Sleep and Dementia:

A report on the evidence-base for non-pharmacological sleep interventions for person with dementia

February 2011

Cary A Brown, Robyn Berry, Maria Tan, Anjalee Khoshla

Department of Occupational Therapy, Faculty of Rehabilitation Medicine

University of Alberta, Canada

Correspondence:

Dr Cary Brown, Associate Professor, University of Alberta

Cary.brown@ualberta.ca

UNIVERSITY OF ALBERTA

THE CANADIAN DEMENTIA KNOWLEDGE TRANSLATION NETWORK

THE CANADIAN DEMENTIA KNOWLEDGE TRANSLATION NETWORK

Funding support provided by the Canadian Dementia Knowledge Translation Network (CDKTN). Any information included in this publication and/or opinions expressed therein do not necessarily reflect vies Network but remain solely those of the authors.

Summary

Expanded Background: Disordered sleep[1], prevalent in older persons (1), has been show to have significant cognitive, physical and psychological consequences (2). For example, the rate of falls in older persons with disordered sleep is demonstrated to be higher (3). The literature shows that falls, and fear of falling, have a negative impact on older persons' self-confidence, and continued engagement in social activities. These activities are important because they provide the physical and social stimulation necessary to maintain cognitive and emotional health (4, 5). British researchers found that disordered sleep was a strong predictor of future depression in older community dwelling adults (6). In turn, depression is one of the risk factors for dementia (7). Disordered sleep patterns in persons with dementia have been found to accelerate functional decline and contribute to increased caregiver stress (8). Caregiver support and wellbeing is critical for successful management of dementia in the home setting. However, living with someone who has dementia and disordered sleep results in sleep deprivation in the caregiver as well, further decreasing caregiver resilience and coping.

Researchers found a relationship between sleep deprivation of as little duration as three weeks and accelerated development of amyloid plaques (which contribute to Alzheimer's disease) in the brains of lab mice (9). Other studies reveal a clear link between insomnia and cognitive tasks such as vigilance (10), concentration, memory, and executive function (1, 11). Cricco et al (12) concluded from a study involving more than 6,400 persons over age 65 living in the community that ' chronic insomnia independently predicts incident of increased cognitive decline in older men'(pg.1186).

We also know from the literature that older persons with disordered sleep are at increased risk of substance misuse as they attempt to self-medicate for their sleep problems. This behaviour can contribute to more rapid onset of dementia and decreased functioning. Both intentional and unintentional substance misuse (illicit, prescription and over the counter medication) has been linked to cognitive decline in older persons [30]. And, while moderate alcohol consumption may delay onset of dementia, chronic alcohol abuse can be a significant risk factor in some forms of dementia (13) . Culberson (14) suggests that the rate of misuse of prescription medication in isolated, elderly women with insomnia in the US maybe as high as 11% . Other researchers point out the complexity of the bidirectional nature of substance misuse to self-medicate for

[1] ** *Disordered sleep* for the purposes of this project denotes the range of sleep problems – hypersomnia (including sleep apnea and narcolepsy), parasomnia (including confusional arousal, night terrors, rest-less leg syndrome, sleep walking), insomnia (difficulty falling and/or staying asleep) and sleep-wake cycle disturbances- which share the common outcome of perceived and/or physiological non-restorative sleep. Disordered sleep can be consequent to environmental, social, and psychological features in addition to biological influences. Additionally, disordered sleep can be problematic for other family members and caregivers.

disordered sleep (15, 16). They highlight that using substances like alcohol and cough medications to help fall asleep have the side effect of actually reducing restorative sleep. This sets up a cycle of substance misuse to promote sleep, leading to poor sleep, leading to more substance misuse and so on. Aria et al (17) found that of the 699 elderly persons studied in Finland, 26% used alcohol to routinely self-medicate for sleep problems. Self-medication does not seem to decrease with age as evidenced by Johnson's (18) finding that the majority of community living women over the age of 85 they studied self-medicated with alcohol and/or over-the-counter medication on a regular basis to improve their sleep.

