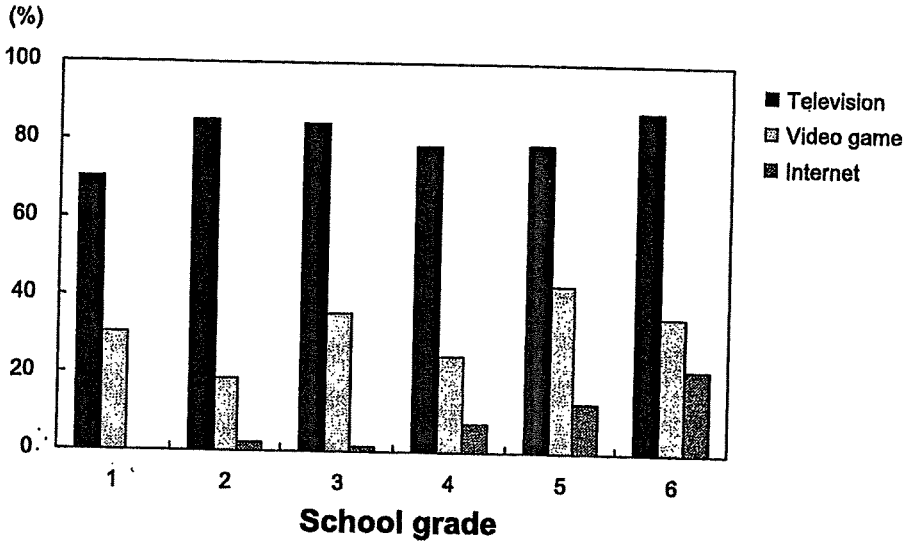

FIGURE 2 Percentage of children who watched television, played video games, or used the Internet.

significantly more common in males (36.9% vs. 24.5%, $p = .003$), whereas use of the Internet was more common in females (9.3% vs. 4.8%, $p = .032$).

Table 1 shows the comparison of sleep/wake parameters after dividing children on the basis of bedtime activities. Children who watched television had significantly later bedtimes on weekends and later wake times on weekdays. Children who played video games before bedtime had significantly later bedtimes and shorter sleep duration both on weekdays and weekends, and later wake time on weekends than children who did not play video games. Children who used the Internet before bedtime had significantly later bedtimes both on weekdays and weekends than children who did not use the Internet. Moreover, Internet users woke up significantly later on weekends and had shorter sleep duration on weekdays. Considering the fact that there was a statistically significant difference in age between users and nonusers of the Internet before bedtime, the same analysis was made focusing on fifth- and sixth-grade students who used the Internet more often than the others. Although bedtimes were similar, wake time on weekends (8:29 min ± 91 min vs. 8:01 ± 60 min, $p = .008$) and sleep duration on weekdays (494 ± 45 min vs. 518 ± 44 min, $p = .009$) were significantly different between frequent and infrequent Internet users.

Bedroom Facilities

Figure 3 shows how often television sets, video games, cell phones or telephones, and personal computers were in the child's bedroom. Totally, 29.1% of the

TABLE 1
Relationship Between Bedtime Activities and Sleep Parameters

Watching Television	+ *(n = 412)*	− *(n = 97)*	*P value*
Age (years)	9.1 ± 1.7	8.8 ± 1.7	.134
Bedtime on weekdays	21:42 ± 45 min	21:40 ± 51 min	.433
Bedtime on weekends	22:07 ± 51 min	21:52 ± 54 min	.007
Wake time on weekdays	6:56 ± 23 min	6:50 ± 22 min	.019
Wake time on weekends	7:46 ± 56 min	7:42 ± 51 min	.387
Sleep duration on weekdays	541 ± 43 min	544 ± 53 min	.909
Sleep duration on weekends	563 ± 49 min	575 ± 55 min	.180
Playing Video Games	+ *(n = 156)*	− *(n = 353)*	*P value*
Age (years)	9.2 ± 1.8	9.0 ± 1.7	.060
Bedtime on weekdays	21:50 ± 45 min	21:38 ± 46 min	.005
Bedtime on weekends	22:20 ± 55 min	21:58 ± 59 min	<.001
Wake time on weekdays	6:57 ± 24 min	6:54 ± 22 min	.490
Wake time on weekends	7:56 ± 58 min	7:41 ± 54 min	.022
Sleep duration on weekdays	529 ± 46 min	547 ± 44 min	<.001
Sleep duration on weekends	557 ± 52 min	569 ± 50 min	.039
Using the Internet	+ *(n = 36)*	− *(n = 473)*	*P value*
Age (years)	10.8 ± 1.3	8.9 ± 1.7	<.001
Bedtime on weekdays	22:09 ± 47 min	21:40 ± 45 min	<.001
Bedtime on weekends	22:36 ± 56 min	22:02 ± 50 min	.001
Wake time on weekdays	6:54 ± 23 min	6:55 ± 23 min	.938
Wake time on weekends	8:13 ± 84 min	7:43 ± 52 min	.002
Sleep duration on weekdays	511 ± 51 min	544 ± 44 min	<.001
Sleep duration on weekends	559 ± 64 min	566 ± 49 min	.663

