Prevalence of Naps in the General Population

This study aims to explore the relationship between naps, sleep/wake schedule, sleep symptoms, sleep and mental disorders in a representative sample of the non-institutionalized German population composed of 2216 women and 1899 men aged 15-99 years. A telephone interview survey was performed by lay interviewers using the Sleep-Eval software. Napping on at least 2 days per week was cited by 22.2% (95% confidence interval: 20.9% to 23.5%) of the sample and increased linearly with age, reaching 53.3% in subjects 75 years of age and over. Presence of daytime sleepiness was positively associated with napping for all age groups. In subjects younger than 65 years, napping was also related to night or shift working, presence of a physical illness, bipolar disorder, and idiopathic hypersomnia. In elderly subjects (>= 75 years), only the report of daytime sleepiness and primary snoring were related to napping. In the general population, the presence of napping in the younger age groups (<65 years) appears mostly to be the consequence of lifestyle such as night or shift working and/or of a mental or sleep pathology, whereas in the elderly, it is partly explained by disruptive events occurring at night, namely, nocturnal awakenings, sleep disorders affecting legs, and primary snoring. (Sleep and Hypnosis 1999;1:88-97)

Key words: aging, epidemology, mental disorders, nap, sleep disorders

INTRODUCTION

Epidemiological data in the general population on daytime napping are scarce (1-4). This paucity of information reflects a disinterest from epidemiologists probably due to such popular beliefs that napping is a benign lifestyle habit shared mostly by elderly persons or a cultural phenomenon encountered primarily in warm, southern climates. Numerous clinical studies, however, have explored the function of napping in the circadian rhythm (5,6), its possibility in the treatment of narcolepsy (7,8), its effects in adaptating to shift work (9-12) and its role in the sleep of the elderly (13). Clinical evidence clearly shows that napping increases linearly with age (1,14). This suggests that sleep physiology changes as a function of age: napping is often considered a normal characteristic of aging on a par with other sleep problems, most notably, disrupted sleep (15). This study aims to assess the frequency of daytime napping as a function of aging in a general population sample and to identify related factors to daytime napping such as life habits and sleep disorders.

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METHOD

Sample Selection

This epidemiological survey involving 4115 subjects aged 15 to 99 was conducted via telephone in the general population of Germany between January 16, 1996 and October 17, 1996. The sample was drawn using a stratified probabilistic approach taking into account the demographic characteristics of the 16 German regions as provided by Eurostats 94. The Kish selection method (16) served to determine the individual to be interviewed within each household, thus providing a random selection and minimizing the likelihood of within-unit noncoverage error.

Interviewers explained the goals of the study to potential participants before requesting verbal consent. A letter was sent to those who requested further details before agreeing to participate. Subjects with insufficient fluency in

German, or with a hearing or speech impairment, or with an illness preventing interview feasibility were disqualified. Subjects who refused to participate after two requests or who gave up before completing at least half the interview were classified as refusals. Phone numbers were dropped and replaced only after a minimum of 10 unsuccessful dial attempts were made at different times and on different days, including weekdays and weekends.

An added-digit technique, that is, increasing the last digit of a number by 1, was employed to control for unlisted telephone numbers (17). A pool of 4000 telephone numbers was first drawn, and the added-digit technique was subsequently applied with numbers no longer in service, refusals and rejected numbers. As a result, the final sample consisted of 10.4% unlisted numbers. The participation rate (68.1%) was calculated on the basis of all eligible telephone numbers, which included, residential numbers not meeting any of the exclusion criteria (N=6047), and completed interviews (n=4115). The final sample included 28.9% of subjects who initially refused to participate, but accepted on a second request.

