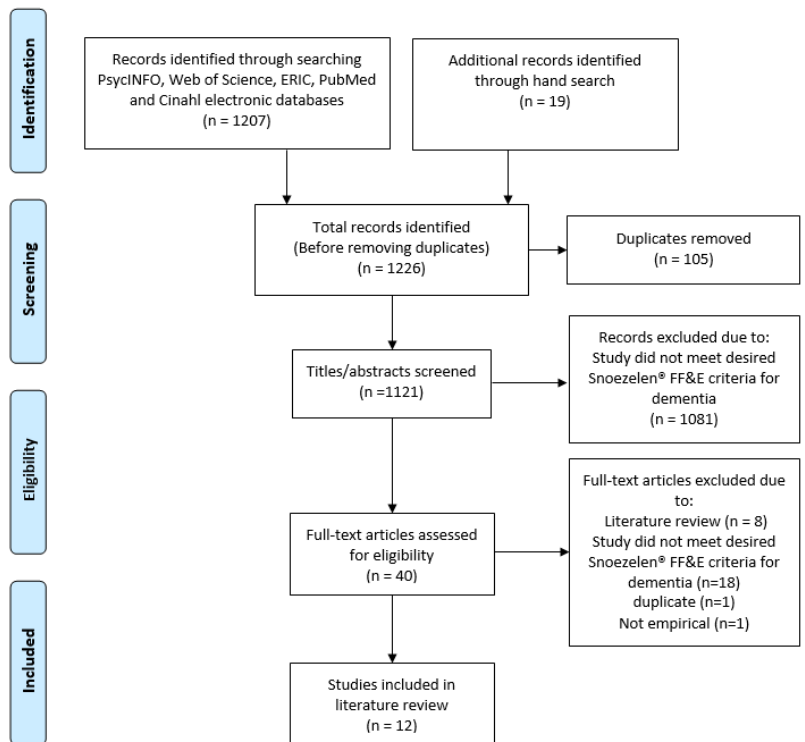
What evidence exists in the literature
regarding the effectiveness of MSE
and variations in its application?

Systematic Literature Review

In order to inform Studies 2 and 3, a thorough investigation of the literature regarding Multisensory Environmental interventions for dementia designed with consistent elements was needed.

1,226 articles were included, published during 1990 to 2015 reporting empirical studies of MSE interventions for problem behaviors including furniture, fixtures, and equipment to provide visual, auditory, tactile, and olfactory stimulation.

PRISMA and PICO frameworks were used.



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

P	Patient, Population or Problem	<i>Dementia</i>
I	Intervention	<i>Multisensory Environments</i>
C	Comparison of Intervention (if appropriate)	<i>NA</i>
O	Outcome to Measure or Achieve	<i>Patient Behavior</i>

Findings

MSE interventions have a positive impact on mood and behavior (e.g., independence in ADLs), reduce BPSD, and therefore likely improve quality of life for patients and caregivers.

Study designs (pre-post) and comparisons (activity based) were not person-centered and therefore ill-fitted for dementia focused investigation.

Single-Case Design methods should be used in future studies, based on a person-centered approach integrating participant preference.

Of the 12 studies that met the final inclusion criteria, non studied MSE within the bathing environment, where most problem behaviors occur.



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OXFORD

Literature Review

Impact of Multisensory Environments on Behavior for People With Dementia: A Systematic Literature Review

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Decision Editor: Rachel Pruchno, PhD

Abstract

Purpose of the Study: Behavioral and psychological symptoms of dementia (BPSD) affect quality of life for people with dementia. Nonpharmacological interventions are the preferred first line of treatment, and it is theorized that BPSD are directly influenced by sensory imbalance and improved by sensory equilibrium. The purpose of this article is to investigate the evidence regarding the use of multisensory environments (MSEs) as treatment for BPSD.

Design and Methods: A systematic literature review was performed using the PICO framework within PsycINFO, Web of Science, ERIC, PubMed, and Cinahl databases, as well as additional hand-searched documents. Included articles were published during 1990 to 2015 and report empirical studies of MSE BPSD interventions that include furniture, fixtures, and equipment to provide visual, auditory, tactile, and olfactory stimulation. Desired elements include ergonomic vibroacoustic furniture, bubble tubes, color-changing lights, and fiber optics.

Results: Twelve articles met the inclusion criteria for review. Evidence supports the positive impact of sensory stimulation as a nonpharmacological behavioral treatment for dementia. Many studies investigated both behavior and mood, and several investigated biomedical parameters including heart rate and cognition. Significant differences were not found in the between-group studies when MSE was compared with other one-to-one interventions. Results on long-term effects were mixed. Variations can be seen in terms of research methods, types of environmental interventions, duration, and specific characteristics of participants, thus confounding the reliability of findings.

Implications: Key findings and directions for future research are discussed including primary outcomes, study design, environmental intervention types, and relevant assessment tools.