Note. Bedtime and wake time: M ± SD (in minutes); sleep duration: M ± SD (in minutes).

bedrooms had televisions, 20.0% had video or portable games (with video games being more common in the bedrooms of older students), 14.3% had cell phones or telephones, and 4.3% had personal computers.

Cell phones or telephones were more commonly present in bedrooms among females than among males (17.1% vs. 11.5%, $p = .046$), whereas there was no sex difference in television sets ($p = .284$), video games ($p = .582$), and personal computers ($p = .544$). The percentage of the participants who watched television before bedtime was significantly higher among children with television sets in the bedroom than among children without television sets in the bedroom

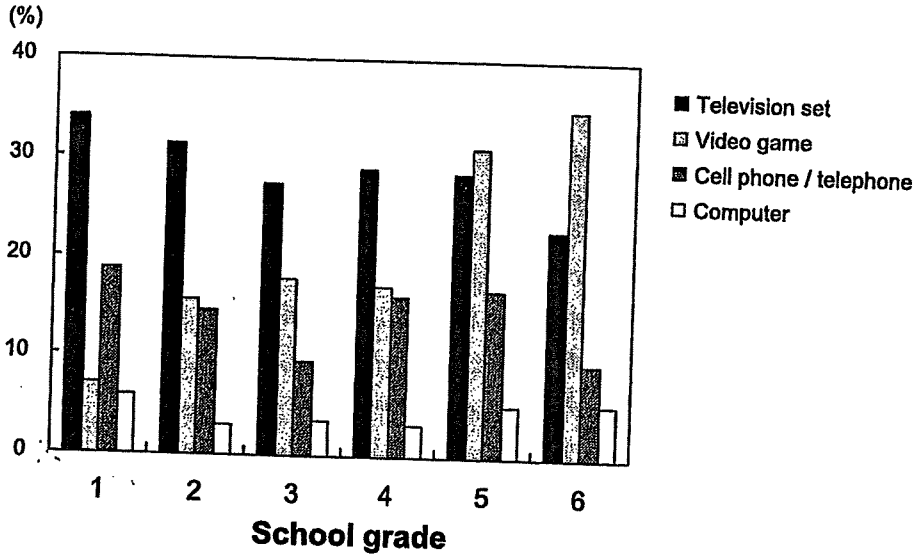

FIGURE 3 Percentage of children who slept in a bedroom with a television set, video game, cell phone, or telephone, or computer.

(87.2% vs. 78.4%, $p = .031$). The percentage of children who played video games before bedtime was significantly higher among children with video games in the bedroom than in those without video games in the bedroom (48.0% vs. 26.3%, $p < .001$).

Children who had televisions in the bedroom showed significantly later bedtimes on weekends (10:13 ± 53 min vs. 10:01 ± 51 min, $p = .008$). Children who had video games in the bedroom showed significantly later bedtimes on weekdays (9:54 ± 48 min vs. 9:39 ± 45 min, $p = .009$) and weekends (10:18 ± 4 min vs. 10:01 ± 51 min, $p = .008$) and shorter sleep duration on weekdays (529 ± 49 min vs. 545 ± 44 min, $p = .006$). Children who had cell phones or telephones in the bedroom showed significantly later bedtimes on weekends (10:15 ± 58 min vs. 10:03 ± 50 min, $p = .014$).

After-School Activities

Most of the children (81.3%) attended after-school activities including extra coursework, sports lessons, and music lessons at least once a week. There were no differences in the percentage of children attending after-school activities among the school grades. Of the students engaged in after-school activities, those in more advanced grades came home later than those in earlier grades.