Interviewers

Thirty seven native German-speaking interviewers from a company specializing in nationwide telephone surveys (Teleperformance) took part in the study. These interviewers were inexperienced in psychiatric assessment but received special training to use the Sleep-Eval Knowledge Based System (18,19). Interviewers worked a maximum of 32 hours per week. Three of the interviewers completed over 300 interviews each; 10 completed between 100 to 230 interviews each, and the remaining interviewers completed less than 100 interviews each. The average duration of the interviews was 48.0 –18.02 minutes. One third of interviews were performed in the afternoon (37.2% between 2 p.m. and 4 p.m.) and 38.2% in the evening (between 6 p.m. and 8:30 p.m.). Half of the interviews were conducted between January and March 1996 (53.4%) and one quarter (26.7%) between April and June. The remaining interviews were done between July and mid-October. The team of interviewers was monitored daily by two supervisors who listened in on calls in progress to ensure that questions were asked correctly and that data were entered properly.

Instrument

The instrument used to perform the interviews was a computer software program constructed on artificial intelligence principles. The Sleep-EVAL system was specially designed to manage epidemiological surveys and administer questionnaires concerning sleep and related mental disorders. It possesses a level-2, non-monotonic architecture endowed with a causal reasoning mode. In short, the system is capable of formulating diagnostic hypotheses on the basis of available data, which are then confirmed or rejected through further questions and deductions. The dynamic process is active through a series of key questions, words and rules of deduction that indicate to the system whether to allow the co-occurrence of two or more diagnoses. The system terminates the interview once all diagnostic possibilities are exhausted. It is programmed to reach diagnoses as per the DSM-IV (20) and the International Classification of Sleep Disorders (21). Validation studies of the system have shown good inter-user reliability through several designs (kappa values ranging from 0.48 to 0.98). More detailed descriptions of the system and how it operates can be found elsewhere (18).

Questionnaire

The questionnaire integrated in the Sleep-Eval system covers a broad range of sleep-related topics. A series of questions were dedicated to assess the following aspects of napping: frequency per week; frequency per day; nap duration; overall sleep time per day including naps; ability to nap anywhere; restorative effect of napping; dreaming during naps; and impact of naps on night sleep. The following dimensions were also explored: sleep-wake schedules for weekdays and weekends; quality of main sleep episode; medication, alcohol, coffee and drug intake; medical consultations and hospitalizations in the past 12 months; driving habits; and sleep and mental disorders. Another series of questions addressed socio-demographic matters.

Definitions

The nap group included all subjects who reported currently taking one or more naps per day (intentional sleep periods) at least two days a week.

Irregular bedtime and daytime sleepiness were defined as follows:

Irregular Bedtime: Bedtime hours that vary most of the time .

Severe Daytime Sleepiness: the feeling of being sleepy a lot or greatly during the day with or without napping to release sleepiness.

Moderate Daytime Sleepiness: the feeling of being moderately sleepy during the day with or without napping to release sleepiness.

Insomnia symptoms were defined as follows:

Difficulty Initiating Sleep: Dissatisfaction with "long sleep latency" (i.e. a sleep latency longer than 30 minutes identified by the subject as a major problem) or an indication of difficulty falling asleep as a major sleep problem.

Disrupted Sleep: Nocturnal awakenings with great

difficulty or the inability to resume sleep occuring at least twice weekly, or identification of difficulty maintaining sleep as a major problem.

Early Morning Awakening: Complaint of short nocturnal sleep duration due to abnormal awakening before 5:00 am (or at least 1-1/2 hours prior to the desired wake-up time) with inability to resume sleep or identification of early morning awakening as a major problem.

Non-restorative Sleep: Sleep of normal duration but associated with a complaint of tiredness at awakening, lacking a normal, rested feeling after nocturnal sleep, or an inability to get going in the morning.

Statistical Analysis

The unweighted sample included 2216 women and 1899 men. After adjusting for gender, age, and region, the weighted sample consisted of 52.1% women. Collected data were grouped and analyzed into five main topics: sleep/wake schedule, sleep symptoms, sleep disorders, physical health, and mental health. Bivariate analyses involving categorial or qualitative variables were carried out with chi-square statistics. ANOVA was used to analyze continous variables. Chi-square statistics and ANOVA were computed using the SPSS computerized statistical package (SPSS 6.1). Ninety-five percent confidence intervals were calculated for prevalence rates and for odds ratios. Logistic regressions (22) were used to compute the odds ratios (OR) associated with napping. Collinearity between variables (i.e., information redundancy) was first verified. Logistic regressions were performed using the SUDAAN software which allows an appropriate estimate of the standard errors from stratified samples by means of a Taylor series linearization method. Reported differences were significant at .05 or less.

