



## AOTA Critically Appraised Topics and Papers Series

# Alzheimer's Disease

*\*A product of the American Occupational Therapy Association's  
Evidence-Based Literature Review Project*

### CRITICALLY APPRAISED TOPIC (CAT)

#### *Focused Question*

**What is the effect of environmental-based interventions (e.g. Montessori and Snoezelen) on performance, affect, and behavior in both the home and institutions for people with Alzheimer's disease?**

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#### **Clinical Scenario:**

Nearly 5 million Americans now have Alzheimer's disease (AD), and the annual incidence of new cases is expected to more than double by the midpoint of the 21st century: from 377,000 per year in 1995 to 959,000 in 2050 (Hebert, Beckett, Scherr & Evans, 2001). By that year, the number of people with AD could increase to 13.2 million. About 3 percent of men and women ages 65 to 74 have AD, and nearly half of those age 85 and older may have the disease. People with AD represent at least half of the 3.4 million nursing and assisted living facility residents (Ness, Ahmed & Aronow, 2004). However, the vast majority of people with dementia are cared for at home (Haley & Baley, 1999).

Symptoms of the disease include memory loss, confusion, impaired judgment, personality changes, disorientation, and loss of language skills. Behavioral symptoms associated with dementia are a major concern for the person who experiences them and for caregivers who supervise, support, and assist them. Challenging behavior, such as aggression, agitation, crying, screaming, combativeness, and wandering, is quite common in people with AD. Many times, the difficult behavior will only last for short periods of time, but increasingly interferes with the person's ability to function (Hebert et al., 2001). Further, Alzheimer's dementia does not follow a uniform or single predictable course (Gitlin & Corcoran, 2005).

A variety of psychosocial, environmental, and physical parameters must be considered in the care of persons with cognitive impairment. Environmental considerations are particularly important because certain environmental conditions seem to affect agitation, while others have the potential to prevent and/or deal with the loss of function (vision, hearing, mobility, social behavior, and mental competence; Brubacher, Zehnder, Monsch, Berres, & Spiegel, 2005).

Based on the "premise that the environmental context is at least as powerful a determinant in the lives and functioning of persons with disabilities as their individual impairments" (Spencer,

1998, p. 291), occupational therapy services often consist of environmental interventions to maximize functional independence, safety, and well-being of the person with Alzheimer's disease (American Occupational Therapy Association [AOTA], 1999). Environmental interventions are modifications to the physical context through which occupational therapy practitioners can strategically increase or decrease demands for performance on the individual (Gitlin & Corcoran, 2005). It is therefore of great interest to occupational therapy practitioners to know what evidence supports the use of such strategies.

### **Summary of Key Findings:**

#### Summary of Levels I, II, and III

- There is evidence to support the efficacy of activity programs, music, behavior therapy, light therapy, carer education, and environmental modifications. The evidence in favor of multidisciplinary teams, massage, and aromatherapy is inconclusive (Opie, Rosewarne, & O'Connor, 1999; Level I).
- Intervention provided by occupational therapists that includes individualized home modifications for persons with Alzheimer's dementia results in improved quality of life of clients as well as increased positive affect and increase independence in activities of daily living (ADL; Dooley & Hinojosa, 2004, Level I) and other daily functioning (Graf et al, 2006, Level I).
- Special care units (SCU) do not appear to be more effective than other types of units in improving or maintaining performance on cognitive/noncognitive abilities. However, the decline is slower in SCUs, and catastrophic reactions decrease (Swanson, Maas, & Buckwalter, 1994, Level II).
- There is no evidence that subjective exit modifications decrease wandering behavior of people with AD (Price, Hermans, & Grimley-Evans, 2001, Level I). Similarly, there is no suitable evidence of the effectiveness and safety of nonpharmacologic interventions in reducing wandering in the domestic setting (Hermans, Htay, Hla, & McShane, 2007, Level I).
- Evidence of the effectiveness of Snoezelen on performance, affect, and behavior of people with AD is mixed. One study reported that Snoezelen appears to have a greater benefit than reminiscence groups in happiness, fear, relating to other people, attention to the environment, agitation, enjoyment, and relaxation during treatment sessions (Baillon et al, 2004, Level I). Another study noted that there is some evidence that multi-sensory stimulation/Snoezelen in a multisensory room reduces apathy in people in the later phases of dementia (Verkaik, van Weert & Francke, 2005, Level I). A systematic review concluded that there is insufficient evidence showing the efficacy of Snoezelen for dementia (Chung & Lai, 2002, Level I)
- Substantially more constructive engagement is observed and higher pleasure is reported during Montessori-based programming than during regular programming (Orsulic-Jeras, Judge & Camp, 2000, Level II). Montessori materials were reported as associated with decreased agitation and gains in attention, object permanence, and memory (Vance & Johns, 2002, Level II).
- Agitation can be significantly decreased by interventions that control the daily activity schedule of a person with Alzheimer's dementia so that there is a balance between the times the person is in high-arousal and low-arousal states (Kovach et al, 2004, Level I).
- Natural environments (recorded sounds of birds, babbling brooks, and small animals coordinated with bright pictures on the wall) contribute to a significant decline in agitated behavior during bathing of people with Alzheimer's dementia (Whall et al, 1997, Level II).

