Sleep, Circadian Rhythms, and Aging: New Avenues for Improving Brain Health, Physical Health and functioning

8th Annual Bedside to Bench Conference
Tuesday, October 6, 2015

Sleep in Institutionalized Elderly

Kathy Richards, PhD, RN, FAAN
George Mason University

Current funding:

- National Institutes of Health
- Phillips Respironics for CPAP Units for Clinical Trial

Other financial relationships:

- None

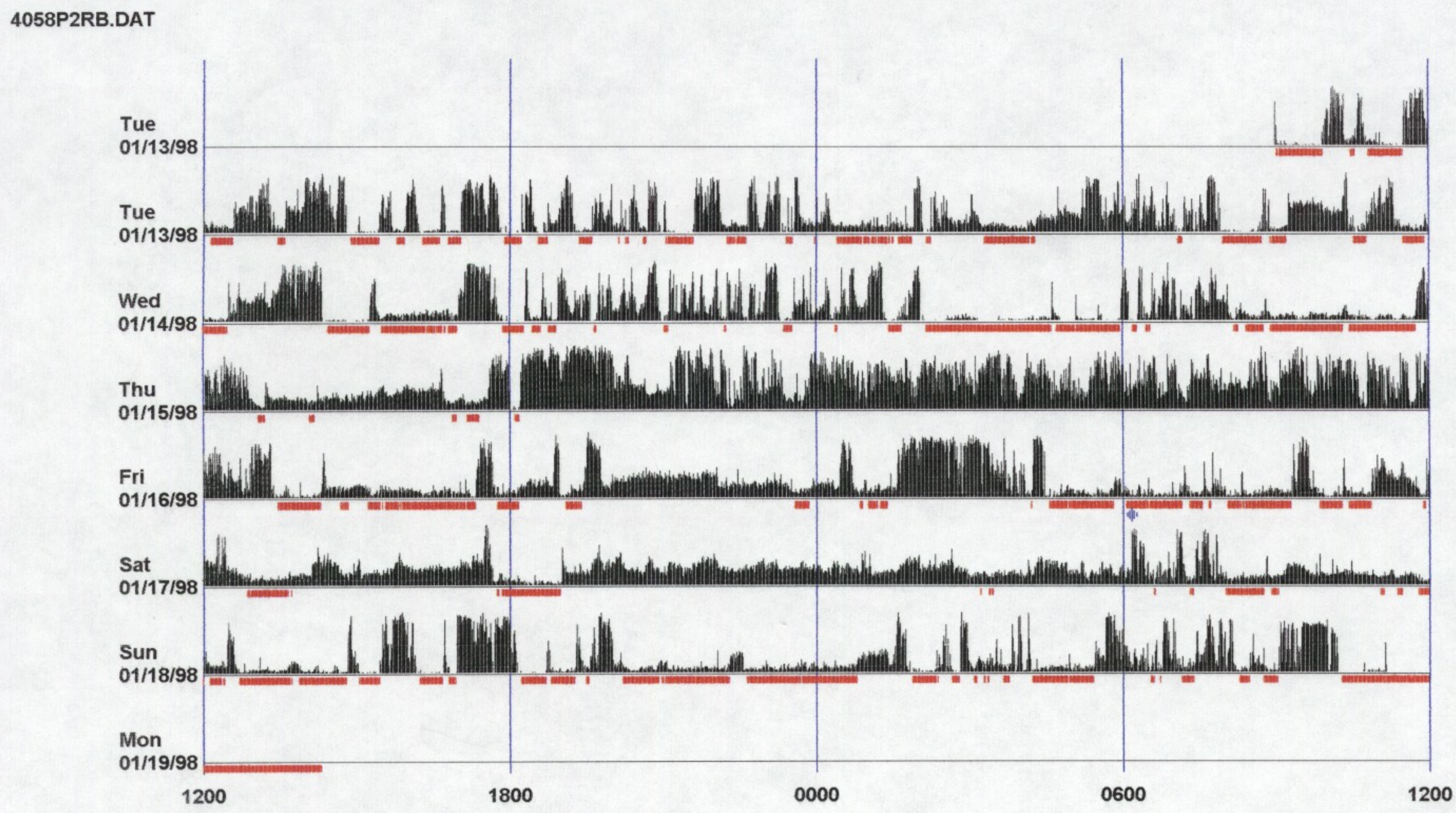
Conflicts of interest:

- None

Significance

Portrait of Marguerite Sleeping
by Henry Matisse

Mini Motionlogger
Actigraph
– Basic –
Ambulatory
Monitoring Inc.
P.O.Box 609, Ardsley, New York 10502
U.S.A.



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Sleep Disturbance and Dementia Are Prevalent and Severe

- 75% if institutionalized older adults have dementia
- 25-50% of institutionalized older adults have sleep disturbance
- Characteristics of sleep
  - Difficulty falling asleep
  - Increased nighttime awakenings
  - Decreased slow-wave and REM sleep
  - Increased daytime napping
  - Rest-activity rhythm fragmentation with high levels of activity during the night
  - Increased agitation in the late afternoon, evening, and night “Sundowning”

Consequences of Sleep Disturbance

- Increased stress and reduced quality of life for patients

- Burdened caregivers

- Institutionalization
  - Spira AP, Covinsky K, Rebok GW, Stone KL, Redline S, Yaffe K. Objectively Measured Sleep Quality and Nursing Home Placement in Older Women. *Journal of the American Geriatrics Society*. 2012;60(7):1237-1243. doi:10.1111/j.1532-5415.2012.04044

- May Accelerate Cognitive decline

Causes for Sleep Disturbance

Institutional Environment

insufficient light, lack of meaningful social activity, physical inactivity, excessive napping, excessive time in bed, frequent awakenings by staff for care, noise from staff and other residents

Sleep Disorders

Obstructive sleep apnea
Restless Legs Syndrome

State-of-the-Art Knowledge Search Strategy

PubMed Search July 27, 2015

Clinical Trials

Sleep in Dementia (209), Sleep in Nursing home (128)

74 articles

½ involved light, physical activity, and/or melatonin

Sleep by Henry Matisse

Insufficient Light

- Light is the most powerful synchronizer
- Aging results in loss of robustness of circadian rhythms
  - Reduction in suprachiasmatic nuclei numbers and activity
  - Reduced sensitivity of the retina to light
  - Yellowing of the lens
  - Smaller pupil diameter
- Light exposure in nursing homes has been shown to be extremely low and vary little between day and night

Bright Light Therapy

- 20 trials on the effect of bright light to strengthen the circadian rhythm and improve sleep in nursing homes and long-stay wards
- Bright white light, varying intensity
- 2009 Cochrane meta-analysis in nursing home residents concluded insufficient evidence as too few studies of high quality
- 2011 review concluded bright light therapy applied at an intensity of >2500 lux in Alzheimer's Disease patients showed a trend to improve nighttime sleep and reduce daytime sleepiness

- Forbes D, Culum I, Lischka AR *et al*. Light therapy for managing cognitive, sleep and functional,behavioural, or psychiatric disturbances in dementia. *Cochrane DB Syst. Rev.* 2009; **4**: 1–78.
- Ploeg ES, O'Connor DW. Methdological challenges in studies of bright light therapy to treat sleep disorders in nursing home residents with dementia. *Psychiatry and Clinical Neurosciences* 2014;6;777-784.
- Salami O, Lyketsos C, Rao V. Treatment of sleep disturbance in Alzheimer's Dementia. *Int J Geriatr Psychiatry*. 2011 August ; 26(8): 771–782. doi:10.1002/gps.2609.