RESULTS

Napping on at least 2 days per week was reported by 22.2% (95% confidence interval: 20.9% to 23.5%) of the sample (n=896). The rate was similar between men (22.0%) and women (22.4%), but increased significantly with age (Table 1). Naps were also more frequently reported by widowed subjects, night-time or shift workers,

Table 1. Prevalence of daytime napping by sociodemographic characteristics

	n	% of naps	[95% C.I.]
Age groups (years)			
15-24	650	13.1	[10.5-15.7]
25-34	790	12.3	[10.0-14.6]
35-44	650	14.4	[11.7-17.1]
45-54	694	18.7	[15.8-21.6]
55-64	546	29.0*	[25.2-32.8]
65-74	464	46.8*	[43.1-50.5]
>= 75	243	53.3*	[47.0-59.6]
Gender			
Male	1945	22.0	[20.2-23.8]
Female	2093	22.4	[20.6-24.2]
Marital status			
Single	1059	16.1	[13.9-18.3]
Married	2217	23.0*	[21.2-24.8]
Separated/Divorced	304	23.7*	[18.9-28.5]
Widowed	450	38.0*	[33.5-42.5]
Years of scholarship			
9 yrs (Hauptschule)	1704	27.2*	[25.1-29.3]
10 yrs (Realschule)	1075	19.3	[16.9-21.7]
13 yrs (Gymnasium)	558	17.9	[14.7-21.1]
University	435	20.0	[16.2-23.8]
Other	250	24.8	[19.4-30.2]
Working status			
Shift or night work	321	29.0*	[24.0-34.0]
Day or evening work	1848	12.5	[11.0-14.0]
Non worker	1033	19.5	[17.1-21.9]
Retired	834	44.3*	[40.9-47.7]

* p< .05 with the lowest figure in the same colomn

and retirees (Table 1). Most of these subjects (89.6%; n=803) reported taking one nap per day, 4.7% (n=42) reported two, and 5.6% (n=50) reported three or more. Frequency of naps was not related to gender or age. About 10% of nappers had napped for less than one year; one quarter napped for one to five years (23.4%); another quarter (24.9%) for more than five years and 41.9% did not know for how long they had been taking naps. As expected, the duration of naps was positively correlated with age (r=0.30; p<0.001).

Table 2. Sleep duration in nappers and non-nappers by age groups

	Sleep duration			
	Main sleep period		24 hour period	
	Nappers mean (s.d.)	Non-nappers mean (s.d.)	Nappers mean (s.d.)	Non-nappers mean (s.d.)
Age groups (years)				
15-24	7.25 (1.17)	7.50 (1.21)	8.34 (1.29)	7.50 (1.21)
25-34	6.88 (1.23)	7.04 (1.05)	7.64 (1.23)	7.04 (1.05)
35-44	6.68 (1.42)	6.93 (0.93)	7.40 (1.65)	6.93 (0.94)
45-54	6.97 (1.20)	6.95 (1.03)	7.64 (1.37)	6.95 (1.03)
55-64	7.14 (1.20)	7.00 (1.16)	7.92 (1.32)	7.00 (1.16)
65-74	7.33 (1.28)	7.11 (1.33)	8.02 (1.42)	7.11 (1.33)
>= 75	7.22 (1.60)	6.86 (1.40)	8.16 (1.71)	6.86 (1.40)