- There is insufficient evidence to assess the value of bright light therapy (BLT) for people with dementia (Forbes, Morgan, Bangma, Peacock & Adamson, 2004, Level I). However, favorable effects of BLT were reported on at least some aspects of sleep and activity rhythmicity (Skjerve, Bjorvatn, & Holsten, 2004, Level I), with morning light and all day light associated with the greatest amount of nighttime sleep, and evening and standard light with the least amount (Sloane et al, 2007, Level III). Further, BLT was reported to have some influence in decreasing agitation (Skjerve, Holsten, Aarsland, Bjorvatn, Nygard, & Johansen, 2004, Level III).
- The evidence in favor of aromatherapy is inconclusive (Opie, Rosewarne & O'Connor, 1999, Level I). Some studies reported that use of 2% lavender oil in an aromatherapy stream (Holmes et al, 2002, Level II) or 10% lavender in base lotion applied to the arms and face may decrease agitation (Thorgrimsen, Spector, Wiles, & Orrell, 2003, Level I), while one study noted that there was no statistically significant treatment effect in favor of aromatherapy using lavender to decrease agitation (Snow, Hovanec, & Brandt, 2004, Level III).
- Research in which music intervention was ambient in nature rather than requiring action on the part of the patient in order to produce sound resulted in reduced agitation and increased time spent with meals (Sherratt, Thornton, & Hatton, 2004, Level I).

#### Summary of Levels IV and V

- People with dementia are significantly better able to locate their room with the assistance of external memory aids outside their bedrooms (Nolan, Matthews, & Harrison, 2001).

#### Contributions of Qualitative Studies:

Not included in review.

#### Bottom Line for Occupational Therapy Practice:

Occupational therapy philosophy has long recognized the influence of the environment on people's behavior. As cognitive competencies decline, the individual with dementia may have increasing difficulty deciphering environmental cues. Compensatory strategies, including environmental modifications, are one of the main ways to keep these clients functioning independently for as long as possible.

Evidence of the usefulness of adjusting environmental press to enhance performance and/or reduce disruptive behaviors and agitation is mixed. There is a need for more rigorous research in the area of nonpharmacological interventions with persons with Alzheimer's disease. Generally, research supports the use of activity programs, music, behavior therapy, light therapy, carer education, and changes to the environment (Opie, Rosewarne, & O'Connor, 1999), all important contributions occupational therapy practitioners can make. Occupational therapy practitioners should advocate for and contribute to the development of care settings in which environmental demands do not exceed the abilities of the resident with AD to adjust (Swanson, Maas, & Buckwalter, 1994).

There is some value in including environmental modification strategies in community-based occupational therapy programs for persons with mild to moderate dementia. Brief occupational therapy interventions can be effective when directed at improving the quality of life of persons

with dementia. Interventions that combine environmental modifications with caregiving approaches and community-based assistance can help improve the client's affect, as well as independence in activities of daily living (Dooley & Hinojosa, 2004; Graff et al., 2006).

People with dementia often wander, at times putting themselves at risk and presenting challenges to carers and institutional staff. There is no evidence so far that subjective barriers reduce wandering (Price, Hermans, & Grimley-Evans, 2001). Patterns on floors or doors (e.g., a grid or lines or bars), mirrors on doors, camouflage of doors or doorknobs, and concealment of view through door windows may prevent the person from wondering to unsafe locations, but do not seem to reduce the urge to wander. Occupational therapy practitioners should use these subjective barriers as part of a diverse approach to problem wandering, which may include the identification and definition of the problem in the individual, preventive activities such as exercise classes or occupational therapies, and improved communication between caregiver and wanderer. There is an urgent need for research related to the effectiveness of nonpharmacological interventions for wandering in the domestic setting. So far, results from institutional-based interventions have been extrapolated to the home environment.