A subgroup of older persons at particular risk of both poorly managed dementia and disordered sleep are the estimated 18,000 yearly immigrants to Canada. As parents and grandparents they have immigrated not for employment opportunities but to be reunited with their adult children (19). Many of these older persons, often women, take up residence in their adult children's established households. In their new homes they can lead lives isolated from the community and in which the risk factors for dementia (like disordered sleep, depression, poor nutrition and limited social stimulation and physical activity) go largely unrecognized. These older persons are often isolated by language and limited mobility from the resources in their new community that they need to deal with this complex array of inter-related risks to cognitive, emotional and physical wellbeing (20).

We see then that there is a problem of older persons, particularly women, being at risk for cognitive, emotional and substance misuse problems in relation to disordered sleep that match and accentuate the risk factors for dementia. Assuming that some elements of the relationship between dementia and disordered sleep are bi-directional and that disordered sleep is a modifiable risk factor for dementia, further research in this under examined area is important. Currently barriers and lack of awareness amongst the clinical community regarding sleep interventions for persons with dementia and their caregivers exist. For example, although non-pharmacological interventions have been demonstrated to be effective for improving restorative sleep in older persons (21, 22) there remains a prevalent belief that decreased ability to sleep is a 'normal' part of aging (23). As a result, people do not recognize sleep problems can be treated and do not seek help. Additionally, societal ageism, older adults' denial of sleep problems, coexisting disabilities related to alcohol misuse (13), depression, isolation, and poor healthcare provider awareness (24), all contribute to the under-diagnosis and treatment of disordered sleep in older persons in general, and specifically, in those persons with dementia.

Study rationale: Disordered sleep in persons with dementia is a contributing factor for cognitive, emotional and psycho-social dysfunction, risk taking behaviors and a range of other health problems (25, 26). The relationship between disordered sleep and decreased cognitive and physical functioning, substance misuse, and a number of mental health problems is highly relevant to healthcare providers. Research also now suggests that this may be a bi-directional relationship. This exciting proposition means that interventions for

disordered sleep may reduce the risk for, or lessen the severity of, cognitive disorders like dementia, other mental and physical health problems, and facilitate continued independent community living (26) . However, the evidence-base for non-pharmacological sleep interventions (NPSI) has not yet been evaluated, synthesized, and clearly presented in the literature. As such, healthcare providers lack the information required to guide practice.

Objective: To evaluate the methodological quality of evidence for NPSIs to improve restorative sleep in persons with dementia.

Approach: A Critical Review of published NPSI research was undertaken in August 2010. The systematic search retrieved twenty-nine studies were retrieved consisting of 14 non-light and 15 light-based interventions which were evaluated for methodological quality.

Findings: The quality of evidence ranged from strong and conclusive to weak and in need of further research. The evidence for non-light based interventions in particular was sparse and of lower methodological quality. The attached tables present a summary of clinically relevant findings and recommendations for family members to help improve sleep for persons with dementia.

Conclusions: Currently here is a paucity of methodologically rigorous research in the area of non-pharmacological sleep interventions for persons with dementia. While the literature clearly identifies the magnitude and clinical, functional, and economic significance of the issue for persons with dementia, their caregivers and society in general, most evidence about effective, pragmatic interventions is anecdotal and untested. The small body of research that exists shows much promise and serves to highlight emerging and extensive opportunities for study. We need to couple tacit knowledge about effective interventions derived from clinicians' and family members' experience with rigorous scientific inquiry so as to build a strong evidence-base for the high need and growing area of non-pharmacological sleep interventions for persons with dementia.

Table 1:

Clinically relevant evidence for non-pharmacological sleep interventions for persons with dementia

Conclusive Evidence	Inconclusive Evidence	Insufficient Evidence
Bright Light Interventions		
▪ Multi-dimensional intervention including bright light exposure (27)	▪ Morning Bright Light therapy (28-33) ▪ Bright light and melatonin (34, 35) ▪ High intensity ambient lighting (34-36)	▪ Social interaction in combination with bright light therapy (37) ▪ Lunchtime Bright Light therapy(38) ▪ Dawn Dusk Simulation (39) ▪ Prolonged exposure to ambient blue high-intensity light (40)
Non-Light Interventions		
▪ Individualized (social) activities (41, 42) ▪ Respite Care (negative outcome for person with dementia and positive outcome for caregiver) (43)	▪ Sleep Hygiene and education (44-46) ▪ Passive Body Heating (47)	▪ Music (48) ▪ Exercise program (49) ▪ Transcutaneous electrical nerve stimulation (TENS) (50) ▪ Therapeutic biking (51) ▪ Outdoor Activity program (52) ▪ Indoor gardening (53) Environmental modification (54)

Table 2: Recommendations for family members to help someone with dementia have a better sleep

There is good evidence that these interventions help someone with dementia to have better sleep

Exposure to bright light

During the daytime people should be exposed to as much bright light as possible. The best source of bright light is natural daylight but there are also special lamps that are sold in pharmacies.