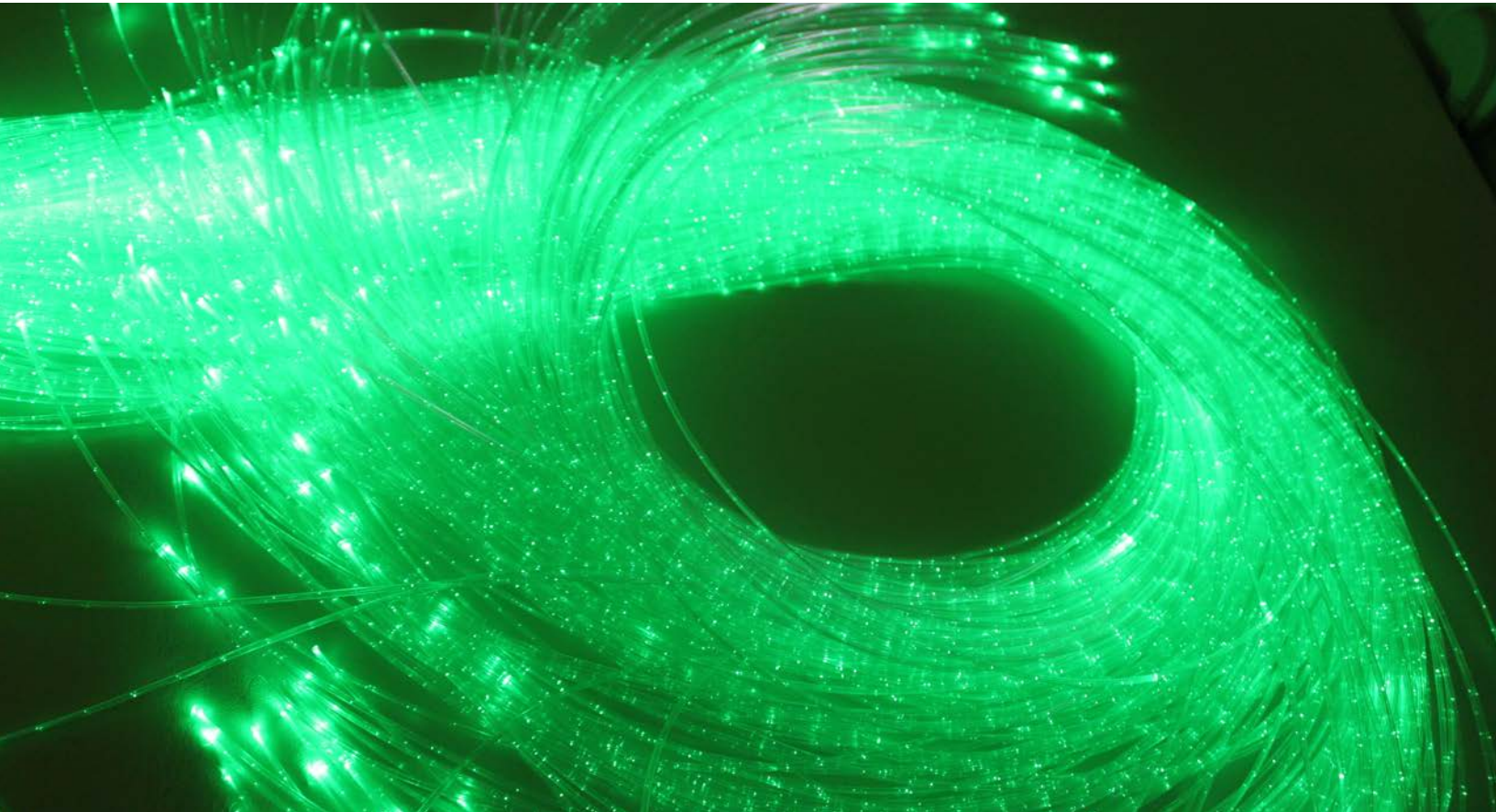
Keywords: Multisensory environment, Sensory stimulation, Behavior, Sensoristaxis, MSE

Study 2

Understanding Barriers to
Uptake of Multi-Sensory
Environments for Veterans
with Dementia

RQ2

What are the barriers to uptake
and staff perceptions regarding
the effectiveness of MSE at VA
Community Living Centers?



Barriers to MSE Uptake & Staff Perceptions

The VA has provided Multisensory Environments to Veterans with Dementia at Community Living Centers since 2010 through Flaghouse.

The first VA-funded Multisensory Environment was in Wilkes Barre, PA and over 53 now exist in both dedicated room and mobile cart applications across the US and Puerto Rico.

Questionnaire Instrument

The questionnaire included 15 items (5 demographic and 10 related to barriers and effectiveness of MSE).

Consisted of 4 sections, described below:

Section 1

Designed to gather operational data of the facility and understand level of involvement with the Multi-Sensory Environment (MSE). Likert Scale, multiple choice.

Section 2

Designed to gather clinical data regarding the use of MSE at each facility. Likert Scale, multiple choice.

