Frequent Napping Is Associated With Excessive Daytime Sleepiness, Depression, Pain, and Nocturia in Older Adults: Findings From the National Sleep Foundation '2003 Sleep in America' Poll

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Objective: *The objective of this study was to describe the prevalence and correlates of regular napping among older adults.* **Methods:** *The National Sleep Foundation's "2003 Sleep in America Poll," a 20-minute telephone interview that focused on the topic of "sleep and aging" (N = 1,506 adults 55–84 years of age).* **Results:** *Overall, 15% of respondents reported regular napping, ranging in prevalence from 10% among those 55–64 years of age to 25% among those 75–84 years of age. In addition to older age and a strong association with excessive daytime sleepiness, other factors that independently increased prevalence included a diagnosis of depression, bodily pain, and nocturia.* **Conclusions:** *Regular napping is common among older adults. Longitudinal studies of napping behavior and health status are needed to establish risk factors other than excessive daytime sleepiness.* (Am J Geriatr Psychiatry 2007; 15: 344–350)

Key Words: Aging, naps, sleepiness, comorbidity, depression, nocturia

Over the past few decades, numerous community-based epidemiologic studies have reported prevalence rates for sleep disturbances, daytime sleep-related complaints such as excessive daytime sleepiness, and possibly undiagnosed sleep disorders among older adults to be as high as 20%–30%.[1–3] However, few of these studies have reported on the prevalence of regular napping and its association with sleep complaints and other mental and physical health problems, especially in relation to excessive

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daytime sleepiness (EDS).[1] In addition, debate continues on whether regular napping among older adults, particularly those in good health, may be beneficial to daytime wakefulness or perhaps detrimental to their nighttime sleep propensity.[4–9]

Epidemiologic prevalence studies typically show that EDS does not increase in prevalence among older adults in contrast to a significant increase in the prevalence of regular napping.[1,8] Established correlates of EDS in older persons include difficulty initiating and maintaining sleep, inadequate sleep, undiagnosed sleep disorders, depression, and poor health, especially from multiple chronic diseases or comorbidity.[1,10,11] Because EDS has been linked to less productivity, health, safety, and quality of life, this condition is receiving greater attention as a public health burden. In contrast, few epidemiologic studies have reported on the prevalence of regular napping and its correlates in both healthy older adults and those with significant health problems, independent of EDS.

The National Sleep Foundation's "2003 Sleep in America Poll" focused on the topic of "sleep and aging" and included information on napping, sleep problems, and mental and physical health conditions.[12] Because regular napping may be an important facet of sleep behavior, we report on the prevalence and correlates of frequent napping, including excessive daytime sleepiness, and self-reported sleep and health-related problems ascertained from a nationally representative poll of nearly 1,500 adults aged 55–84 years of age.

METHODS

Subjects were polled from a geographically representative random sample of telephone listings for U.S. households and were eligible if they were between 55 and 84 years of age. Approximately 26% of solicited subjects (N = 1,506) participated in a brief telephone interview that lasted approximately 20 minutes and included questions about their sleep behaviors, medical and psychiatric conditions, sleep problems, and sociodemographic and lifestyle attributes. A total of 1,497 had complete data on the frequency of naps for this analysis.

The structured telephone interview included primarily closed-ended questions with minimal numbers of response categories. Because response distributions often were skewed around a large proportion falling into a mode for the response categories, we chose to collapse responses and create primarily dichotomous variables to avoid small cell counts in the statistical analyses. Therefore, those who reported napping "4–7 times a week" were categorized as "regular nappers" and coded a value of 1 for this dichotomous variable versus a zero for the other categorical responses of "1–3 times per week," "1–3 times per month," "less than once a month," or "never." Those who reported "having daytime sleepiness so severe that it interferes with your daily activities" as occurring "every day or almost every day" were classified as having excessive daytime sleepiness coded as a 1 versus a zero for the combined responses of "a few days a week, a few days a month, rarely, and never." Respondents who reported "every night or almost every night" for difficulty falling asleep, awakening a lot during the night, waking up too early and cannot get back to sleep, breathing pauses, or snoring were coded a 1 for these complaints versus a zero for those responding "a few nights a week," "a few nights a month," "rarely," and never." Because a large number of respondents reported "do not know" for breathing pauses and snoring, we added a third level of response coded as 2 for these persons. To assess the burden of chronic diseases, participants were asked to report if they were told by a physician that they had one or more of the following diagnoses and were undergoing concomitant treatment: heart disease, hypertension, arthritis, diabetes, cancer, stroke, pulmonary disease, depression, osteoporosis, enlarged prostate (men only), and memory problems. To assess the effects of comorbidity, we summed the number of conditions and assigned categories for comorbidity as "those with no conditions," those with "1–3 conditions," and those with "4 or more conditions." Reported diagnoses of depression and memory problems were dichotomized as separate indicator variables of interest from among the list of conditions ascertained and included in the comorbidity scale.