Effect of Melatonin on Sleep and Cognition in Dementia

- 7 studies (N = 520)
- Dosage 2.5 mg – 10 mg
- Total sleep time significantly improved (mean 24.36 minutes)
- Sleep efficiency marginal (mean difference 1.78, p .07)
- No significant effect on cognition
- Effect greater if study duration more than 4 weeks

- Xu J, Wang L, Dammer E, Li C, Xu G, Chen S, Wang G. Melatonin for sleep disturbance and cognition in dementia: A meta-analysis of randomized controlled trials. Am J Alz Dis and Other Dementias 2015;30(5), 439-47.

Effect of Bright Light and Melatonin

Objective: to test long-term use of 2 major synchronizers of circadian timing for cognitive and non-cognitive outcomes

Interventions: random assignment by facility to bright light or control light, and by participant to melatonin or placebo

Findings:

- melatonin shortened sleep latency (8.2 min) and increased sleep duration (27 min), but worsened mood scores
- combination treatment (melatonin + light) increased sleep efficiency and improved nocturnal restlessness, and attenuated some adverse effects of melatonin

Conclusion: melatonin is only recommended in combination with bright light therapy

Riemersma-Van Der Lek RF, Swaab DF, Twisk J, et al. Effect of bright light and melatonin on cognitive and noncognitive function in elderly residents of group care facilities: a randomized controlled trial. JAMA 2008;299:2642-2655.

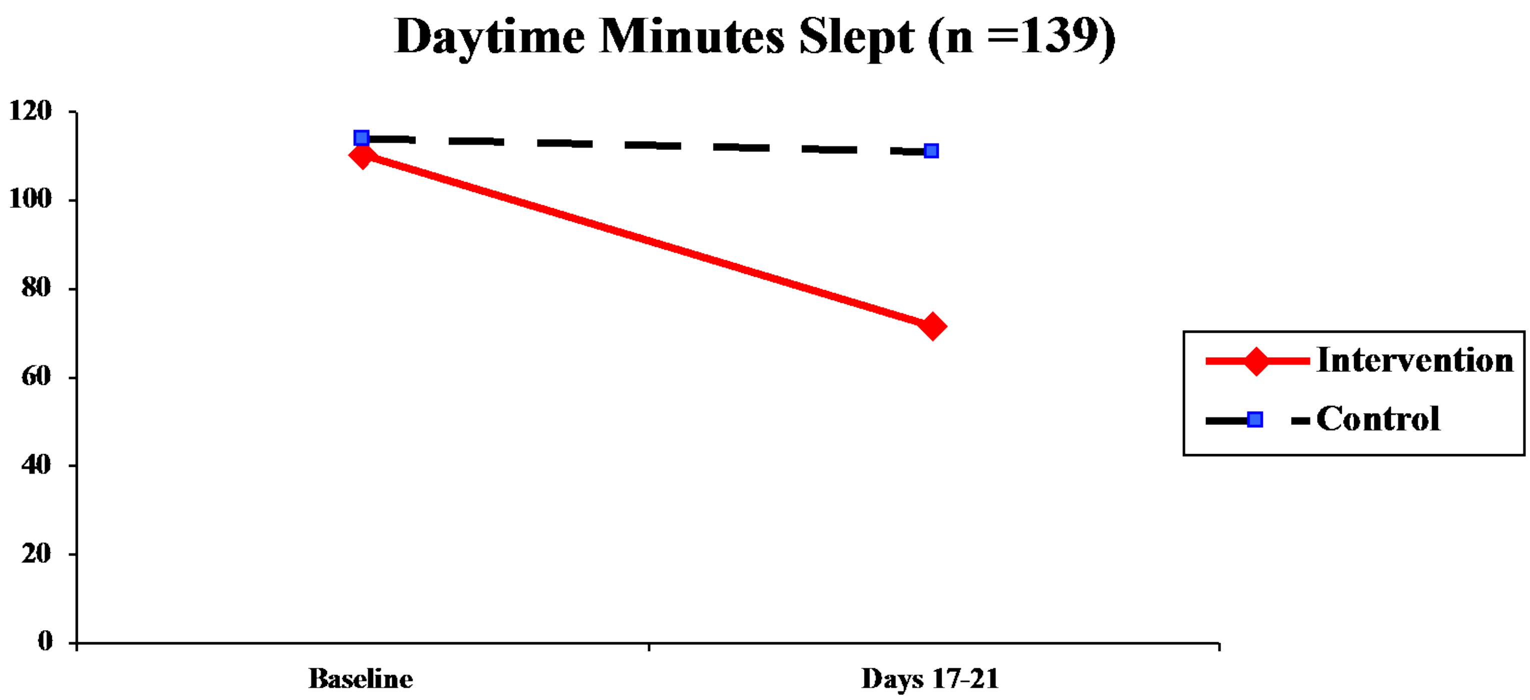
Insufficient Social and Physical Activity

- Both daytime social and physical activity are time cues for circadian rhythms of sleep and wake

- Other ways social and physical activity may influence sleep
  - Improved mood and cognition may mediate the effect of stimulating social activities on sleep
  - Improved function and reduced apnea-hypopnea index may mediate the effect of exercise on sleep