Descriptions of Naps

Most subjects claimed to feel refreshed after napping (88.7%). However, younger subjects were less likely to feel refreshed (15-24 years old: 71.5%; 25-34 years old: 77.3%) than those in any other age group (87.7% to 96.8%; p< 0.0001). Ability to nap anywhere was more often reported by men (47.7%) than women (37.1%; p<.005) but did not change with age. Moreover, a greater proportion of men than women claimed that napping affected their main sleep episode (18.1% vs 11.9%; p<.01). Napping was more likely to affect the main sleep episode of younger subjects (15-24 year olds; 23.3%) than that of older subjects (65-74 year olds: 10.4%; >=75 year olds: 10.4%; p<.02). Dreaming during naps occurred occasionally for 9.9% of subjects and frequently for 7.8%. A greater proportion of younger subjects reported dreaming frequently during naps (15-24 year olds: 24.2%; 25-34 year olds: 18.4%; 35-44 year olds: 14.2%) compared with older subjects (>=45 year olds: 4.5% to 1.8%; p<.0001). Nap length was negatively correlated with age (r=-.24; p<.001), that is, younger subjects usually took longer naps than did older subjects.

Sleep/Wake Schedule

When night time and shift workers were excluded from the calculation, the average bedtime hour was 23hrs 04 min (–122 min) in the remaining sample. This mean bedtime was similar between nappers and non-nappers. However, younger subjects with an irregular bedtime were more likely to nap (16.6%) than subjects with a regular bedtime (10.9%; p <0.05). The mean wake time (excluding night time and shift workers) was 06 hrs 18 min. (–69 min).

Overall, the sleep duration of the main sleep episode was comparable between nappers and non-nappers. However, there was a significant interaction between napping, age groups and sleep duration (F(6,3996) 3.006; p=.006). Indeed, while the sleep duration was shorter among nappers than non-nappers younger than 45 years of age, the sleep duration was longer among nappers than non-nappers in subjects 55 years of age and older. However, when naps were included in the overall sleep duration, the total sleep time was longer in nappers than non-nappers in all groups of age (Table 2).

If we consider the entire sample (n=4115), the median sleep latency was 15 minutes. Interestingly, subjects with a sleep latency over 30 minutes reported napping (27.2%) more often than did subjects with a sleep latency under 15 minutes (19.9%; p<.001). This association, however, was significant only for subjects 35-44 years of age.

Subjects who stayed in bed over 30 minutes once awake were also more likely to nap than those who got up immediately. Subjects with at least one bad night of sleep per week were more likely to nap than other subjects (Table 2).

Sleep Symptoms

Napping was more common among subjects with insomnia symptoms (i.e., difficulty initiating sleep, early morning awakenings, disrupted sleep or non-restorative sleep) (Table 3). The association between napping and difficulty initiating sleep and early morning awakenings was not age related. The association between napping and disrupted sleep was observed in each age group from 25 to

Table 3. Prevalence of daytime napping by sleep quality

Symptoms	N	% of naps	OR [95% CI]
Difficulty initiating sleep			
Absence	3299	21.0	1.0
Presence	676	27.2*	1.4 [1.2-1.7]
Early morning awakening			
Absence	3352	20.9	1.0
Presence	623	27.8*	1.5 [1.2-1.8]
Disrupted sleep			
Absence	2904	18.1	1.0
Presence	1071	32.5*	2.2 [1.9-2.6]
Non restorative sleep			
Absence	3358	21.2	1.0
Presence	617	26.5*	1.3 [1.1-1.6]
Snoring			
No	2524	19.5	1.0
= 1 night/week	688	25.5*	1.4 [1.2-1.7]
>= 2 night /week	794	27.1*	1.5 [1.3-1.8]
Time spent in bed once awake			
< 5 min	1831	20.8	1.0
5 - 30 min	1984	22.0	1.1 [0.9-1.3]
> 30 min	220	35.5*	2.1 [1.6-2.8]

*p < 0.05

74 years of age. Finally, the association between napping and non restorative sleep was significiant only in subjects younger than 55 years of age.

Napping was also more common among occasional (one night per week or less) and regular (two nights per week or more) snorers compared with non-snorers (Table 3). The association between napping and snoring was significant only for three age groups (15-24, 55-64 and 65-74 year olds).