The use of external memory aids in the form of signs with the individual's name and portrait-like photographs can be utilized in either institution- or community-based occupational therapy practice settings. Displaying photographs and attaching a sign to a door is a low-cost and simple intervention that appears to increase the probability of older adults with severe Alzheimer's disease successfully locating their nursing home bedrooms (Nolan, Mathews, & Harrison, 2001).

Patients' ability to navigate their environment is important in the completion of many activities of daily living and instrumental activities of daily living.

Environment-based interventions appear to have the most effect on reducing agitation of people with dementia. Simulations of a natural environment (e.g., use of recorded sounds of babbling brooks, birds, and other small animals; large pictures of the outdoors) during bathing reduce agitation and can improve the relationship between caregivers and the individual (Whall et al., 1997). There is some evidence that ambient, nonvocal music has some calming effect on people with AD (Sherratt, Thornton, & Hatton, 2004). Occupational therapy practitioners should consider this intervention as part of a multisensory stimulation program or as part of the background feature of a dining room. However, music selection may need to be matched to the person's taste. Because of the low cost, these types of intervention could be implemented in institutional, community, or home settings.

While there still is insufficient evidence showing the efficacy of Snoezelen (or multisensory stimulation) for symptoms of dementia other than agitation (Chung & Lai, 2002), the approach can have a positive effect on mood and behavior similar to reminiscence therapy (Baillon et al., 2004). Snoezelen allows for meeting individualized needs of patients with dementia while providing a consistent overall philosophy to a nursing home unit (Verkaik, van Weert, & Francke, 2005). Snoezelen involves the creation of a multisensory space in which patients can enjoy gentle stimulation of the primary senses in the absence of a demand for intellectual reasoning. Occupational therapy practitioners can integrate some of the principles of multisensory stimulation in their work with people with dementia in order to decrease agitation during treatment sessions. With sufficient caregiver education, principles can be adapted for the home as well, where patients may find more opportunities for meaningful participation in occupation.

Similarly, Montessori-based activities can be used in both institutional- and community-based settings. Limited evidence suggests that interaction with Montessori-based materials is pleasurable and is effective in engaging people with dementia in purposeful activities (Orsulic-Jeras, Judge, & Camp, 2000). There also is some evidence that people with AD may be trained to store new information in their long-term memory through Montessori-based programming (Vance & Johns, 2002). The philosophy of this approach is consistent with occupation-based, client-centered practice that emphasizes naturalistic treatment that can be graded for complexity. Repetition of activities at increasing intervals may be an effective strategy occupational therapy practitioners can use in ADL training. Because materials used in Montessori are familiar in daily life, people with AD are more likely to use and interact with them, thus being useful in preventing agitation and behavioral disturbances. Montessori-based programs can be implemented at low cost, and training materials are readily available to help practitioners, students, and family members create and implement Montessori-based activities. However, this intervention is perhaps best used in conjunction with other therapies.

Available research supports occupational therapy's emphasis on organizing a person's daily schedule and environment as a whole to assure a balance of arousal states, thus treating and preventing agitation. Occupational therapy practitioners could use the Balancing Arousal Controls Excesses (BACE) intervention in long-term-care or skilled nursing facilities to balance the client's states of arousal in order to decrease their agitation levels (Kovach et al., 2004). The BACE intervention is of low cost, simple, and nontechnological. It relies on a team approach in order to individualize and manage the whole day's schedule for each client. BACE consists of first identifying usual periods of arousal imbalance and then developing a daily schedule that reduces the number of these periods. This approach could also be implemented in community settings if caregivers are trained.

Bright light therapy (BLT) has been researched as an intervention for behavioral and psychological symptoms of dementia. There is insufficient evidence to assess the value of BLT for people with dementia (Forbes, Morgan, Bangma, Peacock, & Adamson, 2004). So far, there is evidence that BLT has an effect on behavior (particularly agitation) and on the wake cycle (Skjerve et al., 2004). Morning bright light in particular might delay circadian rhythms and improve circadian rhythm quality in nursing home residents (Skjerve, Bjorvatn, & Holsten, 2004; Sloane et al., 2007). In other words, people are more likely to remain awake during the day when more opportunities for occupational participation are available. Occupational therapy practitioners may suggest daily routines at home or in nursing homes that include exposure to bright light for about 2 hours each morning as a way to help patients remain awake for longer periods during the day and thus participate in programmed activities, social interaction, and so on.