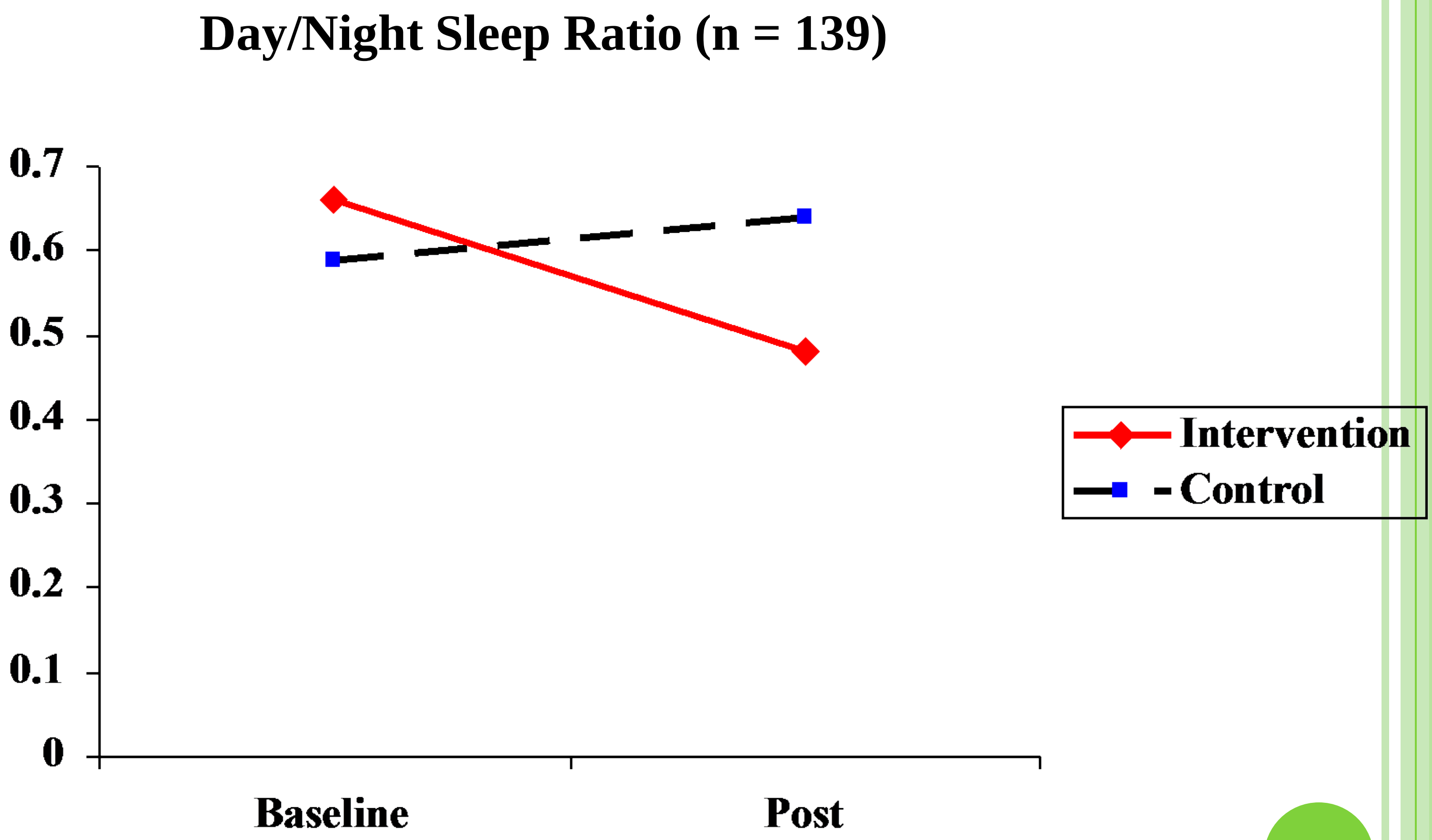
Richards KC, Beck C, O'Sullivan PS, Shue VM. Effect of individualized activity on sleep in nursing home residents with demetia. *J Am Geriatr Soc*. 2005, Sep; 53(9):1510-7.