A higher proportion of nappers reported moderate (19.5%) or severe daytime sleepiness (6.8%) than did non-nappers (11.2% and 2.2% respectively, p<0.0001). This association was true for both males and females and all age groups. Cataplexy episodes were reported by 1.6% of the sample and were more common among nappers (3.5%) than non-nappers (1.1%; p<.0001). Again, there was no gender effect, but the association was significant only for age groups under 65 years (except in the 35-44 years group). Episodes of sleep paralysis were reported by 5.7% of the sample and were slightly more common among nappers than other subjects (7.1% vs 5.3%; p<.05). This last association was found only for females.

Sleep Disorders

Napping was also examined relative to diagnoses of sleep disorders as per the International Classification of Sleep Disorders. As expected, subjects with hypersomnia (OR:4.36 [2.6-7.3]), narcolepsy (OR:7.5 [2.8-79.7]), and obstructive sleep apnea syndrome (OR:2.8 [1.7-4.4]) were more likely to nap than other subjects. Again, the higher rate of napping in these disorders was significant only in some age groups. Thus, a significantly higher proportion of nappers was found in hypersomnia subjects, but only in those younger than 55 years of age. In the cases of narcolepsy and obstructive sleep apnea syndrome, the associations were significant only in subjects 15 to 24 years of age. Subjects with a circadian rhythm disorder (OR:1.8 [1.1-3.1]), psychophysiological insomnia (OR:1.5 [1.0-2.1]), and those with a disorder affecting sleep quality, such as periodic leg movement disorder (OR:5.8 [2.0-16.9]), nocturnal leg cramps (OR:3.0 [1.6-5.5]), and primary snoring (OR:1.4 [1.1-1.6]) were also more likely to nap than other subjects. The association between naps and circadian rhythm disorder was observed only in subjects between 25 to 34 years of age and those between 35 to 44 years of age while the association between naps and primary snoring was significant only in older subjects (65 to 74 year olds and 75 year olds and over).

Finally, subjects with a psychiatric disorder (Mood disorder: OR:2.0 [1.5-2.7]; Panic disorder: OR:1.8 [1.2-2.9]; Anxiety disorder: OR:1.9 [1.3-2.8]) associated with a sleep disturbance also were more likely to nap in the daytime than other subjects.

Physical Health

Subjects with a body mass index =30 kg/m2 (obese) were more likely to nap in the daytime (32.0%) than non-obese subjects (21.7%; p <.001). This difference was observed only among females (36.3% vs 21.3%; p<.001) and was not age related. Furthermore, subjects being treated for high blood pressure had a higher propensity to nap (37.5%) than did other subjects (20.5%; p<.001). This association was found to hold true for both men and women, but only among subjects aged 35-44 years (31.2% vs. 22.3%; p<.01). Similarly, subjects being treated for a physical illness were more likely to nap than other subjects (33.9% vs. 18.6%; p<.001). This association was observed for both men and women, but was significant only for 35-44 year olds (30.5% vs. 16.7%; p<.005) and 45-54 year olds (32.9% vs. 22.7%; p=.02). Hospitalizations in the 12 months prior to the survey were comparable between nappers and non-nappers. Finally, a higher proportion of nappers consulted a physician in the 12 months prior to the survey (69.0%) compared with non-nappers (60.4%; p<.001). This association was significant only for the 55-64 year old group.

Napping was less common among drivers than non-drivers (19.9% vs. 29.3%; p<.001). This was true for both men and women, but only in two age groups. In the 35-44 age group, 13.1% of drivers and 22.1% of non-drivers reported napping in the daytime (p<.05). In the 65-74 age group, the reverse was true: 49.5% of drivers and 38.5% of non-drivers reported taking daytime naps (p<.05). Among