There was no statistical difference in sleep/wake parameters between children with and without after-school activity. Sleep/wake parameters were then compared between children (5th- and 6th-grade students only) who returned

TABLE 2
Relationship Between Time to Return Home From School on Days With After-School Activity and Sleep Parameters Among Fifth- and Sixth-Grade Students

Time to Come Home	*After 8 p.m. (n = 28)*	*Before 8 p.m. (n = 123)*	*P value*
Age (years)	11.3 ± 0.7	11.2 ± 0.7	.351
Bedtime on weekdays	22:47 ± 43 min	22:06 ± 40 min	<.001
Bedtime on weekends	22:40 ± 52 min	22:34 ± 45 min	.324
Wake time on weekdays	7:10 ± 29 min	6:56 ± 24 min	.301
Wake time on weekends	8:27 ± 67 min	8:01 ± 66 min	.740
Sleep duration on weekdays	492 ± 43 min	519 ± 44 min	.006
Sleep duration on weekends	558 ± 52 min	552 ± 58 min	.891

Note. Bedtime and wake time: M ± SD (in minutes); sleep duration: M ± SD (in minutes).

before 8 p.m. and those who returned after 8 p.m. Children who returned after 8 p.m. had significantly later bedtimes on weekdays and shorter sleep durations on weekdays than children who returned before 8 p.m. (Table 2).

Logistic Regression Analyses

Multivariate logistic regression analysis revealed that bedtime after 10 p.m. on weekdays was significantly associated with being female (OR = 1.54, 95% CI: 1.03–2.32), higher school grade (OR = 3.65, 95% CI: 2.77–4.80), and time to return home after 8 p.m. (OR = 5.80, 95% CI: 2.05–16.44). Sleep duration of less than 9 hr on weekdays was significantly associated with higher school grade (OR = 3.13, 95% CI: 1.90–5.15) and using the Internet before bedtime (OR = 3.08, 95% CI: 1.02–9.17). Bedtime after 10 p.m. on weekends was significantly associated with higher school grades (OR = 3.14, 95% CI: 2.34–4.21), watching television before bedtime (OR = 2.09, 95% CI: 1.24–3.50), television in the bedroom (OR = 2.30, 95% CI: 1.42–3.72), and time to return home after 8 p.m. from after-school activity (OR = 6.71, 95% CI: 1.53–29.56). Wake time after 8 a.m. on weekends was significantly associated with being female (OR = 2.52, 95% CI: 1.74–3.66) and higher school grades (OR = 1.51, 95% CI: 1.18–1.92).

The results of multivariate logistic regression analyses regarding the difference of sleep parameters between weekdays and holidays are shown in Table 3. Bedtime delay of more than 1 hr on weekends was significantly associated with watching television and playing video games before bedtime and having a cell phone or telephone in the bedroom. Wake time delay of more than 2 hr

TABLE 3
Univariate and Multivariate Logistic Regression Results for Prediction of Sleep–Wake Patterns Between Weekdays and Weekends

	Univariate Relative Risk (95% CI)	*P Value*	*Multivariate Relative Risk (95% CI)*	*P Value*
	Bedtime delays more than 1 hr on weekends			
Sex (female/male)	0.93 (0.61–1.42)	.740		
Grade (4–6/1–3)	1.07 (0.82–1.38)	.632		
Bedtime activities				
Watch television	2.54 (1.30–4.95)	.006	2.45 (1.25–4.80)	.009
Play games	2.11 (1.37–3.25)	.001	1.96 (1.26–3.04)	.003
Use Internet	1.62 (0.77–3.41)	.202		
Bedroom facilities				
Television set	1.73 (1.12–2.69)	.015	*ns*	
Video game	1.19 (0.71–1.97)	.495		
Telephone	1.94 (1.13–3.33)	.017	1.83 (1.05–3.19)	.033
Computer	1.12 (0.44–2.89)	.805		
Time to return home[a]	2.61 (0.91–7.52	.075		
	Wake time delays more than 2 hr on weekends			
Sex (female/male)	2.62 (1.45–4.76)	.001	2.93 (1.55–5.53)	.001
Grade (4–6/1–3)	2.23 (1.54–3.24)	<.001	1.89 (1.21–2.71)	.002
Bedtime activities				
Watch television	1.32 (0.63–2.79)	.467		
Play games	2.76 (1.59–4.81)	<.001	2.66 (1.45–4.87)	.001
Use Internet	5.38 (2.55–11.34)	<.001	2.38 (1.04–5.47)	.041
Bedroom facilities				
Television set	0.92 (0.50–1.70)	.791		
Video game	2.59 (1.44–4.66)	.001	*ns*	
Telephone	1.67 (0.84–3.33)	.146		
Computer	2.03 (0.73–5.64)	.173		
Time to return home[a]	1.14 (0.39–3.32)	.816		
	Sleep duration increases more than 2 hr on weekends			
Sex (female/male)	2.61 (1.22–5.55)	.013	2.66 (1.17–6.03)	.019
Grade (4–6/1–3)	3.30 (1.93–5.62)	<.001	2.35 (1.33–4.17)	.003
Bedtime activities				
Watch television	1.15 (0.46–2.84)	.765		
Play games	3.77(1.86–7.62)	<.001	2.87 (1.31–6.30)	.008
Use Internet	8.23 (3.63–18.68)	<.001	2.73 (1.05–7.12)	.040
Bedroom facilities				
Television set	0.97 (0.46–2.08)	.946		
Video game	4.32 (2.14–8.73)	<.001	*ns*	
Telephone	2.61 (1.20–5.69)	.016	*ns*	
Computer	1.93 (0.55–6.78)	.307		
Time to return home[a]	0.46 (0.16–1.27)	.135		