Research: Social Activity and Excessive Daytime Napping



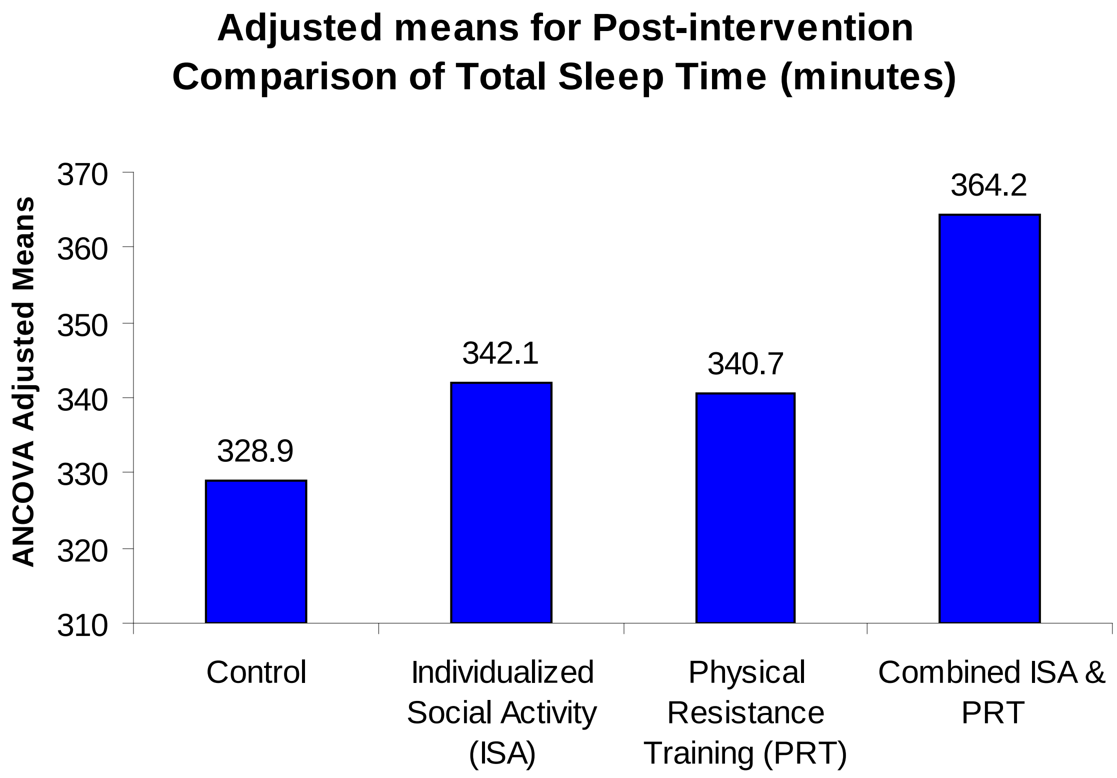
$p = .001$

Research: Social Activity and Excessive Daytime Napping



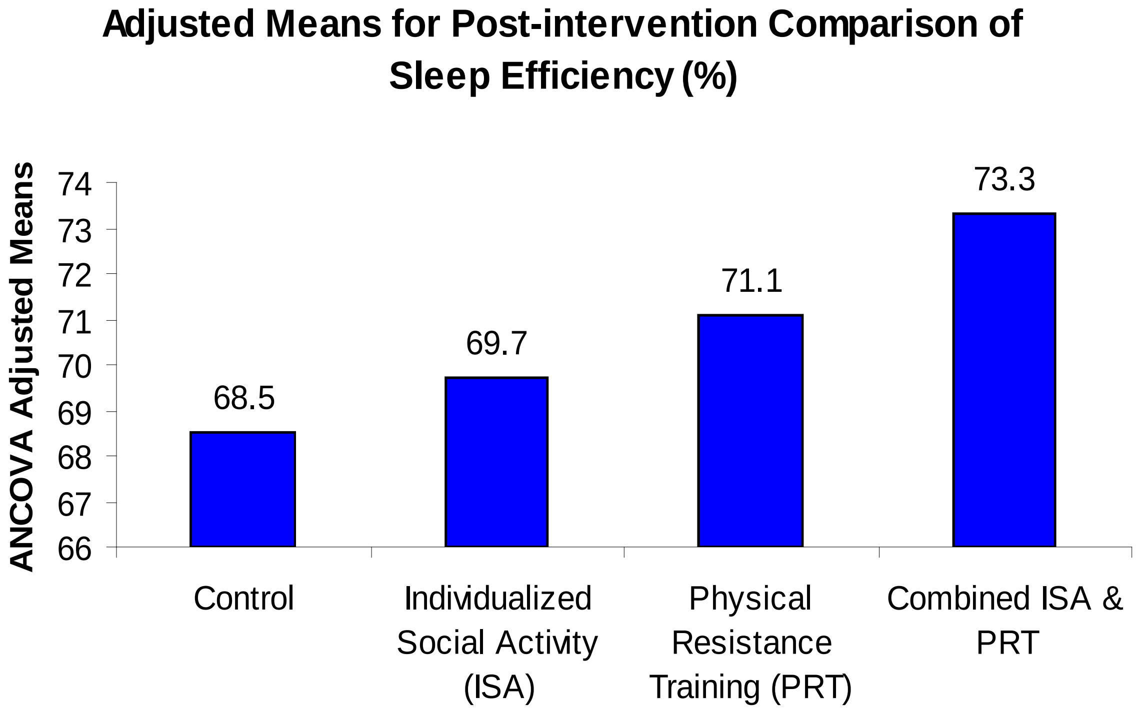
p =.04

Results: Effect of Social Activities and Exercise on Sleep in Dementia



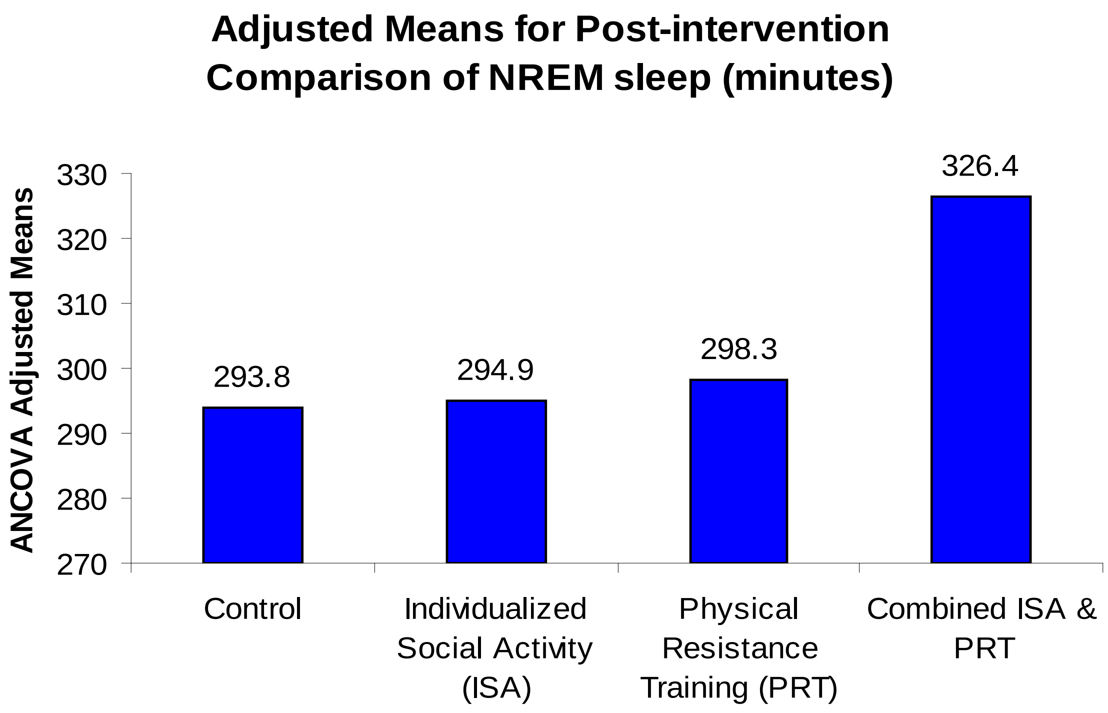
Significant Pairwise comparison:
Mean difference (Combined Group – Control) = 35.23; SE =13.72; *p* = .011

Results: Effect of Social Activities and Exercise on Sleep in Dementia



Significant Pairwise comparison:
Mean difference (Combined Group – Control) = 4.77; SE = 2.015; *p* = .019

Results: Effect of Social Activities and Exercise on Sleep in Dementia



Significant Pairwise comparisons:

Mean difference (Combined Group – Control) = 32.64; SE = 12.19; p = .008

(Combined Group – ISA) = 31.52; SE = 11.93; p = .009

(Combined Group – PRT) = 28.11; SE = 11.69; p = .017

Strength Training, Walking, and Social Activity Improve Sleep in Nursing Home and Assisted Living Residents: Randomized Controlled Trial

Table 3. Analysis of Covariance (ANCOVA), Pairwise Comparisons, and Effect Sizes on Polysomnography Measures

	Adjusted Mean (Standard Error)[*]				ANCOVA Between Treatment			ANCOVA Covariate		ANCOVA Interaction				
Measure	Exercise	Social Activity	Combined Exercise and Social Activity	Control	$F_{3,185}$	P-Value	f	$F_{1,185}$	P-Value	$F_{3,185}$	P-Value	SPSS Pairwise Comparisons	P-Value[a]	ES (d)
Total nocturnal sleep time, minutes	340.7 (58.5)	342.1 (55.8)	364.2 (46.7)	328.9 (81.4)	6.17	.001[†]	.32	70.58	<.001	4.45	.005	Combined Exercise and Social Activity >Control	.01[†]	.53
Sleep efficiency, %[‡]	71.1 (7.5)	69.7 (8.4)	73.3 (9.0)	68.5 (11.7)	5.54	.001[†]	.30	92.79	<.001	4.75	.003	Combined Exercise and Social Activity >Control	.02	.45
Non-rapid eye movement sleep, minutes	298.3 (50.1)	294.9 (51.6)	326.4 (41.1)	293.8 (73.9)	5.53	.001[†]	.30	79.46	<.001	3.38	.02	Combined Exercise and Social Activity >Control	.008[†]	.52
Rapid eye movement sleep, minutes	41.7 (21.0)	47.3 (19.6)	39.0 (20.1)	34.5 (23.1)	1.30	.23	.15	68.24	<.001	3.00	.03	N/A		
Sleep onset latency, minutes[§]	31.4 (30.1)	22.6 (21.1)	19.4 (12.3)	19.2 (17.4)	3.41	.02	.23	44.12	<.001	1.46	.23	N/A		

[*] Adjusted means are means adjusted for baseline differences; these means are different from the raw means displayed in Table 4.

[†] Significant after Bonferroni correction.

[‡] Sleep efficiency was calculated as sleep duration divided by time spent in bed multiplied by 100.

[§] Sleep onset latency was measured as elapsed time from time of lights out to first epoch scored as sleep.