Section 3

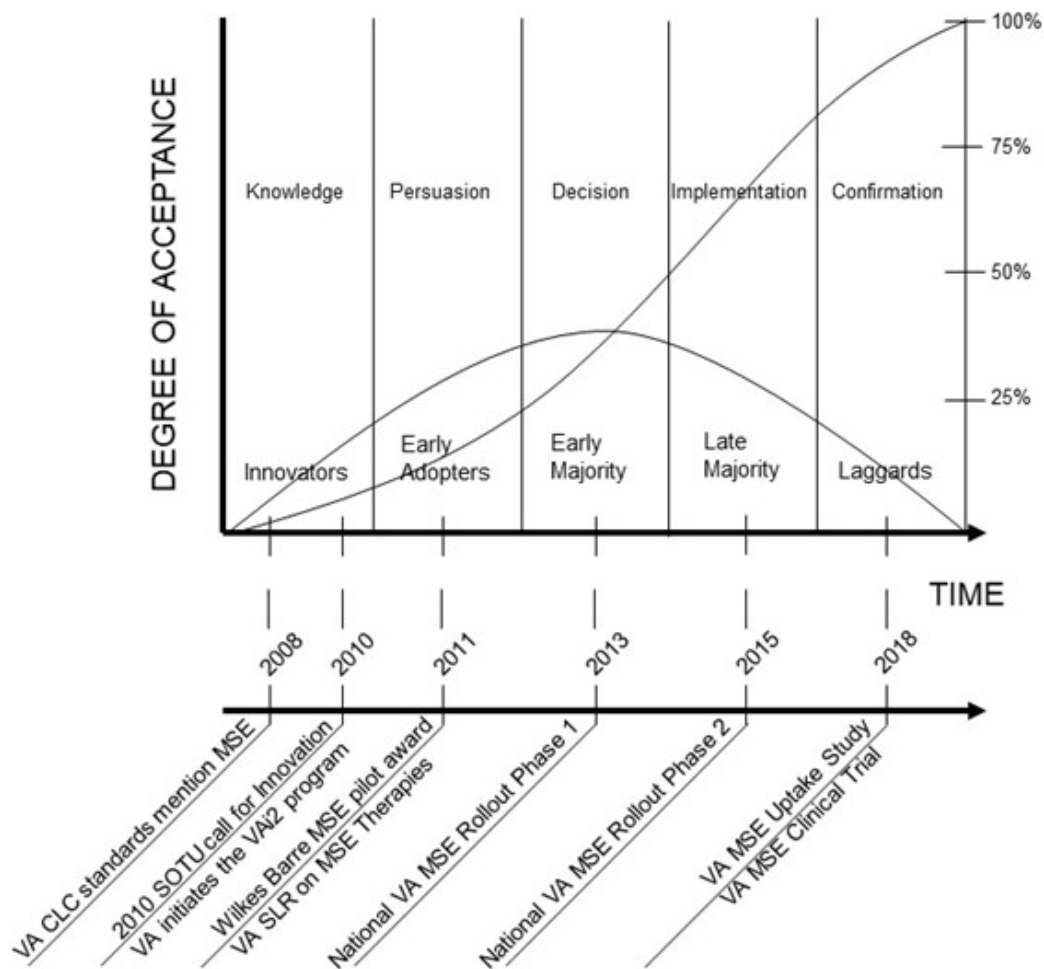
Designed to ascertain barriers to MSE uptake, Veteran preferences and staff perceptions of MSE effectiveness. Likert Scale, multiple choice, open-ended.

Section 4

Designed to allow participants to provide comments regarding lessons learned and suggestions for other facilities interested in MSE. Open-ended.