Note. Results are presented as adjusted odds ratios (and 95% confidence intervals [CI]) from univariate and multivariate logistic regression analysis adjusting for all the factors in the table.

[a]Time to return home before or after 8 p.m. from after-school activity.

on weekends was significantly associated with being female, higher school grades, playing video games, or using the Internet before bedtime. Longer sleep durations of more than 2 hr on weekends was also significantly associated with being female, higher school grades, playing video games, or using the Internet before bedtime.

DISCUSSION

In this study, we investigated the relationship between bedtime activities and sleep/wake patterns in Japanese elementary school children. As bedtime activities are largely culturally dependent, understanding the culture-related lifestyle of children is necessary to improve their sleep quality.

For example, houses are usually smaller in Japan than in the West. This may lead to a higher rate of bedroom sharing with other family members. In addition, traditional Japanese houses usually have a multipurpose room with a "tatami mattress." This room is used as a living room during the day and a bedroom at night after the dining table is put away and a "futon mattress" is laid. In this study, we defined the bedroom as a room used for sleeping at night. Therefore, use of a multipurpose room for sleeping may be associated with placement of televisions in the bedroom at a higher rate.

Owens et al. (1999) reported that television viewing habits and the placement of televisions in the bedroom have a negative impact on children's sleep. In our study, television viewing seems to have a significant but small impact on both the delay of bedtime on weekends and wake time on weekdays. The reason for the difference in the result between our study and Owens et al.'s study is unclear, but it may be due to possible cultural differences in television viewing habits. For example, cable television is very common in the United States and provides hundreds of television programs, but it is present in only 35.9% of houses in Japan (Japanese Ministry of Internal Affairs and Communication, 2005). There may be a difference between cable television and terrestrial broadcasting that can explain the difference in the attitude of children toward television viewing before bedtime.

As for the relationship between sleep parameters and sex/age difference, being female and having higher school grades were shown to be independently associated with delayed bedtime on weekdays, later wake time on weekends, and longer sleep duration on weekends compared to weekdays.

Children in all grades played video games or portable games before bedtime, and older children in the higher grades played these games in the bedroom more frequently. One of the most striking results of our study was that playing video games and using the Internet before bedtime had a larger negative impact on

sleep/wake parameters. Video games may stimulate children by exposing their eyes to bright light and causing excitement at bedtime, which may alter their circadian rhythms (Higuchi, Motohashi, Liu, & Maeda, 2005).

Although use of the Internet was less prevalent than television viewing and playing video games among elementary school children, the rate of Internet use before bedtime increased with advancing age, and its use seemed to affect sleep/wake parameters. A recent report indicated that 67.9% of 6- to 12-year-old children and 93.0% of 13- to 19-year-old adolescents used the Internet during the past year (Japanese Ministry of Internal Affairs and Communication, 2007). It could be speculated that the negative effect on sleep/wake parameters is more prominent among junior and senior high school students. A previous report found that television viewing, computer game playing, and Internet use all have a negative impact on self-reported sleep/wake parameters in adolescents (Van den Bulck, 2004).

A recent lifestyle survey of children in Japan showed that elementary school children often use cell phones not only for telephone calls but also for e-mail transmissions and Internet access (Benesse Educational Research and Development Center, 2005). Furthermore, television programs can be viewed free of charge on most popular cell phones currently sold in Japan. This means that children, just by having a cell phone, may talk on the telephone, surf the Internet, send e-mail, and even watch television. We should advise parents to keep these advanced cell phones away from children before bedtime.

After-school activity, including extra schooling, is another factor affecting children's sleep. Pressure to enter a better junior or senior high school is a general trend in Japan, China, Korea, and other Asian countries. Children are urged to stay up late to prepare for exams. Usually, extra school classes for senior students end later in the evening. Our study indicated that the later time to come home from school significantly affects sleep/wake parameters. Health care professionals and educators should be aware that late after-school activities may disturb sleep.