ES = effect size; P^a = P-value derived from ANCOVA t-test; f = effect size derived from the ANCOVA pairwise comparison t-test; $f = \sqrt{ETA^2/(1 - ETA^2)}$; ES (d) = effect size (Cohen's) = ABS $(\bar{x}_a - \bar{x}_b)/\sigma$.

Richards KC, Lambert C, Beck CK, Bliwise DL, Evans WJ, Kalra GK, Kleban MH, Lorenz R, Rose K, Gooneratne NS, Sullivan DH. Strength training, walking, and social activity improve sleep in nursing home and assisted living residents: randomized controlled trial. J Am Geriatr Soc 2011;59:214-223.

Combined Strength Training and Walking Reduces the Apnea-Hypopnea Index

- **Secondary Data Analysis: N = 144**
  - residents who exercised (EG, n=97)
  - usual care control group (n=47)
- **Primary Outcome:** apnea-hypopnea index (AHI)
- **Results:**
  - Adjusted for the baseline AHI, ANCOVA showed a significant decrease in AHI for the EG compared with the control group. The adjusted means showed a decrease in mean AHI from 20.2 (SD `1.39) to 16.7 (SD `0.96) for a group mean reduction of 17.3%.
  - No significant association of gains in arm or leg strength with change in AHI

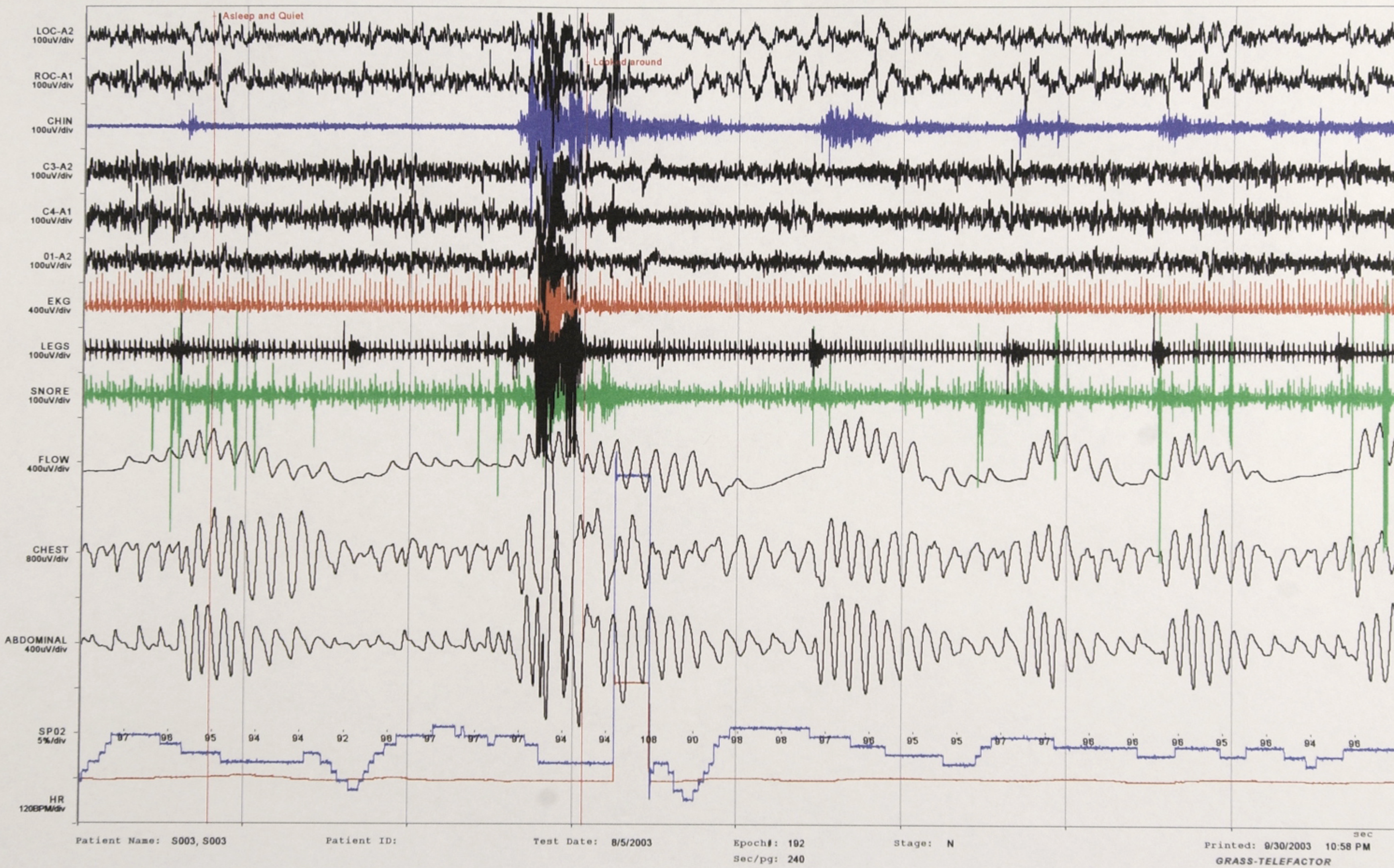
Herrick, J.E., Bliwise D.L., Puri, S., Rogers, S., & Richards, K.C. (2014). Strength training and light physical activity reduces the apnea-hypopnea index in institutionalized older adults. *J Am Med Dir Assoc*, 15(11) 844-846. PMCID: PMC4259214

Additional Benefit of Exercise plus Social Activity

- Improved function
  - Significant improvements in the social activity plus exercise group over the social activity group (95% confidence interval, -3.94 to -0.97) and the usual care group (95% confidence interval, -3.69 to -0.64).
- Sleep-based mechanism
  - However, no significant relationship between change in function and change in any sleep quality parameter

Lorenz, R.A., Gooneratne, N., Cole C.S., Kleban, M.H., Kalra, G.K., & Richards, K.C. (2012) Exercise and social activity improve everyday function in long-term care residents. *Am J Geriatr Psychiatry*, 20(6), 468-476. PMID: 22617163

Obstructive Sleep Apnea



MEMORIES

Mild Cognitive Impairment and Obstructive Sleep Apnea

- Determine if treatment of obstructive sleep apnea with continuous positive airway pressure (CPAP) in persons with mild cognitive impairment delays their cognitive decline and preserves everyday function.
- Specific Aims:
  - Determine feasibility of the study methods
  - Estimate effect sizes for a larger definitive study
  - Validate neuroimaging biomarkers

Richards KC R01 AG034682

Results: Sleep and Nighttime Agitation

Best fitting multiple linear regression model predicting Behavioral Disturbance Index

Predictor	***r* (*p*-value)**	**Coeff**	**SE**	**t**	***p*-value**
P-RLS	0.31(0.02)	0.70	0.23	3.0	0.004
MMSE	-0.33 (0.012)	-0.04	0.007	-2.79	0.012
Log AHI	-0.37 (0.004)	-0.32	0.11	-3.0	0.004
Intercept		2.95	0.39	7.51	0.000