Table 4. Main factors related to daytime napping by age groups

Variables	Odd ratio	[95% CI]	p
Subjects between 15 to 24 years of age			
- Work status			
Night or shiftwork	5.07	[1.92-13.38]	0.00
Non worker	1.21	[0.61-2.41]	0.59
- Daytime sleepiness			
Severe	4.31	[1.11-16.75]	0.03
Moderate	1.13	[0.41-3.07]	0.81
- Idiopathic hypersomnia	4.69	[1.21-18.23]	0.02
Subjects between 25 to 34 years of age			
- Work status			
Night or shiftwork	3.21	[1.79-5.75]	0.00
Non worker	1.17	[0.69-1.99]	0.55
- Daytime sleepiness			
Severe	4.80	[1.61-14.29]	0.00
Moderate	2.03	[1.16-3.54]	0.01
- Bipolar disorder	2.55	[1.05-6.18]	0.04
Subjects between 35 to 44 years of age			
- Work status			
Night or shiftwork	3.28	[1.77-6.08]	0.00
Non worker	1.68	[0.98-2.88]	0.06
- Daytime sleepiness			
Severe	2.72	[0.86-8.56]	0.09
Moderate	2.59	[1.52-4.43]	0.00
- Physical illness	1.70	[1.00-2.90]	0.05
- Bipolar disorder	3.16	[1.02-9.82]	0.05
Subjects between 45 to 54 years of age			
- Work status			
Night or shiftwork	2.72	[1.36-5.41]	0.00
Non worker	1.85	[1.09-3.14]	0.02
- Daytime sleepiness			
Severe	4.12	[1.35-12.55]	0.01
Moderate	2.35	[1.26-4.38]	0.01
- Body mass Index >=30 kg/m2	1.99	[1.00-3.95]	0.05
Subjects between 55 to 64 years of age			
- Work status			
Night or shiftwork	1.03	[0.32-3.38]	0.95
Retired	2.15	[1.39-3.34]	0.00
Non worker	1.82	[1.12-2.96]	0.02
- Daytime sleepiness			
Severe	3.65	[1.48-9.02]	0.00
Moderate	1.61	[0.95-2.73]	0.07
Subjects between 65 to 74 years of age			
- Daytime sleepiness			
Severe	2.32	[0.55-9.75]	0.25
Moderate	2.39	[1.27-4.50]	0.01
- Woman	0.43	[0.28-0.66]	0.00
- Body mass Index >=30 kg/m2	1.89	[1.08-3.31]	0.02
- Primary snoring	1.74	[1.06-2.86]	0.03
- Disrupted sleep	1.61	[1.06-2.43]	0.02
- Depressive disorder	3.42	[1.14-10.20]	0.03
Subjects >= 75 years of age			
- Daytime sleepiness			
Severe	1.30	[0.42-3.99]	0.64
Moderate	4.35	[1.55-12.19]	0.01
- Primary snoring	3.28	[1.31-8.23]	0.01

drivers, the report of road accidents in the past year did not differ between nappers and non-nappers (6.2% vs. 5.2%; ns). The proportion of subjects who were issued fines was comparable for nappers and non-nappers (17.0% vs 18.8%; ns).

Mental Health

The use of a medication to enhance sleep was reported by 5.6% of nappers compared with 2.1% of non-nappers ($p < 0.001$). Nappers also reported using a medication for anxiety (2.0%) or depression (2.8%) more often than did non-nappers (0.8% and 1.1%; $p<0.001$ respectively).

Napping was more prevalent among subjects who met the DSM-IV criteria for Depressive Disorder (Major Depressive episode or Dysthimia) (33.2%) than among non-depressed subjects (21.4%; $p<.001$). However, this was not the case for the two extreme age groups (15-24 and =75 year olds) and those between 55-64 years of age. No association emerged between napping and the presence of Bipolar Disorders or Adjustment Disorders, except in the 25-34 and 35-44 age groups where subjects with a Bipolar Disorder were three times as likely to take naps as subjects without this type of disorder (25-34: 30.8% vs. 11.7%; $p=.005$; 35-44: 36.1% vs. 13.9%; $p<.05$). Subjects meeting the criteria for Anxiety Disorder had a greater tendency to nap (25.9%) than non-anxious subjects (21.5%; $p=.06$). However, this association was significant only for the 25-34 (20.8% vs. 11.4%; $p=.02$) and the 45-54 age groups (32.4% vs. 17.0%; $p<.005$).