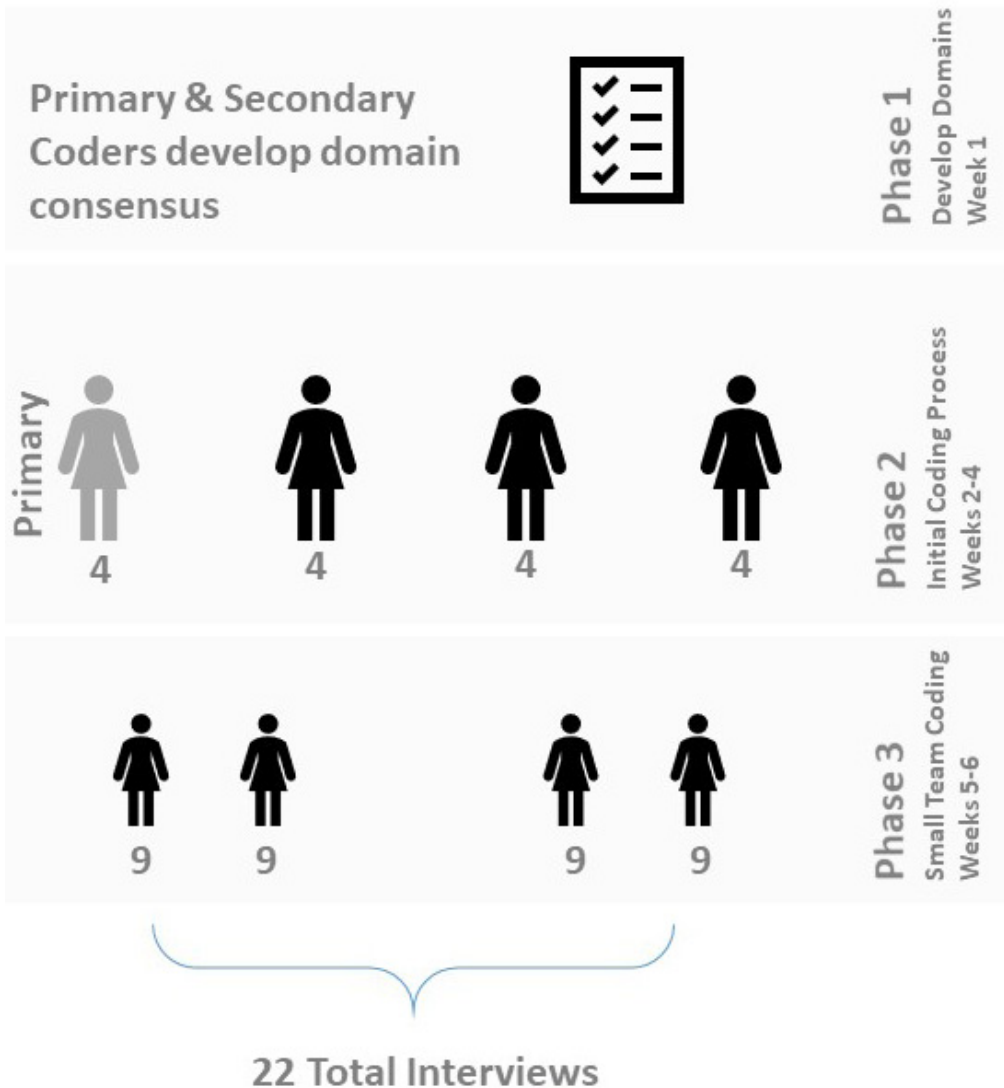
Conceptual Framework & RQI Procedure



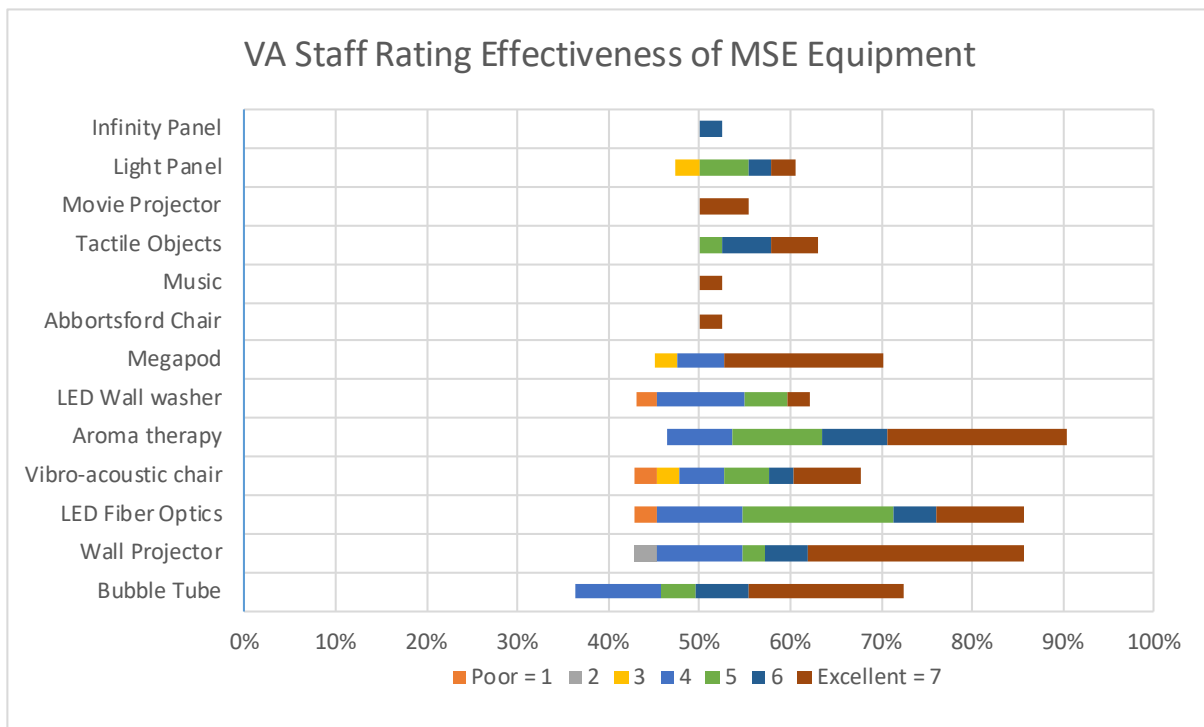
Conceptual diagram illustrating the diffusion of Multisensory Environments as an innovation throughout the VA since 2010

(Rogers, 1962)

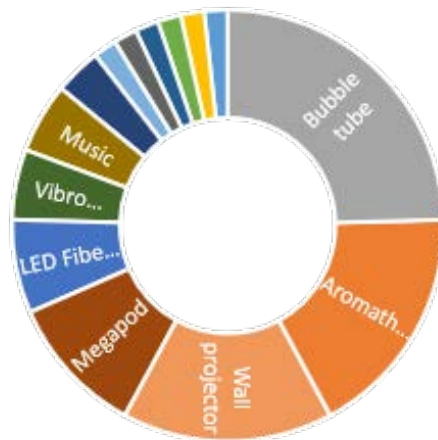
Conceptual Framework & RQI Procedure



Findings



Veteran's Most Preferred Sensory Items



Findings

Aim	Theme	Subtheme
A1	Inadequate Training	Not enough training overall
		Inconsistent new staff training and cross-training
	Lack of Staff Engagement with MSE	Lack of training explaining the purpose of MSE
		High turnover prevents staff MSE engagement Lack of MSE knowledge negatively impacts perceived value
Lack of Clear MSE Maintenance Plan	Staff don't want the added responsibility of MSE	
	Inadequate Accessibility to the MSE	Access barriers of room size, proximity and keys
A2	Importance of Communicating Applications, Methods and Preferences	Need to communicate behavioral applications
		Need to communicate successful documentation methods
	Key Role of Design of the MSE	Importance of incorporating Veteran preferences
		Importance of a dedicated room Importance of a room large enough for a variety of applications Importance of MSE interior design elements
Importance of an MSE Champion	Champion influences consistency in MSE Ownership of MSE programmatic elements	
	Positive Effects of MSE	MSE impacting positive behavior change MSE impact positive engagement MSE provide a calming effect
	Unintended Negative Effects of MSE	Applications in addition to dementia Use it carefully for Veterans with PTSD MSE difficult for some patients to understand