How does it work?

Bright light is registered by the eyes and signals the brain to produce hormones and other chemicals that help us stay awake and alert in the daytime. When light is dim the brain interprets this message as a signal that it is time to sleep. When this happens the body produces hormones and chemicals that make us drowsy and not thinking as clearly as possible.

When should it be used?

People should be exposed to bright light during the daytime. After the evening meal lights should be dimmer so the body is signalled to produce hormones and chemicals to help people go to sleep.

When should it not be used?

Avoid bright lights at night-time in the bedroom. This includes televisions, LED alarm clocks and light coming from streetlights outside. These light sources will signal the body to wake up. A restful sleep requires the room to be as dark as possible.

Increased daytime activity

Avoiding naps in the daytime helps make sure that people are tired and can sleep at night-time.

How does it work?

Daytime activity helps the body's digestive and elimination functions so that night-time sleep is undisturbed. Pleasurable social activities also increase the body's production of hormones and chemicals that improve mood, decrease anxiety, and promote relaxation. These all contribute to better sleep at night.

When should it be used?

Activity and socializing should occur spread across the day to avoid over-tiring and the tendency to nap. Try to avoid physical activity or stimulating social activities within two hours of bedtime- the body needs time to relax and naturally become tired.

When should activity not be used?

Avoid activity too close to bedtime – it is better to spread light activity across the day rather than having one period of high effort that is so tiring that a nap in the daytime will be needed.

There is some evidence that these interventions help someone with dementia to have better sleep

Sleep hygiene

Sleep hygiene means establishing good habits and a bedroom setting that promote sleep.

These habits include:

- Having a fixed bedtime and an awakening time that are the same everyday.
- Having certain activities that are always associated with going to bed (for example a certain piece of music, having a light snack of a the same 'bedtime' food each night , or putting on a specific hand lotion reserved for bedtime) all help people recognize that it is time for sleep.
- Avoiding napping during the day.
- Avoiding alcohol 4-6 hours before bedtime.
- Having lots of fluids during the day – hydration is important. A few hours before bed is early enough to cut back to prevent needing to get up in the

Passive body heat

A warm bath or sitting under a warm blanket for ½ hour before going to bed can help raise the body's temperature.

How does it work?

When we sleep our body temperature drops slightly. Being too warm keeps us from going to sleep. If you raise a person's body temperature slightly for a short period of time while he is awake, as he cool off he will feel more sleepy. That's why a warm bath before bed helps us sleep- the bath raises our body temperature for a short period and as we cool

night.

- Avoid caffeine 4-6 hours before bedtime.
- Avoiding heavy, spicy, or sugary foods 4-6 hours before bedtime. A light snack (a plain cookie, a few grapes or ½ a banana) is fine and often helps people settle to sleep.
- Being active in the daytime, but not right before bed.

<u>For a good sleep setting:</u>

- Check that the bed is comfortable.
- Set the overnight temperature a bit cool and keep the room well ventilated.
- Block out all distracting noise (running a fan helps create neural background sound to block out disturbing noises).
- Make sure the bedroom is as dark as possible- no TV, hallway light, or street lights coming through the window. All of these will send messages to the brain that it is time to be awake.

off after the bath we feel sleepy.

When should it be used?
Warm baths or warm blankets within an hour of going to bed help. If your family member does not like to take a bath at night- try using a warm electric blanket around his shoulders or in his lap for about 20 minutes before bed instead. Remember the warmth should be comfortable, not hot and unpleasant.

There has been <u>only a little</u> research about these sleep interventions for someone with dementia but they are promising and need more study

Dawn-Dusk Simulation
This means adjusting the lighting in a home to simulate regular daytime and night as much as possible. Pharmacies sell alarm clocks that use a gradual increase in light to wake people up instead of a loud alarm. The light increased gently just like the daylight as the sun comes up. Other lighting is available to mimic bright daylight during the day. In the evening lights should gradually be dimmed – again to mimic the sun going down.