One of the limitations in our study was that the sample was from one elementary school. Thus, our findings may not be generalizable to all school children in Japan. However, we chose an elementary school that was located neither in an urban area nor rural area so that we could reduce regional or socioeconomic bias. In addition, we selected a public elementary school that all except a few children in the area must attend. Therefore, we assumed that sampling bias due to regional or socioeconomic factors was minimal. It may be important to survey urban and rural areas of Japan to see if there are significant geographic differences in sleep habits.

Another limitation was that psychometric data were not received; demographic details such as family size, number of siblings, number of rooms, and

parental education were not asked about; and the frequency and duration of bedtime activities were not quantified. However, our findings may be useful in educating parents and healthcare practitioners to encourage children to have better sleep.

CONCLUSION

Activities before bedtime, televisions and cell phones in the bedroom, and after-school activities were shown to affect the sleep/wake schedule, although the effects remained small. To improve children's nocturnal sleep, children and parents should avoid factors (especially playing video games and using the Internet before bedtime) that potentially affect the sleep/wake schedule. Televisions, cell phones, and computers should not be taken into the bedroom, and after-school activities that delay bedtime and shorten sleep duration should be limited.

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REFERENCES

Armstrong, K. L., Quinn, R. A., & Dadds, M. R. (1994). The sleep patterns of normal children. *The Medical Journal of Australia, 161*, 202–206.

Benesse Educational Research and Development Center. (2005). *First basic survey report on children's lifestyle.* Okayama, Japan: Benesse Corporation.

Broadcasting Culture Research Institute. (2005). *Japanese life style survey report.* Tokyo, Japan: Nihon Housou Kyoukai.

Fukuda, K., & Ishihara, K. (2001). Age-related changes of sleeping pattern during adolescence. *Psychiatry and Clinical Neurosciences, 55*, 231–232.

Higuchi, S., Motohashi, Y., Liu, Y., & Maeda, A. (2005). Effects of playing a computer game using a bright display on presleep physiological variables, sleep latency, slow wave sleep and REM sleep. *Journal of Sleep Research, 14*, 267–273.

Japanese Ministry of Internal Affairs and Communication. (2005). *Prevalence of cable television.* Tokyo, Japan: Press Release.

Japanese Ministry of Internal Affairs and Communication. (2007). *Survey on the methods of telecommunication.* Tokyo, Japan: Press Release.

Japanese Parent Teacher Association. (2007). *Prevalence of video games.* Tokyo, Japan: Press Release.

Japanese Society of Child Health. (2001). *Infant health survey report.* Tokyo, Japan: Author.

Martin, S., & Oppenheim, K. (2007). Video gaming: General and pathological use. *Trends and Tudes, 6*(3), 1–6.

Owens, J., Maxim, R., McGuinn, M., Nobile, C., Msall, M., & Alario, A. (1999). Television-viewing habits and sleep disturbance in school children. *Pediatrics, 104*, e27.

Tynjala, J., Kannas, L., & Valimaa, R. (1993). How young Europeans sleep. *Health Education Research, 8*, 69–80.

Van den Bulck, J. (2004). Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. *Sleep, 27*, 101–104.

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. *Child Development, 69*, 875–887.

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ORIGINAL ARTICLE

An international survey of sleeping problems in the general population

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Key words: Multinational – Prevalence – Sleep disorders – Survey – Treatment

ABSTRACT

Objective: This international omnibus survey investigated the prevalence and characteristics of sleep problems, as well as strategies for resolving sleep problems, in the general population of the USA, France, Germany, Italy, Spain, the UK and Japan.

Research design and methods: A representative sample of the general population aged ≥15 years was recruited from each country. Questions focused on the nature of sleeping problems, the impact of problems on daily functioning and behavior with regard to resolving sleeping problems.

Results: A total of 10132 individuals were included in this survey. The prevalence of sleeping problems was 56% in the USA, 31% in Western Europe and 23% in Japan. Most individuals with sleeping problems considered these to have an impact on their daily functioning, with family life most affected in the Western European sample, personal activities in the US sample and professional activities in the Japanese sample. Almost half of individuals with sleep problems had never taken any steps to resolving them, and the majority of respondents had not spoken with a physician about their problems. Of those individuals who had consulted a physician, drug prescriptions had been given to approximately 50% in Western Europe and the USA and 90% in Japan.

Conclusions: Sleeping problems continue to present a considerable burden across Western Europe, the USA and Japan. Despite this, they are under-reported and under-treated, with almost half of affected individuals not taking any steps to resolve their sleeping problems.