Respondents also answered questions about age, gender, height, weight, hours of paid work per week, hours of volunteer work per week, frequency of exercise, presence of bodily pain, self-rated quality of

sleep, and nocturia. The indicator variable for poor sleep included those with a self-rated quality of sleep reported as "poor" or "fair" on most nights. Nocturia was based on reports of the need to get up to go to the bathroom every night or almost every night. No social support was based on respondents who reported that it was difficult or very difficult to find a family member or friend to talk to when they had a problem or felt the need to talk with someone.

χ^2 tests for independence were used to assess associations in bivariate analyses. In lieu of a multiple comparisons correction to a standard p value cutoff of 0.05 for declaring a significant association given the number of comparisons, exact p values were presented for significant bivariate associations. Factors found to be associated in these bivariate analyses were assessed for entry into a multiple logistic regression model that included age group and gender using a stepwise entry approach to identify independent main effects from the candidate variables. Significance level for entry and remaining in the model was set at 0.05. SAS software was used to compute the χ^2 statistical tests and the multiple logistic regression models.[12] The National Sleep Foundation's 2003 annual survey was not bound by an Institutional Review Board's approval.

RESULTS

Overall, 15% of respondents reported regular napping, ranging in prevalence from 10% among those 55–64 years of age to 25% among those 75–84 years of age. The prevalence of regular napping did not differ significantly between men and women (see Table 1) and was not associated with marital status, exercise, or coffee consumption. In contrast, other bivariate analyses shown in Table 1 indicate that regular nappers differed significantly from nonregular nappers in that they had fewer hours of employment, higher body mass index scores, greater comorbidity, bodily pain, nocturia, memory problems, depression, and less social support.

In addition, bivariate analyses presented in Table 2 show that regular nappers also differed significantly in subjective measures of sleep such as having fair or poor self-perceived sleep quality, sleeping fewer than 6 hours a night, difficulty falling asleep, difficulty staying asleep, early morning awakening, awakening unrefreshed, excessive daytime sleepiness, and nocturnal pauses in respiration. No association was found between regular napping and sleeping nine or more hours a night, snoring, or diagnosis of a sleep disorder (insomnia, restless leg syndrome, or sleep apnea).

TABLE 1. Percent Taking Regular Naps (response category = 4–7 times per week) According to Sociodemographic, Lifestyle, and Health Conditions: National Sleep Foundation 2003 Sleep in America Poll

	N	Percent Regular Nappers	p Value (df)[a]
Age group, years			
55–64	648	9.6	<0.001 (2)
65–74	561	15.0	
75–85	288	25.0	
Gender			
Men	630	16.2	0.128 (1)
Women	867	13.4	
Married			
Yes	956	15.2	0.378 (1)
No	541	13.5	
Employment/volunteer			
<30 hrs/wk	1,141	16.0	0.004 (1)
≥30 hrs/wk	356	9.8	
Exercise (weekly)			
Yes	775	13.6	0.249 (1)
No	722	15.7	
Coffee			
None	313	16.0	0.725 (2)
1–3 cups/day	858	14.1	
≥4 cups/day	307	14.7	
Body mass index, kg/m^2			
<30	1,133	13.3	0.017 (1)
≥30	364	18.4	
Medical comorbidity			
None	276	6.9	<0.001 (2)
1–3	1,029	14.3	
4–9	192	27.1	
Bodily pain			
No	979	11.9	<0.001 (1)
Yes	518	19.7	
Nocturia			
No	699	9.9	<0.001 (1)
Yes	798	18.7	
Memory problems			
No	1,327	13.8	0.018 (1)
Yes	170	20.6	
Depression diagnosis			
No	1,260	12.8	<0.001 (1)
Yes	237	24.1	
Social support			
No	1,360	13.9	0.022 (1)
Yes	137	21.2	

[a]p values and degrees of freedom from χ^2 tests for independence between variables.

TABLE 2. Percent Taking Regular Naps (response category = 4–7 times per week) According to Self-Reported Measures of Sleep Quality: National Sleep Foundation 2003 Sleep in America Poll

	N	Percent Regular Nappers	p Value (df)[a]
Sleep quality			
Good to excellent	1,150	13.0	0.001 (1)
Fair–poor	347	19.9	
<6 hours' sleep			
No	1,358	13.7	0.003 (1)
Yes	139	23.0	
≥9 hours' sleep			
No	1,423	14.4	0.452 (1)
Yes	74	17.6	
Difficulty falling asleep			
Easy	1,359	14.0	0.045 (1)
Problematic	138	20.3	
Difficulty Staying asleep			
Easy	1,162	12.3	<0.001 (1)
Problematic	335	22.4	
Early awakening			
No	1,339	13.7	0.004 (1)
Yes	158	22.2	
Awaken unrested			
No	1,287	13.1	<0.001 (1)
Yes	210	23.8	
Excessive daytime sleepiness			
No	1,393	11.4	<0.001 (1)
Yes	104	56.7	
Respiratory pauses			
No	1,058	14.1	0.018 (2)
Yes	107	22.4	
Do not know	332	13.6	
Snoring			
No	742	14.2	0.803 (2)
Yes	345	15.7	
Do not know	410	14.4	
Sleep disorders diagnosis			
No	1,298	14.1	0.194 (1)
Yes	199	17.6	

[a]p values and degrees of freedom from χ^2 tests for independence between variables.