How does this work?
Our bodies receive messages from light that triggers the brain to produce chemicals and hormones to either keep us awake or help us sleep. When we live inside a lot, out of direct light and using artificial light, or body clocks (also known as "circadian rhythm" can get disrupted.

When should you use Dawn-Dusk simulation?
When ever your family member with dementia is not receiving enough natural daylight to maintain proper circadian rhythm. This occurs most often in winter and when living in institutions with lots of artificial light instead of direct sunlight.

Other promising sleep interventions that need more study

- Music to promote sleep
- Exposure to high intensity blue-light (produced by special LED lights)
- Exposure to high intensity light particularly at noon time
- Indoor gardening
- Specific types of exercise programs
- The use of monitoring devices to alert caregivers to nighttime wandering
- Decreasing stimulation and potential wandering in the sleeping environment by keeping the bedroom door close at night

References

1. Foley D, Ancoli-Israel S, Britz P, Walsh J. Sleep disturbances and chronic disease in older adults: results of the 2003 National Sleep Foundation Sleep in America Survey. J Psychosom Res. 2004 May;56(5):497-502.
2. Misra S, Malow BA. Evaluation of sleep disturbances in older adults. Clin Geriatr Med. 2008 Feb;24(1):15-26, v.
3. Stone KL, Ensrud KE, Ancoli-Israel S. Sleep, insomnia and falls in elderly patients. Sleep medicine. 2008 Sep;9 Suppl 1:S18-22.
4. Chou KL, Chi I. Reciprocal relationship between fear of falling and depression in elderly Chinese primary care patients. Aging Ment Health. 2008 Sep;12(5):587-94.
5. van Haastregt JC, Zijlstra GA, van Rossum E, van Eijk JT, Kempen GI. Feelings of anxiety and symptoms of depression in community-living older persons who avoid activity for fear of falling. Am J Geriatr Psychiatry. 2008 Mar;16(3):186-93.
6. Livingston G, Blizard B, Mann A. Does sleep disturbance predict depression in elderly people? A study in inner London. Br J Gen Pract. 1993 Nov;43(376):445-8.
7. Dudgeon S. Rising tide: The impact of dementia on Canadian society. Toronto: Alzheimer Society of Canada; 2010 January 2010 Contract No.: Document Number|.
8. Tractenberg RE, Singer CM, Cummings JL, Thal LJ. The Sleep Disorders Inventory: an instrument for studies of sleep disturbance in persons with Alzheimer's disease. J Sleep Res. 2003 Dec;12(4):331-7.
9. Kang J-E, Lim M, Bateman R, Lee J, Smyth L, Cirrito J, et al. Amyloid beta dynamics are regulated by orexin and the sleep-wake cycle. Science Express. In press 2009.
10. Altena E, Van Der Werf YD, Strijers RL, Van Someren EJ. Sleep loss affects vigilance: effects of chronic insomnia and sleep therapy. J Sleep Res. 2008 Sep;17(3):335-43.
11. Bastien CH, Fortier-Brochu E, Rioux I, LeBlanc M, Daley M, Morin CM. Cognitive performance and sleep quality in the elderly suffering from chronic insomnia. Relationship between objective and subjective measures. J Psychosom Res. 2003 Jan;54(1):39-49.
12. Cricco M, Simonsick EM, Foley DJ. The impact of insomnia on cognitive functioning in older adults. Journal of the American Geriatrics Society. 2001 Sep;49(9):1185-9.
13. Culberson JW. Alcohol use in the elderly: beyond the CAGE. Part 1 of 2: prevalence and patterns of problem drinking. Geriatrics. 2006 Oct;61(10):23-7.