A1= Barriers to Uptake of MSE at the VA for Veterans with Dementia

A2= Staff perceptions of MSE effectiveness at the VA for Veterans with Dementia

Study 3

Effects of MSE Intervention
on Behavior in Assisted
Bathing for Veterans with
Dementia

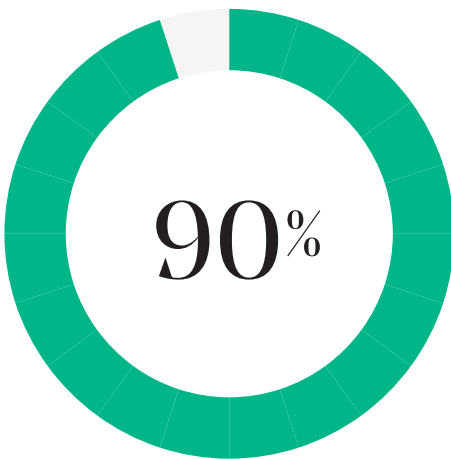
RQ3

What is the impact of MSE on
behavior during assisted bathing
for Veterans with dementia?

MSE Bathing Study

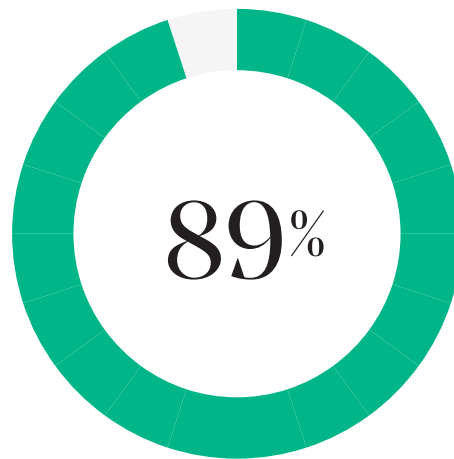
Nursing home residents with dementia need who need help with bathing

(Baker, Hanley & Mathews, 2006; Sloane et al., 2004)

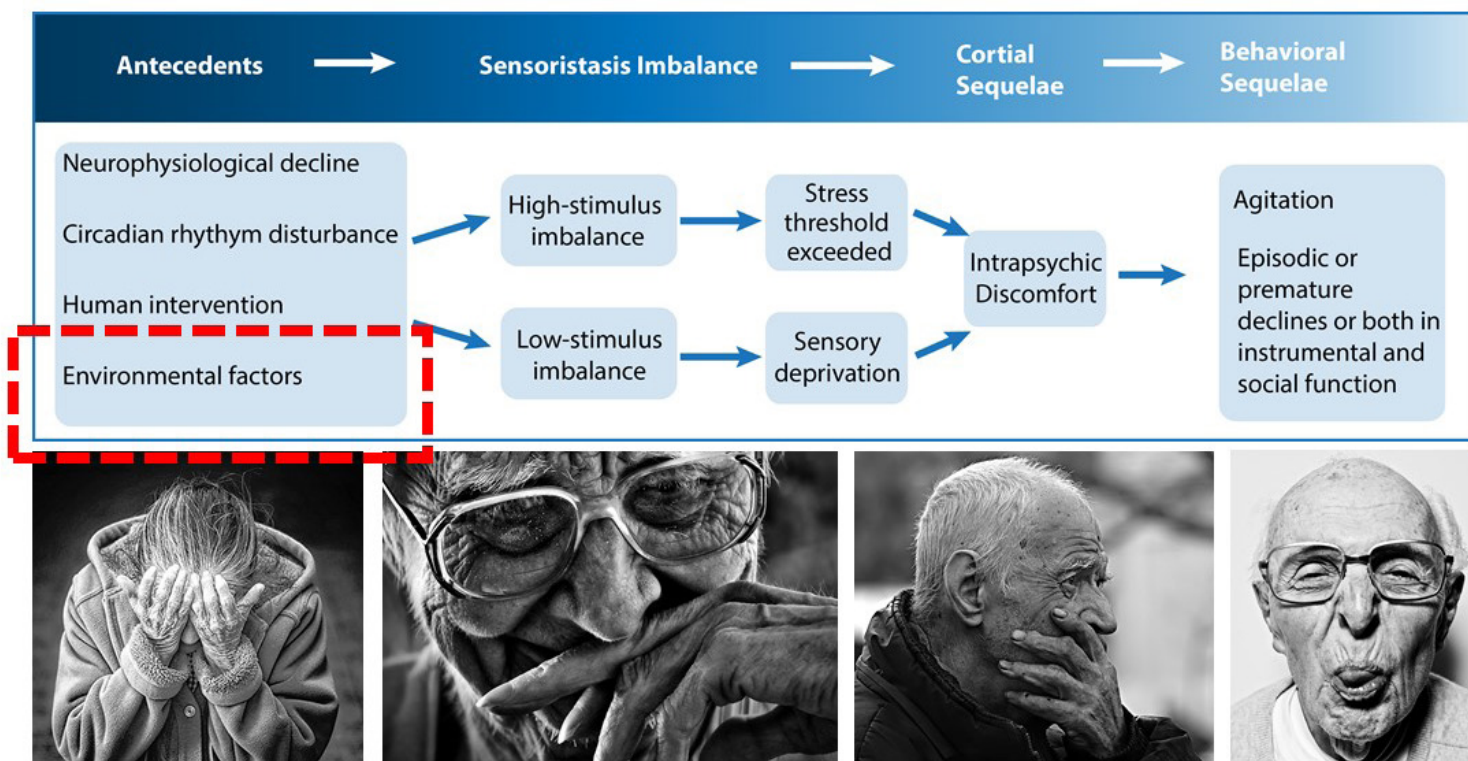


Problem behaviors occur during bath time and often last long after the bath.