Overall, the presence of at least one dysomnia and/or mental disorder was observed in 27.4% of nappers compared to 19.5% in non nappers ($p<.0001$). The rate of nappers with a dysomnia and/or mental disorder changes with younger nappers displaying more dysomnia and/or mental disorder than older nappers: 15-24 year old: 33.5%; 25-34: 34.8%; 35-44: 33.7%; 45-54: 36.0%; 55-64: 23.4%; 65-74: 19.5% and >= 75 year old: 20.7% ($p<.0001$).

Variables significantly associated with daytime napping in bivariate analyses were subsequently entered into stepwise logistic regression procedures. Overall, 17 variables were used through the seven models. The first model included subjects between 15 to 24 years of age. In this model, napping was found to be independently related to being night or shift worker, being a non worker, having idiopathic hypersomnia, and reporting a severe daytime sleepiness. In subjects 25 to 34 years of age, a higher probability of napping was found in night or shift workers, non workers, those with a moderate or severe daytime sleepiness and those with a bipolar disorder. The model with subjects 35 to 44 years of age yielded to similar results: night or shift workers, non workers, subjects with a moderate daytime sleepiness, those with a bipolar disorder, and those with a physical illness had a higher probability of reporting naps. In subjects between 45 to 54 years of age, night or shift workers, non workers, subjects with a moderate or severe daytime sleepiness, and those with a body mass index >=30 kg/m2 had a higher probability of reporting naps. In subjects between 55 to 64 years of age, only non workers or retirees and subjects with a severe daytime sleepiness had a higher probability of reporting naps. In subjects between 65 to 74 years of age, a lower probability of napping was found in women. A higher probability of napping was observed in subjects with moderate daytime sleepiness, those with a body mass index >=30 kg/m2, those reporting a disrupted sleep, those with primary snoring and those with a depressive disorder. Finally, in subjects 75 years or older, only moderate daytime sleepiness and primary snoring were significantly related to napping (Table 4).

DISCUSSION

Previous epidemiological surveys have afforded little attention to napping: less than ten studies from the general population have addressed this concern in the last three decades and reported similar results than ours in term of prevalence and evolution with age (1-4,23). This paucity of information from the general population can be further illustrated in the book by Dinges and Broughton (24) which extensively reviews the existent literature on napping phenomenon. This may be due in part to the negative connotation associated with napping, especially in industrialized countries where napping is perceived as a shameful habit having little or nothing to do with sleep disorders. Although napping in and of itself is not a sleep disorder, its presence may be symptomatic of an underlying sleep disorder warranting medical attention, such as narcolepsy, hypersomnia, obstructive sleep apnea syndrome and other disorders affecting sleep quality, including periodic leg movement disorder, nocturnal leg cramps and primary snoring. In the present study, napping was found to be significantly associated with disrupted sleep and being elderly (i.e., elderly subjects with disrupted sleep were more likely to take naps), and with non-restorative sleep and being young (i.e., subjects under 55 years of age who complained of non-restorative sleep were more likely to nap).

However, the findings of this study should be interpreted with a certain degree of caution. First, the refusal rate was quite high (31%) despite efforts to boost participation. Furthermore, the results were based solely on self-reports without polysomnographic recordings or multiple sleep latency tests (MSLT). The diagnoses were established solely on the basis of the minimal criteria suggested by the ICSD-90.

The results show that there are numerous differences between nappers and non-nappers within different age

groups. The sleep of nappers under 65 is characterized by an irregular sleep-wake schedule, a shorter sleep time, and a longer sleep latency compared with their non-napping counterparts. Similarly, younger nappers present with many pathological symptoms or disorders (e.g., cataplexy-like symptoms and mental disorders) not observed in non-nappers in the same age group.

Nappers under 65 years of age are also dissimilar to elderly nappers. The latter have higher occurrence of sleep leg disorders (Periodic limb movment disorder, nocturnal leg cramps or restless leg syndrome), insomnia symptoms, use of sleep medication and physicial diseases while nappers under 65 years of age have a higher occurrence of depressive disorders, feel more often that napping is unrefreshing, and have their night sleep affected by napping. They are also more likely than elderly nappers to have at least one dysomnia and/or mental disorder.