Introduction

Insomnia can be defined as difficulty falling asleep, difficulty maintaining sleep, early-morning awakening and non-restorative sleep with associated daytime consequences[1–4]. However, the wide range of distinctive etiologies and varying degrees of sleep disturbance often make classification difficult. Depending on definition and regions, up to one-third of the population may experience insomnia symptoms[5–13]. For example, on a large cross-sectional telephone survey conducted in a representative sample of the populations of France, the UK, Germany, Italy, Portugal and Spain, difficulty initiating or maintaining sleep for at least three nights

per week was reported by 27% of the sample; however, half of these individuals did not have a diagnosis of a sleep or mental disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders – 4th edition (DSM-IV)[7]. While data from Asian populations are limited, the overall prevalence of insomnia in a representative sample from the general population of Japan was 21.4% in the month preceding the survey, mainly attributed to difficulty maintaining sleep and falling asleep[12]. Multiple logistic regression analysis showed that advanced age, being unemployed, lack of habitual exercise, perceived poor health, and stress were associated with a higher likelihood of insomnia.

Sleep disturbances have a potentially serious health impact. An analysis of 28 epidemiological studies found that insomnia is associated with psychological disorders, being a risk factor for depression, anxiety disorders, alcohol and drug abuse, and suicide[14]. This supports the findings of a number of other studies in various populations[9,15,16]. Furthermore, there is at the very least an association between insomnia and decreased immune function[14], and a possible association with cardiovascular disease[16]. Several studies have shown that daytime sleepiness is a risk factor for motor vehicle accidents[9,17] and may have considerable socio-professional consequences, including increased absenteeism from work[18,19].

Health-related quality of life (HRQOL) is nearly always affected in patients experiencing excessive daytime sleepiness or difficulty initiating or maintaining sleep, according to the findings of the large Sleep Heart Health Study[20]. In this study, HRQOL was evaluated with the generic Short-Form 36 (SF-36) Health Outcomes Questionnaire in over 5800 individuals in the general US population. Impairments in HRQOL associated with subjective sleep symptoms were found to be of a similar degree to other chronic diseases. Likewise, individuals self-reporting insomnia for at least three nights a week over a month had statistically lower scores on all subscales of the SF-36 compared with individuals without sleep problems[21]. These findings support those of a French study showing that, even after excluding patients with DSM-IV criteria for anxiety or depression, insomnia is associated with reduced emotional and mental health status[22]. In this analysis, reductions in SF-36 scores correlated with the severity of insomnia.

The impact of insomnia on health and HRQOL translate into economic consequences. Walsh and Engelhardt estimated the direct costs of insomnia (costs of substances used to treat the condition and related healthcare services) in the USA were almost US$14 billion in 1995, much of which was attributed to nursing home care for the elderly[23]. In France in 1995, estimates of the direct costs of insomnia were US$2 billion[24]. It should be noted that these values do not take into consideration the indirect or related costs of insomnia such as reduced work productivity or increased likelihood of accidents, which would be expected to at least double the economic burden of sleep disorders[25]. Indeed, a French study comparing individuals with severe insomnia with good sleepers matched for professional activities and work schedules found that those with sleep problems missed twice as many workdays during the previous year[18]. Furthermore, individuals with insomnia reported more difficulties with concentration and an increased frequency of work-related accidents.

While sleep disturbances clearly contribute to a significant health and economic burden, evidence suggests that they are under-reported and under-treated. In an omnibus consumer survey conducted in France, Germany, Italy and the UK, it was found that 37% of respondents with insomnia took no action to resolve it at all, while 10% used over-the-counter remedies and 13% adopted non-pharmacological measures[26]. A recent survey conducted in Western Europe, the USA and Japan demonstrated that the burden of insomnia on sufferers is considerable, although only 3% (Japan) to 22% (France) of individuals consulted a physician about their symptoms[27]. However, if insomnia and its consequences on daytime functioning are to be better understood, there is clearly a lack of understanding on the strategies used by patients with insomnia to cope with sleep disorders and daytime impairment.

Based on these preliminary data, we wanted to deepen our knowledge of insomnia in a more extensive and worldwide representative sample. The goal of this international omnibus survey was to further investigate the prevalence and characteristics of sleep problems, as well as strategies for resolving them in the general population of the USA, France, Germany, Italy, Spain, the UK and Japan.