Adjusted $R^2 = 0.31$; $p = 0.0000$

Rose, K.M., Beck, C., Tsai, P., Liem, P.H., Davila, D.D., Kleban, M., Gooneratne, N.S., Kalra, G., **Richards, K.C.** (2011) Sleep disturbances and nocturnal agitation behaviors in older adults with dementia. *Sleep*, 34(6), 779-786. PMCID: PMCID: PMC3098946

Periodic Leg Movements Predict Total Sleep Time

Predictors	*β*hat
Time in Bed	0.85*
Age	-2.37**
Periodic Leg Movement Index	-0.72**
R^2	0.4363*

$p<0.001$; **$p<0.05$, R^2 is the proportion of the variation in TST explained by the model; *β*hat is the estimated coefficient of the predictor in the given multivariate linear regression model

Richards KC, Roberson PK, Simpson K, et al. Periodic Leg Movements Predict Total Sleep Time in Persons with Cognitive Impairment and Sleep Disturbance.*Sleep*. 2008;31(2):224-232. PMCID: PMC2225566

RLS and Nighttime Agitation in Older Adults with Cognitive Impairment

- RLS infrequently recognized and diagnosed in persons with dementia/mild cognitive impairment
- Lack of RLS diagnostic tool suitable for persons who lack the cognitive abilities to report complex symptoms

Richards KC, Shue VM, Beck CK, Lambert CW, Bliwise DL. Restless Legs Syndrome Risk Factors, Behaviors, and Diagnoses in Persons With Early to Moderate Dementia and Sleep Disturbance. *Behavioral sleep medicine*. 2010;8(1):48-61. doi:10.1080/15402000903425769. PMCID: PMC3745281

Restless Legs Syndrome Diagnosis

pii: sp-00146-14

http://dx.doi.org/10.5665/sleep.4492

DIAGNOSTIC ACCURACY OF INDICATORS OF RESTLESS LEGS SYNDROME

Diagnostic Accuracy of Behavioral, Activity, Ferritin, and Clinical Indicators of Restless Legs Syndrome

Kathy C. Richards, PhD, RN, FAAN[1]; James E. Bost, MS, PhD[2]; Valerie E. Rogers, PhD, RN[3]; Lisa C. Hutchison, PharmD, MPH, FCCP[4]; Cornelia K. Beck, PhD, RN[4]; Donald L. Bliwise, PhD[5]; Christine R. Kovach, PhD, RN, FAAN[6]; Norma Cuellar, PhD, RN, FAAN[7]; Richard P. Allen, PhD[8]

[1]George Mason University, Fairfax, VA; [2]Children's Healthcare of Atlanta, Atlanta, GA; [3]University of Maryland, Baltimore, MD; [4]University of Arkansas for Medical Sciences, Little Rock, AR; [5]Emory University, Atlanta, GA; [6]University of Wisconsin-Milwaukee and Jewish Home and Care Center of Milwaukee. Milwaukee, WI: [7]University of Alabama, Tuscaloosa, AL; [8]Johns Hopkins University, Baltimore, MD

Study Objectives: Lack of a valid diagnostic measure of restless legs syndrome (RLS) for persons with dementia, who do not have the cognitive ability to report complex symptoms, impedes RLS treatment and research in this population. The aim of this study was to determine the sensitivity and specificity of a combination of indicators for identifying RLS that could eventually be used to diagnose RLS in persons with dementia.
Design: 3-day, prospective instrument validation.
Setting: Sleep laboratory.
Participants: Cognitively intact, 107 with RLS, 105 without RLS.
Interventions: N/A.
Measurements: Serial 20-min observations with a new measure, the Behavioral Indicators Test–Restless Legs (BIT-RL); leg movements with 3 nights of the Periodic Activity Monitor–Restless Legs (PAM-RL); ferritin; sleep history; clinical data; polysomnography; Hopkins Telephone Diagnostic Interview of RLS Symptoms.
Results: The best-fitting diagnostic model for identifying RLS included previous history of iron deficiency (odds ratio [OR] 7.30), leg discomfort (OR 6.47), daytime fatigue (OR 6.15), difficulty falling asleep (OR 3.25), RLS family history (OR 2.60), BIT-RL (OR 1.49), and absence of diabetes (OR 0.27), with sensitivity 78%, specificity 79%, and 77% correctly classified. This model retained its predictive accuracy even with co-morbid sleep apnea.
Conclusions: When compared to those without restless legs syndrome (RLS), persons with RLS have observable behaviors, such as rubbing the legs, that differentiate them, but the behaviors have no circadian and activity-related variability. The final model of clinical and sleep historical data and observation for RLS behaviors using the Behavioral Indicators Test–Restless Legs had good diagnostic accuracy.
Keywords: diagnostic accuracy, restless legs syndrome, sleep
Citation: Richards KC, Bost JE, Rogers VE, Hutchison LC, Beck CK, Bliwise DL, Kovach CR, Cuellar N, Allen RP. Diagnostic accuracy of behavioral, activity, ferritin, and clinical indicators of restless legs syndrome. *SLEEP* 2015;38(3):371–380.

INTRODUCTION

Restless legs syndrome (RLS) is a common sensorimotor disorder characterized by an urge to move the legs that often occurs with strange and uncomfortable leg sensations.[1] Persons with dementia often have a number of risk factors for RLS and behaviors, such as fidgeting and pacing, which may indicate that they have RLS.[2] RLS is a potential cause of nighttime agitation symptoms,[3] such as wandering and screaming, and sleep disturbance in persons with dementia, but RLS is often undiagnosed and untreated in this population.

RLS often remains undiagnosed in persons with dementia for two reasons. First, the current diagnostic gold standard, self-report of sensory symptoms, is unsuitable for persons with dementia because their cognitive and language deficits prevent them from accurately reporting the specific temporal, rest-associated, movement-associated, and sequential symptoms required for RLS diagnosis.[2] Second, a valid objective method for diagnosing RLS in persons with dementia does not yet exist. Therefore, the overall purpose of this diagnostic accuracy study was to identify valid measures of RLS that could eventually be obtained from persons with dementia, their caregivers, and their medical records. We first conducted an instrument validation study on persons without dementia because they do have the ability to accurately express their symptoms of RLS.

We hypothesized that persons with RLS would display specific key observable behavioral indicators during wakefulness, such as rubbing the legs or an inability to keep the legs still. We also hypothesized that in persons with RLS these observable behavioral indicators would be more frequent during the evening or night than in the morning, and that the behavioral indicators would decrease immediately following activity. We created a measure of these behaviors, the Behavioral Indicators Test–Restless Legs (BIT-RL), carried out serially during six 20-min observational periods. We also tested whether low serum ferritin, increased periodic leg movements during sleep, demographic variables, and a history of previously identified RLS risk factors such as depression, family history of RLS, and reports of sleep disturbance might improve diagnostic accuracy of the BIT-RL. Therefore, the specific aim of this study was to estimate the sensitivity and specificity of the BIT-RL, periodic leg movements during sleep as measured with the Periodic Activity Monitor–Restless Legs (PAM-RL, Respironics,

A commentary on this article appears in this issue on page 333.