There is evidence in the neurological and neuropsychological literature that persons with dementia have impaired olfactory abilities. Concordant with this literature, there is little support for the use of a purely olfactory form of aromatherapy to decrease agitation in patients with severe dementia (Snow, Hovanec, & Brandt, 2004). There is a modest improvement in agitation behaviors of persons with severe dementia when 2% lavender oil is administered to an environment via an aromatherapy stream for short periods of time (Holmes et al., 2002). The results of one study showed significant reduction in agitation with the use of 10% Melissa (lavender) and base lotion applied topically to arms and face twice daily for 1 to 2 minutes (Thorgrimsen, Spector, Wiles, & Orrell, 2003). Occupational therapy practitioners may consider using this intervention in enclosed spaces, where effects can be limited to one patient at a time. Incorporation of aromas to ADL routines or occupations normally associated with

smells (e.g., use of lotion with lavender, gardening) to reduce agitated behaviors and thus increase the likelihood of the person's participation in activities. However, the assumption commonly held that aromatherapy at least does no harm to people with dementia may not be correct, and further evidence for its effectiveness is needed.

**Review Process:**

Procedures for the selection and appraisal of articles

**Inclusion Criteria:**

- Published between 1987 and 2007
- Research participants were persons with dementia
- Included an intervention that could be used by occupational therapy professionals.
- Related to environmental-based interventions, including Montessori, Snoezelen, and Progressively Lowered Stress Threshold
- Level I, II, III, and IV studies
- Written in English

**Exclusion Criteria:**

- Published prior to 1987
- Did not include an intervention
- Interventions did not modify the way in which the activity was to be carried out
- Level V studies
- Qualitative studies

**Search Strategy**

Categories	Key Search Terms
Patient/Client Population	Alzheimer's, dementia
Intervention	Strategy, technique, treatment, intervention, environment, Montessori, Snoezelen, ESP, Progressively Lowered Stress Threshold, multi-sensory, aromatherapy, bright light therapy
Comparison	Not searched
Outcomes	Self care, ADL, activities of daily living, work, employment, occupation, vocation, job, leisure, recreation, socialization, interaction, social participation, communication, social interaction, social engagement, engagement, affect, emotion, agitation, behavior

**Databases and Sites Searched**

Academic Search Premiere, AgeLine, CINAHL, Google Scholar, EBSCOhost, Medline, OT Search, PsycINFO, PubMed, ScienceDirect, Web of Science

### ***Quality Control/Peer Review Process:***

- A group of five Creighton University Doctor of Occupational Therapy students developed search terms in consultation with the course instructor for OTD 541: Critical Analysis of Occupational Therapy Practice
- The group conducted searches in the databases
- A medical librarian reviewed the group's search strategies and results to improve them
- AOTA staff and project consultant reviewed results of the search and provided additional suggestions for search strategies
- The group completed a critically appraised paper (CAP) for each article that met the criteria
- An individual student enrolled in the same course and the course instructor followed up and conducted the database searches again 1 year later to make sure no new articles were missed. One article was eliminated because it was contained in a systematic review. Several articles were added to include review of complementary approaches, including bright light therapy and aromatherapy.
- The instructor completed an evidence table for each new article included in the review
- The instructor, AOTA staff, and project consultant reviewed the CAPs for unanswered questions and discrepancies in interpretation of the results
- The instructor completed the CAT
- AOTA staff and project consultant reviewed the CAT

### **Results of Search:**

#### ***Summary of Study Designs of Articles Selected for Appraisal***

<b>Level of Evidence</b>	<b>Study Design/Methodology of Selected Articles</b>	<b>Number of Articles Selected</b>
I	Systematic reviews, meta-analysis, randomized controlled trials	13
II	Two groups, nonrandomized studies (e.g., cohort, case-control)	6
III	One group, nonrandomized (e.g., before and after, pretest, and posttest)	2
IV	Descriptive studies that include analysis of outcomes (single subject design, case series)	1
V	Case reports and expert opinion, which include narrative literature reviews and consensus statements	0
	Qualitative studies	0
	<b>TOTAL</b>	<b>21</b>