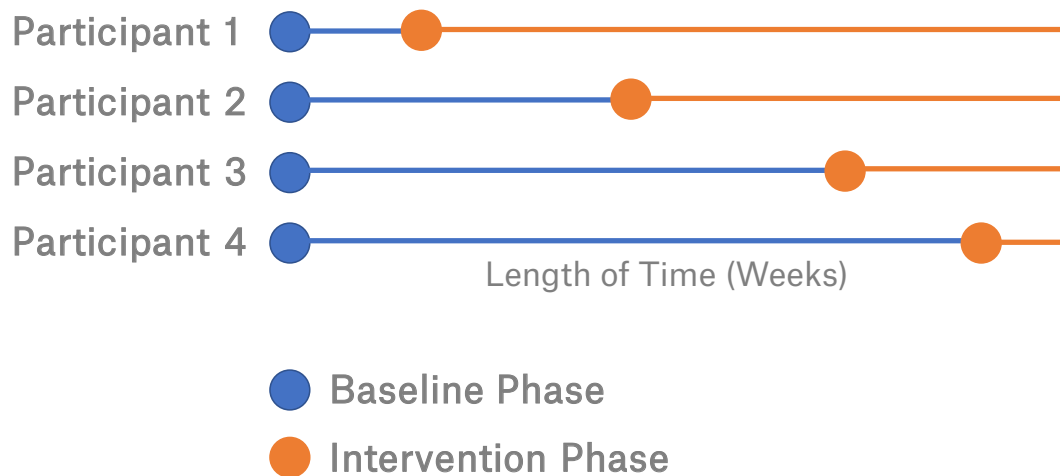
(Baker, Hanley & Mathews, 2006; Sloane et al., 2004)



Conceptual Framework, Model of Imbalances in Sensoristasis



For the data analysis, anonymous personas and pseudonyms were assigned to each of the four Veteran participants as shown above.



Research Design

Experimental Field Study using Single Case Research Design (SCRD) Following the (A-B) multiple baseline across participants approach to investigate the impact of MSE on aggression and agitation during assisted bathing

By design, if all three baselines change after the intervention is implemented, the results can be credited directly to the intervention. There is no need for a withdrawal period

(Coffee, 2011; Kazdin, 2011)

Study Design

Operational behavioral definitions for people with dementia were defined as physical aggression, verbal aggression, attempted physical aggression, agitation, emotional symptoms, and engagement

Operational definitions were adapted from the Care Recipient Behavior Assessment tool (CAREBA), which was used in the Bathing Without a Battle literature (Sloane et al., 2004)

Primary Behaviors

Dependent Variables:

- Positive:
 - Engagement, Happiness
- Negative:
 - Verbal Aggression (Pat), Attempted Physical Aggression (Al), Disengagement (Kyle), Anxious (Bob)

Rectangular Snip

Collateral Behaviors

Collateral Behaviors:

- Physical Aggression, Agitation, Sad, Angry
- Other emotion, Other engagement

Setting and MSE Intervention

Snoezelen Showering Guidelines:

Follow steps below before bringing the Veteran into the room

Step 1

Plug in light box at right of door. Flip black power switch on, then hold down red button for 6 seconds to power on. Point light at curtain.

Step 2

Plug in the Snoezelen Cart

Step 3

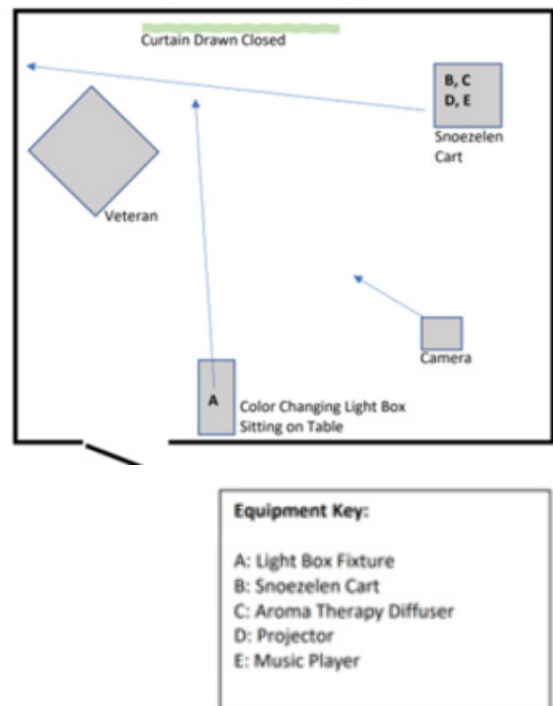
Plug in the aroma therapy diffuser

Step 4

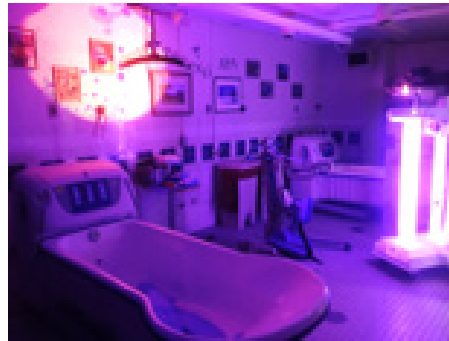
Make sure the color wheel projector located on top of the Snoezelen cart is pointed at the shower area

Step 5

Turn on the music at Snoezelen cart. Bring in Veteran. Begin recording, proceed with shower. Turn off camera when finished. Call Medical Media to get the camera.