Although the overall prevalence of EDS (7%) did not increase significantly with age in contrast to an increase in the prevalence of regular napping, the prevalence of EDS was significantly higher among regular nappers (see Figure 1). Approximately one-third of the regular nappers who were 65–74 years old reported having excessive daytime sleepiness compared with only one-fifth of regular nappers in the younger and older age groups. Among those who napped regularly, approximately one-half reported that typically they were so sleepy that they just fell asleep rather than planned to nap (data not shown). This reporting of inadvertent napping was not associated with increasing age or the prevalence of EDS.

A stepwise multiple logistic regression model (adjusted for age and gender) of the previously mentioned associated variables, as reported in Table 3, shows an almost ninefold increase in risk of regular napping among persons with EDS (odds ratio [OR]: 8.65, 95% confidence interval [CI]: 5.55–13.48). Other independent predictive factors that increased the odds of regular napping by at least 50% included self-report of a physician's diagnosis of depression (OR: 1.76, CI: 1.20–2.59), experiencing bodily pain every day or almost every day (OR: 1.53, CI: 1.11–212), and the need to get up and go to the bathroom every night or almost every night (OR: 1.52, CI: 1.10–2.12). Other characteristics associated in bivariate analyses, including level of comorbidity, symptoms of insomnia, and poor self-perceived sleep quality, did not significantly increase the odds for being a regular napper independent of the variables in the model, namely age, gender, EDS, depression, bodily pain, and nocturia.

Approximately 35% of respondents reported experiencing bodily pain "every day or almost every day" and this complaint was strongly associated with comorbidity. If bodily pain is removed from the analysis, then major comorbidity (i.e., four or more medical conditions) became an independent risk factor for regular napping (OR: 1.51, CI: 1.01–2.26, $p = 0.0494$) in addition to EDS, depression, and nocturia. Again, no other factors were found to be independent predictors, including any measure of nighttime sleep problems or poor self-perceived sleep quality.

DISCUSSION

In this nationally representative poll of older adults, men and women were equally likely to be regular nappers, a behavior that was significantly more prevalent among the older respondents. Regardless of their age, approximately one-half of the regular nappers had planned to nap versus reporting that they just fell asleep because of being sleepy. One-fourth reported nearly always having daytime sleepiness so severe that it interfered with their daily activities. In addition to older age and a strong association with

FIGURE 1. Prevalence of Excessive Daytime Sleepiness Overall and According to Regular Napping by Age Group

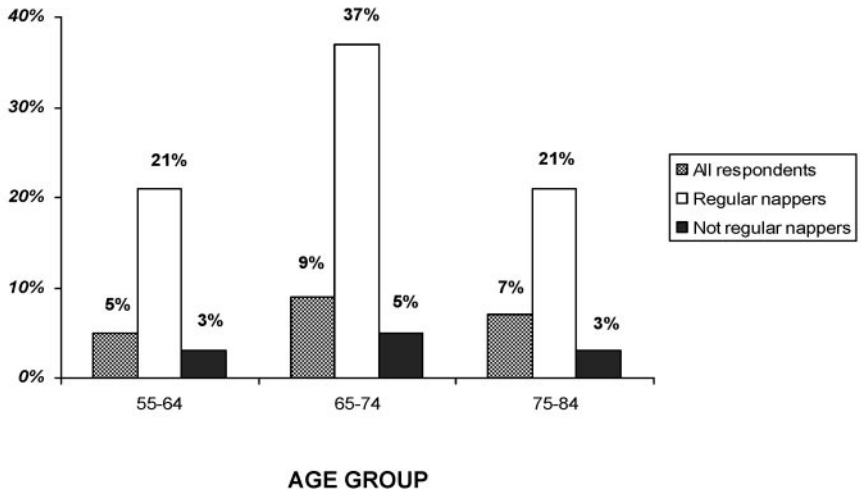

TABLE 3. Summary Stepwise Multiple Logistic Regression Model Predicting 'Regular Napping' in 1,497 Older Adults Selected From Among the Variables Significantly Associated With Regular Napping: National Sleep Foundation 2003 Sleep in America Poll