Methods

A representative sample of the general population aged ≥15 years was recruited from the USA, France, Germany, Italy, Spain, the UK and Japan in October 2005. Data were collected by computer-assisted telephone interviews as part of multi-client monthly omnibus surveys conducted by LH2 in France, TNS in Germany, TRIBE in Italy, TNS in Spain and QRS in the UK.*

* TNS (Taylor–Nelson Sofres group), www.tnsglobal.com; TNS Healthcare is a sector of the TNS group, www.tns-healthcare.com; LH2, previously named Louis Harris France, is a full-service MR company based in Paris, www.LH2.fr; TRIBE specializes in medical fieldwork and is based in Milan, no specific website; QRS is a fieldwork company based near London and specializes in quantitative data collection, www.qrs-research.co.uk; NRC (Nippon Research Center) is a member of Gallup International Network (GIA), www.nrc.co.jp/english/.

In the USA, data were collected via an online panel facilitated by TNS, and in Japan via a postal questionnaire facilitated by NRC. These local fieldwork agencies conducted this study according to international standards. TNS was selected because it has offices and a good reputation in poll studies in France, Germany, Spain, USA and Japan. TNS was not represented in Italy and the UK but has experience in the field with the selected companies TRIBE and QRS.

For the telephone interviews, an automated dialing system was used to randomly select telephone numbers based on files stratified according to region and city size. Quotas on age, gender and the employment status of the head of the family were applied. Recruitment of participants for the online and postal panels were based on representative files of national populations. Ethical rules regarding confidentiality of data were strictly observed in each country and guaranteed by each local fieldwork agency. Any third parties did not have access to respondents' identities.

A semi-structured omnibus survey, consisting of a standardized 10–15-minute interview, was conducted over the telephone by professional interviewers, or was provided as an online or postal questionnaire on a weekly or monthly basis. The questions were identical regardless of whether they were answered over the telephone, via the internet or on paper and the questions did not include features that would bias the responses. Respondents were eligible to complete the survey if they answered to the following question in the affirmative: 'Have you suffered from sleeping problems in the past 12 months?' The questionnaire asked respondents about the nature of their sleeping problems in terms of symptoms, frequency and duration. Questions also focused on which sleeping symptoms caused the greatest degree of concern, how sleeping problems had evolved over time and the impact of sleeping problems on daily functioning.

Insomnia was defined as having at least one sleep problem (difficulty falling asleep, difficulty staying asleep due to night-time awakenings, waking up early and not being able to go back to sleep, poor quality of sleep) experienced at least several times per week for more than 1 year, with daytime consequences. People who have been diagnosed with sleep apnea or restless legs syndrome were excluded.

Behavior regarding resolving sleep problems was also investigated: respondents were questioned as to whether they had consulted a physician about their sleep problems, or whether they had received a drug prescription for their symptoms. Questions included: 'have you ever talked about these sleep problems with a physician?, 'what type of physician did you consult?', did the physician prescribe you a drug for your sleeping problems?', 'did you take the drug prescribed by the physician?', and 'for how long did you take it?' The level of satisfaction with treatment for sleep problems was assessed on a numerical 10-point rating scale, with 1 representing 'not satisfied at all' and 10 indicating 'very satisfied'. There was no question about continuous versus intermittent use.

Respondents were also asked whether they found sleep problems to be troublesome (phrased as whether they were 'very bothered', 'bothered', or 'not bothered').

Questionnaires were translated in each country and care was taken not only with linguistic aspects (checked by TNS writers) but also with sleep issues (validated by sleep specialists from each country considered). A special meeting between specialists at the beginning of the study was devoted to these issues.

Different channels were used to interview people depending of the country.

- Only face-to-face omnibuses are available in Japan because phone and web interviews are not accepted by the public.
- Web interviews are particularly suitable for the American market because of the large internet penetration in all age brackets (allowing large size samples).
- Phone interviews were the best solution in Western Europe because of the low penetration rate of the internet in the elderly population (which is the population having sleeping disturbances the most frequently) and a lower cost/effectiveness ratio for face-to-face methodology in this case.

Categorical values are presented as percentages with 95% confidence intervals (CIs). A chi-squared analysis of survey results was conducted to assess relationships between respondent characteristics and the impact of their sleep problems on daily functioning or the likelihood of receiving a drug prescription to treat sleep symptoms as well as to identify country specificities.

Data were extrapolated to the population of each country (aged ≥ 15 years), based on 2005 USA Census Bureau data (USA: 234 934 412; France: 49 498 357; Germany: 70 586 441; Italy: 50 017 532; Spain: 34 531 882; the UK: 49 721 174; and Japan: 109 221 888).

A weighting was performed to adjust our sample to the structure of each population at a national level, in terms of age, gender and household socioeconomic level.