Setting and MSE Intervention



The location for the study was the bathing room and Multisensory equipment including a mobile cart with a bubble tube, LED color changing lights, LED fiber optic spray, music, colorful wall projections and aroma therapy.

Observational Instrument

File	Preferences	Timer
Physical Aggression	Other Emotion	Other Engagement
Verbal Aggression	Happy	Engaged
Attempted Physical Aggression	Sad	Disengaged
Agitated	Angry	
	Anxious	

The research team worked with program developers at Vanderbilt University to create a customized, touch screen application to code the behaviors. Baseline and intervention sessions were recorded and the frequency and duration of target behaviors observed was coded using the software. Two researchers calculated inter-rater reliability of 80% of coded behaviors.

Participants



Pat
Female
Baseline Sessions: 3
Intervention Sessions: 4



Al
Male
Baseline Sessions: 5
Intervention Sessions: 12



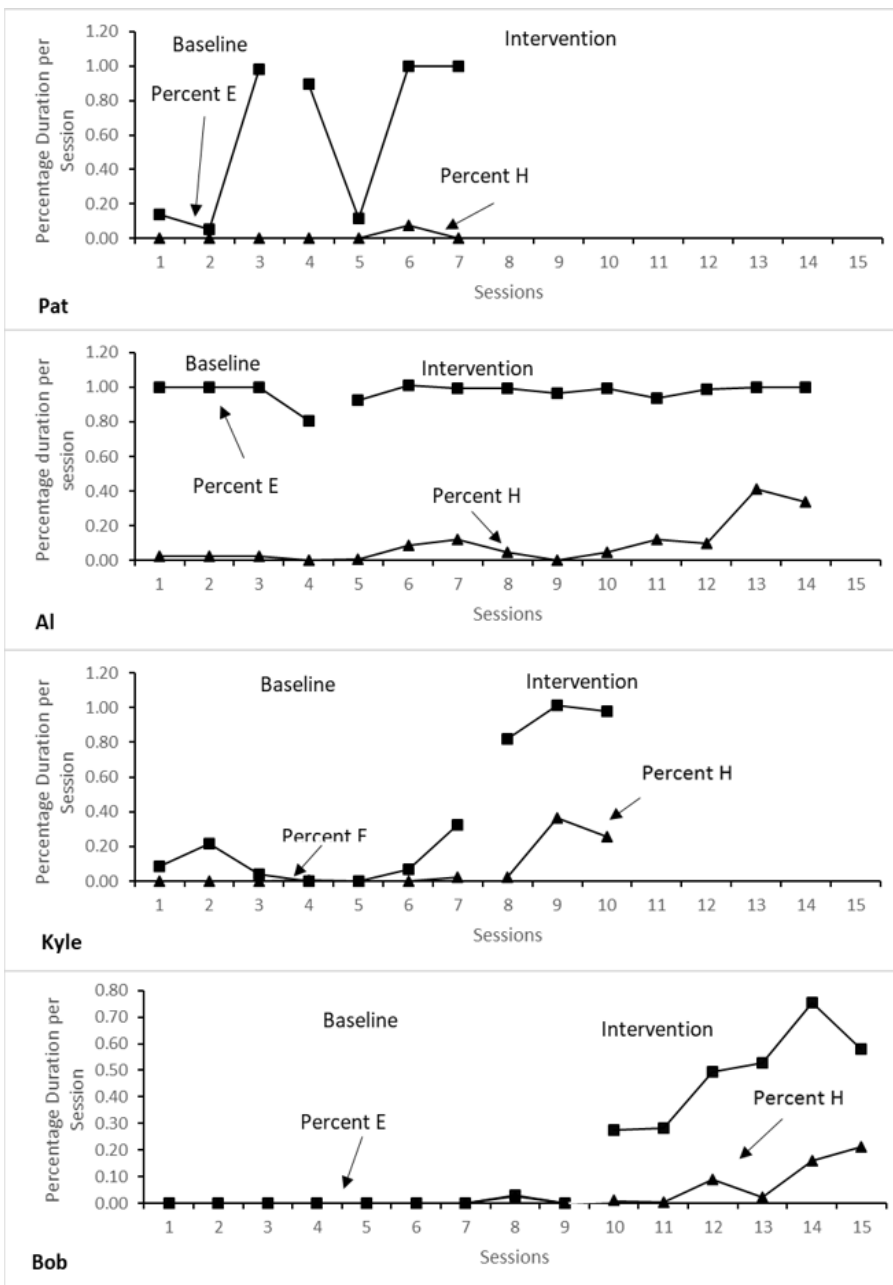
Bob
Male
Baseline Sessions: 9
Intervention Sessions: 8