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Address correspondence to: Kathy Richards, PhD, RN, FAAN, College of Health and Human Services, George Mason University, 4400 University Drive MS3C, Robinson Hall, Fairfax, Virginia 22030; Tel: (703) 993-1962; Fax: (703) 993-1942; Email: kricha11@gmu.edu

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EDITORIAL

Restless Legs Syndrome in the Darkness of Dementia

Commentary on Richards et al. Diagnostic accuracy of behavioral, activity, ferritin, and clinical indicators of restless legs syndrome. SLEEP 2015;38:371–380.

Georgios M. Hadjigeorgiou, MD[1]; Nikolaos Scarmeas, MD[2,3]

[1]Department of Neurology, Faculty of Medicine, University of Thessaly, Larissa, Greece; [2]Taub Institute for Research in Alzheimer's disease and the Aging Brain, Gertrude H. Sergievsky Center, Department of Neurology, Columbia University, New York, NY; [3]Department of Social Medicine, Psychiatry and Neurology, National and Kapodistrian, University of Athens, Greece

Restless Legs Syndrome (RLS), also known as Willis-Ekbom Disease, is a common sensorimotor sleep-related movement disorder characterized by an "urge to move the legs" and an "unpleasant sensation."[1] Due to the circadian variation of symptoms, these begin or worsen during periods of rest, mainly during the evening or night. RLS is associated with severe clinical consequences including sleep-onset or sleep-maintenance insomnia, depression and anxiety, possible increased vascular risk, and other conditions.[2] As a result, other important areas of functioning including occupational, educational, and other daily activities could be negatively influenced. Prevalence of RLS ranges from 2.4% to 10.8% in Caucasian populations, while the lower prevalence rates have been reported in East Asia and South America.[3] Idiopathic RLS, clinically similar to secondary RLS, is usually familial and has an early onset (before the age of 30 years). Secondary RLS is associated with various conditions, including iron deficiency, kidney failure, and pregnancy. Currently there are two first-line treatment choices, namely dopamine agonists and α2δ ligands.[3] Although dopaminergic dysfunction, abnormal iron metabolism, central opiate system, and genetics have been implicated, RLS pathogenesis largely remains unknown.[4] Diagnosis of idiopathic or secondary RLS is based on five essential clinical criteria that were recently updated.[1]

In this issue of *SLEEP*, Richards and colleagues try to face a very challenging problem: identifying a condition that is diagnosed on clinical grounds in persons with dementia who cannot self-report.[5] They try to bypass this inherent difficulty by creating a behavioral observation test (Behavioral Indicators Test - Restless Legs, BIT-RL) in addition to clinical measures and physiological recording (Periodic Activity Monitor-Restless Legs, PAM-RL). In the absence of such instruments this is a very important first step towards developing this field. Their efforts are even more significant given that sleep disturbances are extremely common in dementias, and that persons with dementia have a number of behaviors possibly indicative of underlying RLS.[6,7] At the same time, it is quite clear that the diagnosis of RLS in patients with dementia still has many limitations and obstacles, the main one being validation of the instruments in the target population of demented subjects. Both dementia and RLS diagnoses remain clinical. In the absence of valid biomarkers, there is ample room for diagnostic error in both conditions, making the elucidation of true relations between RLS and specific dementias quite challenging. Along this line, it may be helpful if future attempts to validate assessment approaches in specific types of dementia types (i.e., Alzheimer disease). It would be an additional step forward if diagnosis of RLS in dementia is biomarker based. This may provide more information regarding association of specific RLS-biological changes (e.g., ferritin level) with specific biological pathways (e.g., β-amyloid, tau).

Foreseen challenges in this future validation process include the following: (1) There is an extremely high, almost universal use of medications that have been associated with RLS in demented subjects (e.g., neuroleptics, SSRIs). (2) Many of the indicators included in BIT-RL[5] are very common in dementia, particularly in the setting of neuropsychiatric symptoms such as aggression, agitation, irritability[8] and even depression.[9] (3) As RLS symptoms usually occur or worsen at night, many of the dementia-associated neuropsychiatric symptoms also exacerbate late during the day in period of sundowning.[4] Some of the subjective sleep complaints, the strongest predictors of RLS in this report,[5] may not be accurately reportable by dementia subjects (e.g., difficulty falling asleep, daytime fatigue, leg discomfort) and may not be readily obtainable by informants (e.g., discomfort in legs). Additionally, some of them (difficulty falling asleep, daytime fatigue) maybe confounded by coexisting apathy and depression. As a result, more weight has to be placed on the developed observational instruments.

More research on qualifications and characteristics of trained raters who can accurately score the BIT-RL would be helpful. For example, it would be quite informative to explore whether dementia informants and caregivers (not uncommonly spouses, thus elderly subjects) could provide valid and reliable BIT-RL ratings, or whether short observations by expert clinicians would be necessary.

Apart from the necessity of an accurate diagnosis of RLS in demented patients, evaluation of RLS severity is also crucial since not all RLS patients need to be treated. In clinical practice, the severity of RLS is often evaluated using rating scales such as the International Restless Legs Rating Scale, and treatment is prescribed mainly in patients with moderate and severe RLS. This should be another important focus of future research in order to avoid overtreatment of RLS in demented patients.

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Georgios Hadjigeorgiou, MD, Department of Neurology, Faculty of Medicine, University of Thessaly, BIOPOLIS, Larissa 51110, Greece; Tel: +30-241350-2301; Fax: +30-241350-1020; Email: gmhadji@med.uth.gr

Diagnostic Accuracy of Behavioral Activity, Ferritin, and Clinial Indicators of Restles Legs Syndrome