14. Culberson JW, Ziska M. Prescription drug misuse/abuse in the elderly. Geriatrics. 2008 Sep 1;63(9):22-31.
15. Doghramji K. The epidemiology and diagnosis of insomnia. Am J Manag Care. 2006 May;12(8 Suppl):S214-20.
16. Hartmann PM. Drug treatment of insomnia: indications and newer agents. Am Fam Physician. 1995 Jan;51(1):191-4, 7-8.
17. Aira M, Hartikainen S, Sulkava R. Drinking alcohol for medicinal purposes by people aged over 75: a community-based interview study. Fam Pract. 2008 Dec;25(6):445-9.
18. Johnson JE. Insomnia, alcohol, and over-the-counter drug use in old-old urban women. J Community Health Nurs. 1997;14(3):181-8.
19. Canada. Tripling of the number of parents and grandparents immigrating to Canada in 2005.: Citizenship and Immigration Canada 2005 [updated 2005; cited 2006 Nov 3 2006]; Available from: http://www.cic.gc.ca/english/press/05/0511-e.html
20. Brown C. The implications of occupational deprivation experienced by elderly female immigrants. . Diversity in Health and Social Care. 2008;5(1):65-9.
21. Mimeault V, Morin CM. Self-help treatment for insomnia: bibliotherapy with and without professional guidance. J Consult Clin Psychol. 1999 Aug;67(4):511-9.
22. Morin CM, Mimeault V, Gagne A. Nonpharmacological treatment of late-life insomnia. J Psychosom Res. 1999 Feb;46(2):103-16.
23. Ellis J, Hampson SE, Cropley M. The role of dysfunctional beliefs and attitudes in late-life insomnia. J Psychosom Res. 2007 Jan;62(1):81-4.
24. Byles JE, Mishra GD, Harris MA. The experience of insomnia among older women. Sleep. 2005 Aug 1;28(8):972-9.
25. Ancoli-Israel S. Sleep and its disorders in aging populations. Sleep medicine. 2009 Jul 30.
26. Bloom HG, Ahmed I, Alessi CA, Ancoli-Israel S, Buysse DJ, Kryger MH, et al. Evidence-based recommendations for the assessment and management of sleep disorders in older persons. Journal of the American Geriatrics Society. 2009 May;57(5):761-89.
27. Alessi CA, Martin JL, Webber AP, Cynthia Kim E, Harker JO, Josephson KR. Randomized, controlled trial of a nonpharmacological intervention to improve abnormal sleep/wake patterns in nursing home residents. Journal of the American Geriatrics Society. 2005 May;53(5):803-10.
28. Ancoli-Israel S, Martin JL, Kripke DF, Marler M, Klauber MR. Effect of light treatment on sleep and circadian rhythms in demented nursing home patients. Journal of the American Geriatrics Society. 2002 02;50(2):282-9.
29. Dowling GA, Mastick J, Hubbard EM, Luxenberg JS, Burr RL. Effect of timed bright light treatment for rest-activity disruption in institutionalized patients with Alzheimer's disease. International journal of geriatric psychiatry. 2005 08;20(8):738-43.
30. Fetveit A, Skjerve A, Bjorvatn B. Bright light treatment improves sleep in institutionalised elderly--an open trial. Int J Geriatr Psychiatry. 2003 Jun;18(6):520-6.
31. Lyketsos CG, Lindell Veiel L, Baker A, Steele C. A randomized, controlled trial of bright light therapy for agitated behaviors in dementia patients residing in long-term care. Int J Geriatr Psychiatry. 1999 Jul;14(7):520-5.
32. Skjerve A, Bjorvatn B, Holsten F. Light therapy for behavioural and psychological symptoms of dementia. International journal of geriatric psychiatry. 2004 Jun;19(6):516-22.
33. Yamadera H, Ito T, Suzuki H, Asayama K, Ito R, Endo S. Effects of bright light on cognitive and sleep-wake (circadian) rhythm disturbances in Alzheimer-type dementia. Psychiatry Clin Neurosci. 2000 Jun;54(3):352-3.