Kyle
Male
Baseline Sessions: 7
Intervention Sessions: 3

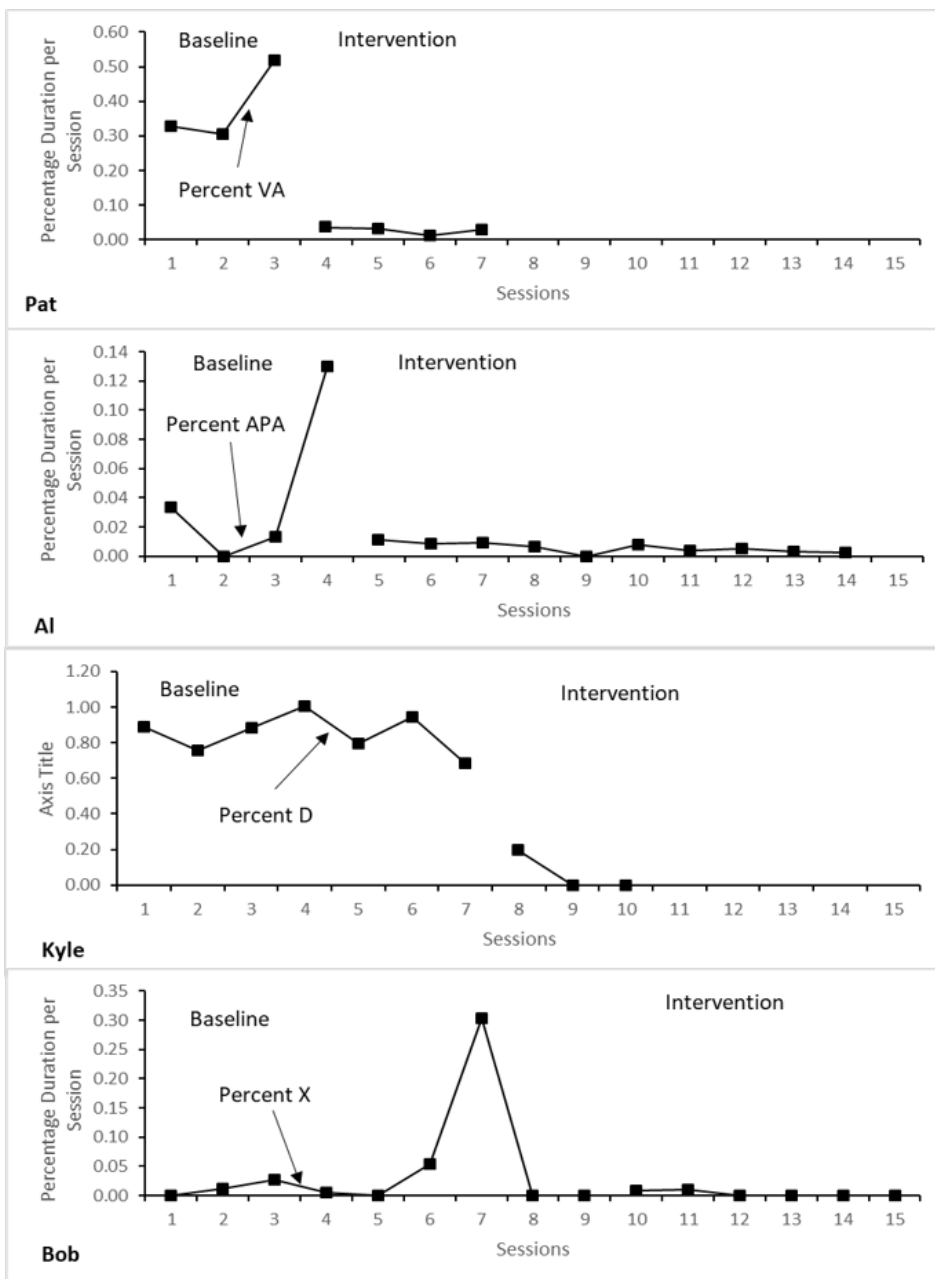
Results

Total percentage duration of positive behaviors



Results

Total percentage duration of problem behaviors



Summary of Findings

On average, positive behaviors increased and negative behaviors decreased for all participants in the MSE.

At the VA, dedicated MSE rooms were preferred by staff respondents over mobile carts.

Training, staff engagement, a clear maintenance plan and access to the MSE were critical barriers to uptake.

Veterans seemed to favor the bubble tubes, aromatherapy and solar wall projector which staff also perceived as being the most effective in reducing problem behavior.

MSE within the bathing environment may reduce problem behaviors and increase positive behaviors.

Incorporating sensory preference seems to contribute to the impact of the environment.

Implications for Practice

Medical care staff can use these findings to improve MSE uptake by implementing policies and organizational procedures that reduce barriers to uptake.

Healthcare design teams may help support better behavioral outcomes through incorporating sensory elements within the environments where problem behaviors are known to occur, like bathing rooms.

Families may assist their loved ones with dementia at home to improve quality of life through the use of multisensory environments within the home setting.

MSE may be broadly applicable to other cognitive impaired populations.

Implications for Future Research

Create a framework or guideline for MSE application at the VA that documents a step-by-step process for implementing MSE effectively.

Investigation of additional behavioral data recorded at the VA sites who participated in the interview-based study looking for insights.

Replicate interview study using an online format.

Follow up with VA staff participants of the interview study to validate findings and inquire deeper from questions that arose from first round of interviews.

Replicate the bathing study and or conduct the study at a non-VA site and or with participants who have other cognitive impairments.

Study impact of an MSE with greater customization and sensory preference incorporation.

Develop tools including an observational assessment and a sensory preference assessment.