Restless Legs Syndrome in the Darkness of Dementia

Knowledge Gaps

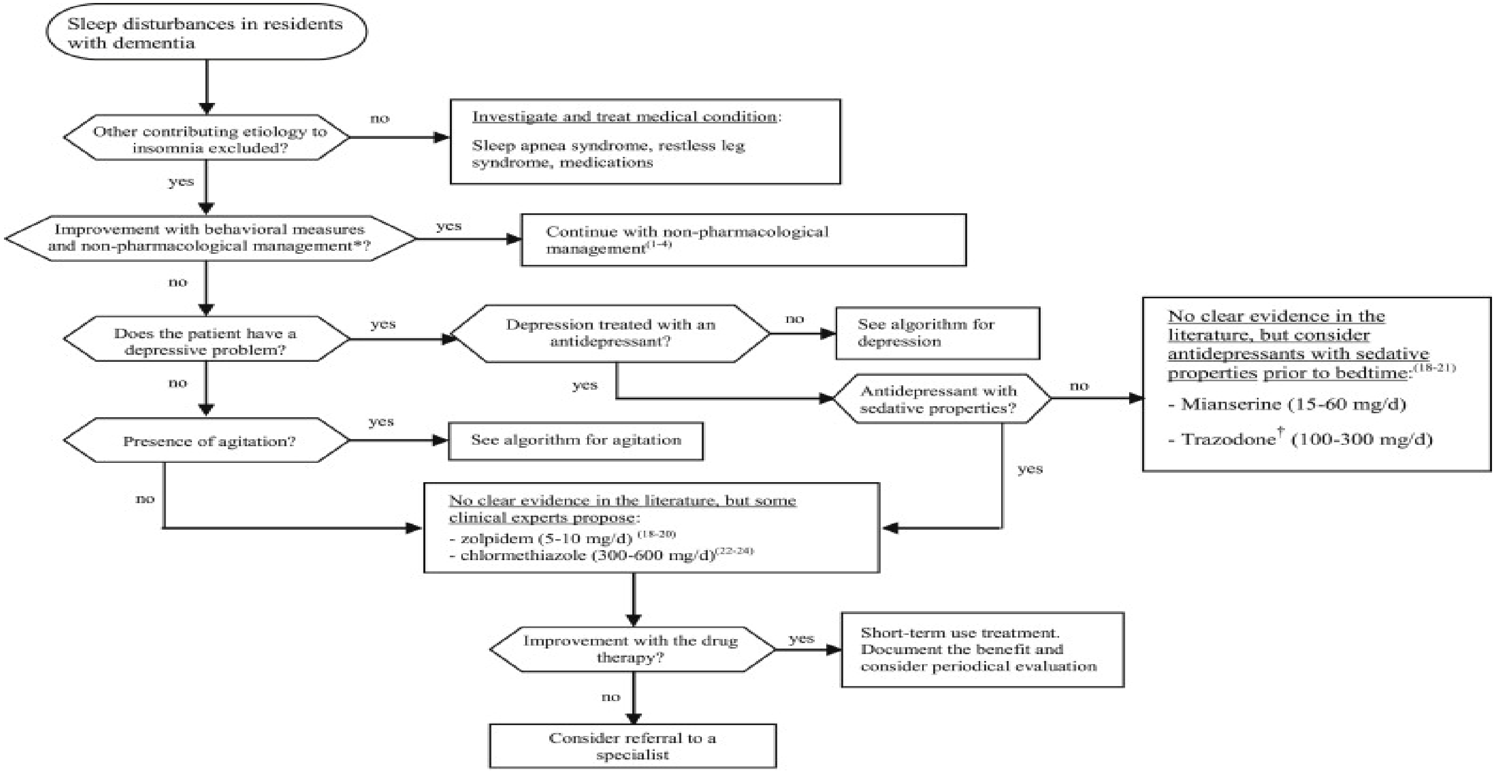

Fig. 3. Recommended algorithm for management of sleep disturbances in residents with dementia (nursing homes in the canton of Fribourg). ∗Light therapy; warm drink; limit fluid intake before bedtime; expose to bright day light or other approaches. †Take into a...

Isabelle Anguish, Jean-François Locca, Christophe Büla, Serge Zumbach, Olivier Bugnon

Pharmacologic Treatment of Behavioral and Psychological Symptoms of Dementia in Nursing Homes: Update of the 2008 JAMDA Recommendations

Journal of the American Medical Directors Association, Volume 16, Issue 6, 2015, 527–532

http://dx.doi.org/10.1016/j.jamda.2015.03.014

Exercise and Sleep Knowledge Gaps

- Few well designed studies using objective sleep outcome measures
- Few studies have examined common sleep disorders in institutionalized elders and potential interactions with exercise
- Few studies have examined interactions with cognition and other pathways
- Lack of data on duration, frequency, intensity, type, time of day
- Little information on the clinical significance of the effect of exercise on the AHI (nocturia, daytime sleepiness)

Knowledge Gaps

- Inadequate representation of diverse races and ethnicities in nursing home sleep research
- Little knowledge on effects of treatment of sleep apnea

SLEEPING WOMAN BY MAN RAY

RESEARCH OPPORTUNITIES

Research Opportunities

1) Concurrently address sleep disturbance and commonly occurring comorbid chronic conditions and examine interactions

2) Design clinical trials tailored to specific causes for sleep disturbance and examine causal mechanisms

Tailored Lighting Intervention

Sample: 14 residents of skilled nursing homes (with dementia)
Primary Outcomes: sleep, agitation, and depression
Design: 4-week, low-level bluish-white lighting intervention

A digital timer was programmed to automatically turn on all luminaires close to the time each resident woke up and off at 6 pm.

Figueiro MG, Plitnick BA, Lok A, et al. Tailored lighting intervention improves measures of sleep, depression, and agitation in persons with Alzheimer's disease and related dementia living in long-term care facilities. Clin Interv Aging 2014;9:1527-1537.

Research Opportunities

3) Diagnose and treat sleep disorders in institutionalized elderly and examine cognitive, functional, and quality of life outcomes

Restless legs syndrome (sundowning, nocturnal wandering)
Obstructive sleep apnea (cognition, quality of life, function)

4) Develop/validate/refine measures of sleep disturbance for persons with limited cognitive and verbal abilities

5) Examine relationships between sleep disturbance and co-morbid delirium

- Guarnieri B et al. Recommendations of the Sleep Study Group of the Italian Dementia Research Association on clinical assessment and management of sleep disorders in individuals with mild cognitive impairment and dementia: A clinical review. Neurol Sci, published online 19 July 2014.
- Terzaghi M, Sartori I, Rustioni V, Manni R. Sleep disorders and acute nocturnal delirium in the elderly: A comorbidity not to be overlooked. European Journal of Internal Medicine 25(2014) 350-355.

Recommendations for Improving the Quality of Clinical Trials to Determine the Effect of Interventions on Sleep in Institutionalized Elderly

- Use well-characterized sample, specific dementia diagnosis, genotyping
- Control as many confounding variables as possible
- Use an RCT design and placebo control, if possible
- Analyze planned (apriori) outcome measures guided by conceptual model
- Actigraphy
  - ≥7 nights
  - Use parameters related to sleep, activity, and circadian rhythms
  - Identify actigraphy parameters that are clinically most important for primary sleep outcome
  - Use primary sleep outcome as inclusion criteria
- Polysomnography
  - Multiple nights
  - Modified scoring criteria for dementia

Our Fantastic Team

- Nalaka Gooneratne, MD
- John Detre, MD
- Stephen Moelter PhD
- Amy Sawyer PhD, RN
- Terri Weaver PhD, RN, FAAN
- Cornelia Beck, PhD, RN, FAAN
- Donald Bliwise, PhD
- William Evans, PhD
- Patricia O'Sullivan, EdD
- Catherine Cole, PhD, RN
- Corinne Lambert, PhD, RN
- Paul Yushevich, PhD
- Paula Roberson, PhD
- Dennis Sullivan, MD
- Paofeng Tsai, PhD, RN
- Mort Kleban, PhD
- Rebecca Lorenz PhD, RN
- Karen Rose PhD, RN
- Carol Enderlin MNSc, RN
- Alexandra Hanlon, PhD
- Gurpreet Kalra, MS