This suggests that the presence of napping in the younger age groups (<65 years of age) is the consequence of lifestyle and/or of pathology, whereas in the elderly, it is explained in part by disruptive events occurring at night, namely, nocturnal awakenings and primary snoring. This last finding was also observed in laboratory studies (25). In the elderly, it appears that good or poor sleep has little impact on the presence of daytime naps. One hypothesis is that there is a decline in the amplitude of the circadian rhythm in the sleep propensity of the elderly (25,26). This hypothesis is supported by the fact that bedtime occurs about 30 minutes earlier for the elderly compared with younger subjects and that overall sleep time including naps is comparable across age groups. This suggests a redistribution of sleep over a 24-hour period (14,27-32). Another explanation was put forward by Broughton (33). According to this author, the human sleep/wake rhythm could be a biphasic one with a two per day rhythm of sleep: a main sleep period occuring at night and a napping period in the midafternoon. However, societal requirments are not designed to respect this biphasic sleep/wake pattern. In fact, industrialization and productivity are not compatible with daytime napping, which is further illustrated in our data by the dramatic increase in the percentage of men who nap once they are retired and by the higher proportion of non workers who nap.

Similarly, previous studies (34) have shown that daytime napping has little effect on the night sleep of the elderly. This is in line with the claims made by the elderly in our study. An alternative explanation is that most elderly persons have little or no life constraints preventing them from napping whenever they feel the urge. This was reported in other studies (35) which observed that opportunity is an important factor in napping. This may explain the higher proportion of nappers among retirees, students and the unemployed. However, in the elderly group, other psychosocial factors such as loneliness (36, 37) and boredom (38) may also affect changes to sleeping habits.

Shift workers are a particular subgroup in which napping occurs in order to compensate for a sleep deficit in the night-shift period. However, whether napping is beneficial to this specific group is not clear. Although alertness at work has been reported as diminished in shift workers who nap (12) other studies have shown that napping by shift workers reduces the sleep deficit and alleviates some of the other effects of shift rotation (11).

The association between napping and mental disorders deserves some attention. As already stated, this relationship appeared almost only in nappers under 65. While some studies have shown that the majority of depressive individuals have some forms of insomnia complaints (39), hypersomnia symptomatology, such as naps, appear to be less common and affect between 10% to 75% of depressive subjects (40,41). We further analyzed the depressive symptomatology in order to verify whether particular depressive symptoms may be associated with napping.We found that napping in depressive subjects was associated in half of the cases with psychomotor retardation and obesity; other depressive symptoms were associated with napping in about one fourth of the subjects which is consistent with other reports (42). In our study, bipolar disorders were also associated with napping in the 25-44 age groups. This association was already underlined in clinical studies (43) and appears to be the consequence of the sleep reduction often observed in manic subjects.

CONCLUSION

Is napping a benign lifestyle habit or should physicans take note? First, one should consider that most nappers do not have any sleep or mental disorders: about two thirds of the subjects younger than 65 years of age and four out of five among the elderly did not have any sleep or mental disorders in this study. However, further examination is required. The physician has to first consider the age of the subject. In subjects under 65, the physcian should look for other excessive daytime sleepiness symptoms since napping may indicate a sleep disorder of excessive sleepiness that requires medical attention such as narcolepsy or hypersomnia. The sleep quality should also be investigated, especially symptoms of disordered breathing. Snoring and sleep apnea are likely to produce daytime somnolence. Investigation of sleep habits is also indicated. Poor sleep hygiene but also circadian rhythm disturbance may be responsible for daytime napping. Finally, the possibility of a mental disorder should also be considered. Among the elderly, napping appears to be a common habit that is reported by about half of this age group. However, it does

not exclude the possibility of an underlying sleep disorder especially those likely to deteriorate the quality of sleep such as snoring, restless legs syndrome, and periodic leg movement disorder.

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