34. Haffmans PM, Sival RC, Lucius SA, Cats Q, van Gelder L. Bright light therapy and melatonin in motor restless behaviour in dementia: a placebo-controlled study. Int J Geriatr Psychiatry. 2001 Jan;16(1):106-10.
35. Riemersma-van der Lek RF, Swaab DF, Twisk J, Hol EM, Hoogendijk WJ, Van Someren EJ. Effect of bright light and melatonin on cognitive and noncognitive function in elderly residents of group care facilities: a randomized controlled trial. JAMA. 2008 Jun 11;299(22):2642-55.
36. Sloane PD, Williams CS, Mitchell CM, Preisser JS, Wood W, Barrick AL, et al. High-intensity environmental light in dementia: effect on sleep and activity. Journal of the American Geriatrics Society. 2007 Oct;55(10):1524-33.
37. Mishima K, Hishikawa Y, Okawa M. Randomized, dim light controlled, crossover test of morning bright light therapy for rest-activity rhythm disorders in patients with vascular dementia and dementia of Alzheimer's type. Chronobiol Int. 1998 Nov;15(6):647-54.
38. Fukuda N, Kobayashi R, Kohsaka M, Honma H, Sasamoto Y, Sakakibara S, et al. Effects of bright light at lunchtime on sleep in patients in a geriatric hospital II. Psychiatry Clin Neurosci. 2001 Jun;55(3):291-3.
39. Fontana Gasio P, Krauchi K, Cajochen C, Someren E, Amrhein I, Pache M, et al. Dawn-dusk simulation light therapy of disturbed circadian rest-activity cycles in demented elderly. Exp Gerontol. 2003 Jan-Feb;38(1-2):207-16.
40. van Hoof J, Aarts MPJ, Rense CG, Schoutens AMC. Ambient bright light in dementia: Effects on behaviour and circadian rhythmicity. Building and Environment. 2009;44(1):146-55.
41. Richards KC, Beck C, O'Sullivan PS, Shue VM. Effect of individualized social activity on sleep in nursing home residents with dementia. Journal of the American Geriatrics Society. 2005 09;53(9):1510-7.
42. Richards KC, Sullivan SC, Phillips RL, Beck CK, Overton-McCoy AL. The effect of individualized activities on the sleep of nursing home residents who are cognitively impaired: a pilot study. Journal of gerontological nursing. 2001 Sep;27(9):30-7.
43. Lee D, Morgan K, Lindesay J. Effect of institutional respite care on the sleep of people with dementia and their primary caregivers. Journal of the American Geriatrics Society. 2007 02;55(2):252-8.
44. McCurry SM, Gibbons LE, Logsdon RG, Vitiello MV, Teri L. Nighttime insomnia treatment and education for Alzheimer's disease: a randomized, controlled trial. Journal of the American Geriatrics Society. 2005 05;53(5):793-802.
45. McCurry SM, Logsdon RG, Vitiello MV, Teri L. Treatment of sleep and nighttime disturbances in Alzheimer's disease: a behavior management approach. Sleep medicine. 2004 Jul;5(4):373-7.
46. Ouslander JG, Connell BR, Bliwise DL, Endeshaw Y, Griffiths P, Schnelle JF. A nonpharmacological intervention to improve sleep in nursing home patients: Results of a controlled clinical trial. Journal of the American Geriatrics Society. 2006;54(1):38-47.
47. Mishima Y, Hozumi S, Shimizu T, Hishikawa Y, Mishima K. Passive body heating ameliorates sleep disturbances in patients with vascular dementia without circadian phase-shifting. American Journal of Geriatric Psychiatry. 2005 May;13(5):369-76.
48. Lindenmuth GF, Patel M, Chang PK. Effects of music on sleep in healthy elderly and subjects with senile dementia of the Alzheimer type. American journal of Alzheimer's disease and other dementias. 1992;7(2):13.
49. Namazi KH, Zazorozny CA, Gwinnup PB. Influences of physical activity on patterns of sleep behavior of patients with Alzheimer's disease. International Journal of Aging and Human Development. 1995 Vol. 40, No. 2. p. 145-153(9p).
50. Van Someren EJ, Scherder EJ, Swaab DF. Transcutaneous electrical nerve stimulation (TENS) improves circadian rhythm disturbances in Alzheimer disease. Alzheimer Disease & Associated Disorders. 1998 Jun;12(2):114-8.
51. Buettner LL, Fitzsimmons S. AD-venture program: therapeutic biking for the treatment of depression in long-term care residents with dementia. American journal of Alzheimer's disease and other dementias. 2002;17(2):121-7.
52. Connell BR, Sanford JA, Lewis D. Therapeutic effects of an outdoor activity program on nursing home residents with dementia. Journal of Housing for the Elderly. 2007 Vol. 21, No. 3-4. p. 195-209(15p).
53. Lee Y, Kim S. Effects of indoor gardening on sleep, agitation, and cognition in dementia patients--a pilot study. International journal of geriatric psychiatry. 2008 May;23(5):485-9.
54. Yamakawa M, Shigenobu K, Makimoto K. Environmental Control Interventions for Frontotemporal Dementia With Reversed Sleep--Wake Cycles. American journal of Alzheimer's disease and other dementias. 2008;23(5):470.