Predictor Variables	Adjusted[a] Odds Ratios	Confidence Limits	Significance Level
Daytime sleepiness	8.65	5.55-13.48	<0.0001
Depression Diagnosis	1.76	1.20-2-59	0.0042
Bodily pain	1.53	1.11-2.12	0.0104
Nocturia	1.52	1.10-2.12	0.0133

[a]The final model also included indicator variables for age 65–74, age 75–84, and women. The model's c-statistic = 0.74 for concordance is the proportion of observed nappers predicted by this multiple logistic regression model.

excessive daytime sleepiness, other factors that independently increased the odds for regular napping included a diagnosis of depression, frequently experiencing bodily pain, and needing to get up to go to the bathroom every night or almost every night. However, because these conditions were also correlated with prevalent nighttime complaints, questions about difficulty in initiating and maintaining sleep at night were not associated independently with the odds for being a regular napper.

According to the recently completed National Institute of Mental Health's National Comorbidity Survey, the 12-month prevalence rate for any *DSM–IV* mental disorder in the United States was estimated to be 26%.[13] In this poll, 16% of respondents reported that they had been diagnosed by a physician as having depression, and the prevalence of regular napping among them was 50% higher than the prevalence among those without a diagnosis of depression. A large number of epidemiologic studies show that psychiatric disorders and substance abuse are risk factors for sleep disturbances; however, the relationships with napping behavior are not clear.[2,14,15] Important interactions may exist between depression and its associated factors such as unemployment that may increase opportunities for regular napping. The relatively small number of persons in this sample does not provide sufficient power to examine stratified analyses that may possibly highlight important effect modifiers such as full-time work on this observed napping and depression relationship.

Bodily pain, another fairly common complaint in this study (35%), also has been found to be associated with sleep disturbances in epidemiologic studies of older adults, particularly in the context of arthritis.[16,17] Overall, nearly one-half of the respondents reported a diagnosis of arthritis (46%) and approximately one-half of them also reported bodily pain. However, unlike arthritis, bodily pain was associated consistently with nearly all of the sleep disturbances ascertained in this poll, including daytime sleepiness.[18] Other medical conditions associated with daytime sleepiness in this survey included depression, diabetes, stroke, and lung disease.[18] Because of

the robust independent association between bodily pain and regular napping, there is need to further investigate whether treating pain that disrupts sleep or treating sleep disruption caused by pain will reduce their need for regular napping as a result of their disrupted sleep. However, we also showed that in the absence of having identified those reporting bodily pain, regular napping was equally associated with having four or more medical conditions (i.e., major comorbidity). Although these associations among independent predictors may suggest issues of collinearity in the final model, for example, between depression and bodily pain, we found that these correlations were not sufficiently strong enough to indicate a lack of fit based on a nonsignificant residual χ^2 test for the final model of main effects.

In addition, the independent relationship between regular napping and the need to get up and go to the bathroom every night or almost every night suggests a possible area for interventional study as well. Indeed, nocturia is a common condition among older adults, and a recent review of epidemiologic studies of this condition shows that these persons have significant disruptions in their sleep.[19]

Although a diagnosis of memory problems that was reported by 11% of respondents was not associated independently with regular napping, a number of epidemiologic studies have reported napping and excessive daytime sleepiness to be associated with cognitive impairment as well as an increased risk of mortality.[3,9,20] Because the poll only included adults aged 55–84, these associations may have been weakened by exclusion of very old adults in which the associations are most manifest.

Survey data from telephone polls such as this one have other notable limitations and possible biases that must be considered in the context of interpreting results. The most apparent drawback is the low response rate (23% in this case). It remains unknown whether nonrespondents or refusals had similar rates of reported napping behavior, sleep disturbances, and medical conditions because no information is available from telephone contacts with persons who refuse to participate. In addition, as more people become solely dependent on cell phones, the issue of response bias in conducting telephone surveys is receiving attention because these persons' cell phone numbers are not typically available under random-digit dialing methodologies.[21] However, the consistency between the current poll results and other more representative epidemiologic studies of the relationships reported in this analysis suggests that the current poll is likely to be reasonably representative of older adults. Another major limitation of this cross-sectional survey is the lack of established temporal relationships between the onset of regular napping and the onset of the associated health conditions or behaviors. Although the prevalence of regular napping is common among older adults, only longitudinal studies of napping behavior and health can address temporal relationships and identify risk factors other than excessive daytime sleepiness.

In conclusion, a recent state-of-the-science conference on the manifestations and management of chronic insomnia in adults recommends future research focus on longitudinal observational studies to identify factors affecting incidence of, natural history of, and remission from chronic insomnia.[22] Importantly, we feel that any such longitudinal observational studies of sleep disturbances will need to ascertain and address the role of napping as a behavior that may influence incidence, natural history, and remission of insomnia complaints as well as other forms of sleep disturbances, especially excessive daytime sleepiness.

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