## Limitations of the Studies Appraised

### Levels I, II, and III

#### Level I

- Small, heterogeneous, non-representative samples (Baillon, Van Diepen, Prettyman, Redman, Rooke, & Campbell, 2004; Forbes, Morgan, Bangma, Peacock, & Adamson, 2004; Graff et al., 2006; Kovach, Taneli, Dohearty, Schlidt, Cashin, & Silva-Smith, 2004; Opie, Rosewarne, & O'Connor, 1999; Thorgrimsen, Spector, Wiles, & Orrell, 2003)
- Some intervening factors not controlled (Baillon, Van Diepen, Prettyman, Redman, Rooke, & Campbell, 2004; Kovach, Taneli, Dohearty, Schlidt, Cashin, & Silva-Smith, 2004)
- Meta-analyses could not be performed because of the limited number of trials and different study methods of the available trials (Chung & Lai, 2002; Swanson, Maas, & Buckwalter, 1994; Thorgrimsen, Spector, Wiles, & Orrell, 2003)
- Methodological problems such as inconsistency in follow through reporting (Dooley, & Hinojosa, 2004), subjective outcome measures (Kovach, Taneli, Dohearty, Schlidt, Cashin, & Silva-Smith, 2004), imprecise data collection methods, and insufficient statistical analysis (Opie, Rosewarne, & O'Connor, 1999; Verkaik, vanWeert, & Francke, 2005)
- Authors of a systematic review about domestic settings used articles from institutional settings and applied them to domestic settings (Hermans, Htay, Hla, & McShane, 2007; Price, Hermans, & Grimley-Evans, 2001)
- Adverse effects were not evaluated (Skjerve, Bjorvatn, & Holsten, 2004)

#### Level II

- Small, heterogeneous and non-randomized samples (Holmes, Hopkins, Hensford, MacLaughlin, Wilkinson, & Rosenvinge, 2002; Orsulic-Jeras, Judge, & Camp, 2000; Swanson, Maas, & Buckwalter, 1994; Vance & Johns, 2002; Whall, Black, Groh, Yankou, Kupferschmid, & Foster, 1997)
- Target light dose of 2,500 lux, although in line with accepted therapeutic standards, may not have been sufficient for older persons, in whom the amount of light reaching the retina is as much as two-thirds less than in young adults. By targeting all residents in the investigational units, the study may have included a significant proportion of persons without sleep disorders, thereby tending to bias results toward the null (Sloane et al., 2007).
- Treatment fidelity data only collected for intervention condition, so variability in “standard” activity not accounted for (Vance & Johns, 2002)

#### Level III

- Small, heterogeneous, non-randomized sample size; changes in behavior may have been due to increased attention from nursing staff during treatment times (Skjerve, Holsten, Aarsland, Bjorvatn, Nygard, & Johansen, 2004; Snow, Hovanec, & Brandt, 2004).

### Levels IV and V

- Intervening variables were not isolated; it is unknown to which intervention results are due (Nolan, Mathews, & Harrison, 2001)

## Articles Selected for Appraisal

Baillon, S., Van Diepen, E., Prettyman, R., Redman, J., Rooke, N., & Campbell, R. (2004). A comparison of the effects of Snoezelen and reminiscence therapy on the agitated behaviour of patients with dementia. *International Journal of Geriatric Psychiatry*, *19*, 1047–1052.

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Price, J. D., Hermans, D. G., & Grimley-Evans, J. (2001) Subjective barriers to prevent wandering of cognitively impaired people. *Cochrane Database of Systematic Reviews*, Issue 1. Art. No.: CD001932. DOI: 10.1002/14651858.CD001932.

Sherratt, K., Thornton, A., & Hatton, C. (2004). Music interventions for people with dementia: A review of the literature. *Aging & Mental Health*, 8(1), 3–12.

Skjerve, A., Bjorvatn B., & Holsten, F. (2004). Light therapy for behavioural and psychological symptoms of dementia. *International Journal of Geriatric Psychiatry*, 19, 516–522.

Skjerve, A., Holsten, F., Aarsland, D., Bjorvatn, B., Nygard, H., & Johansen, I. M. (2004). Improvement in behavioral symptoms and advance of activity acrophase after short-term bright light treatment in severe dementia. *Psychiatry and Clinical Neurosciences*, 58, 343–347.

Sloane, P. Williams, C. S., Mitchell, C. M., Preisser, J. S., Wood, W., Barrick, A.L.;et al. (2007) High-intensity environmental light in dementia: Effect on sleep and activity. *Journal of the American Geriatrics Society*, 55, 1524–1533.

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This work is based on the evidence-based literature review completed in December 2007 by René Padilla, PhD, OTR/L, FAOTA with student contributions from Jennifer McChesney, Trisha Ostrander, Ashley Sewell, Michelle Sierra, Michelle Walding, and Tracy Webb who were doctoral students in the occupational therapy program at Creighton University at the time of this work.

CAT format adapted from a template provided by Dr. Annie McCluskey and freely available for use on the OT-CATS website (<http://otcats.com>)

For more information about the Evidence-Based Literature Review Project, contact the American Occupational Therapy Association, 301-652-6611, x 2052.



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