Results

Population characteristics

The study population was composed of a total of 10 132 individuals (3962 from the USA, 1002 from

France, 1001 from Germany, 1000 from Italy, 1002 from Spain, 1000 from the UK and 1165 from Japan), who were representative of the national population of their respective countries in terms of region, age, gender and head of family occupation.

Prevalence of sleeping problems

The overall prevalence of perceptions of sleeping problems was the greatest in the USA (56%; 95% CI 54–58%). In Western Europe, the prevalence was 34% in France (95% CI 31–37%), 33% in Germany (95% CI 30–36%), 30% in Italy (95% CI 27–33%), 23% in Spain (95% CI 20–26%) and 36% (95% CI 33–39%) in the UK, while the prevalence in Japan was 23% (95% CI 21–25%).

Subjects reporting sleep apnea or restless legs syndrome were excluded from the study:

- 6% of the population in Western Europe, 11% in the US, 3% in Japan declared that they suffered from sleep apnea.
- 11% of the population in Western Europe, 17% in the US, 2% in Japan declared that they suffered from restless legs syndrome.

The number of patients with insomnia *per se* (based on at least one sleep problem experienced at least several times per week for more than 1 year, with daytime consequences) can be evaluated to be 28%, 39% and 21% of the European, US and Japanese respondents, respectively who reported having sleeping problems during the previous 12 months (excluding sleep apnea and restless legs syndrome).

The gender and age characteristics of the total and sleeping problems groups are shown in Table 1.

The impact of age on the prevalence of insomnia differed according to region: in Japan, the highest prevalence of sleeping problems was in those aged 55–64 years (25%), while in Western Europe and the USA, the highest prevalence was in those in the 35–44 year age group (22% and 20%, respectively).

Types of sleep problem

Of the individuals reporting sleep problems (excluding sleep apnea or restless legs syndrome), difficulty maintaining sleep was the most common complaint in the USA and Western Europe, but problems with sleep induction was most common in Japan. More respondents from the USA reported poor sleep quality than those from other regions (Figure 1). A total of 43% (95% CI 40–46%), 62% (95% CI 60–64%), and 48% (95% CI 42–54%) of participants in Western Europe, the USA and Japan, respectively, reported more than one sleeping problem, with 17% (95% 15–19%), 26% (24–28%), and 11% (95% CI 7–15%) of respondents experiencing difficulty with all aspects: sleep induction, sleep maintenance and quality of sleep.

In individuals reporting more than one sleep problem, poor sleep maintenance was most common in the USA, while difficulty getting to sleep was more common in Japan. Both problems were reported to a similar extent by European respondents. Conversely, poor sleep quality was not as common as the other two sleep parameters in any region.

Development of sleep problems

In participants with sleep problems, 59% (95% CI 56–62%) of respondents from Western Europe, 52% (95% CI 50–54%) of those from the USA and 85% (95% CI 81–89%) from Japan reported that their main sleep problem had not changed in severity over time. In participants who did report a change in their main sleep problem, this was considered to be a deterioration by 46% (95% CI 42–50%) of European respondents, 78%

Table 1. *Gender and age characteristics of the total population and of the sleeping problems group*

	Participants (%)		
	USA (n = 3962)	Western Europe (n = 5005)	Japan (n = 1165)
Male gender, %	51 **(44)**	48 **(39)**	45 (41)
Age, %			
15–24 years	15 (14)	14 (15)	15 (13)
25–34 years	19 (19)	18 (13)	16 (14)
34–44 years	19 (20)	19 (22)	16 (13)
44–54 years	17 (17)	16 **(21)**	16 (14)
54–64 years	13 (13)	14 (15)	19 **(25)**
≥65 years	18 (17)	19 (15)	18 (21)

Significant differences (CI = 95%) between the total population. The subgroup with sleeping problems have been emboldened

(95% CI 75–81%) of US respondents and 15% (95% CI 9–21%) of Japanese respondents. The nature of the predominant symptom remained the same in most cases.

Frequency of sleep problems

Most individuals from Western Europe and the USA reporting sleep problems experienced symptoms at least several times per week. In Japan, problems were less frequent (Figure 2). The majority of respondents from each region indicated that they had experienced symptoms for at least 1 year (mean of 6 years, 5 years and 4 years in Western Europe, the USA and Japan, respectively). Despite having experienced sleeping problems for more than 1 year, only 51%, 55% and 52% of respondents in Western Europe, the USA and Japan, respectively considered their problems to be chronic rather than occasional. However, if a chronic sleep problem is defined as having experienced a symptom for ≥ 1 month, 88% (95% CI 86–90%) of participants from Western Europe, 93% (95% CI 90–96%) from Japan and 93% (95% CI 92–94%) from the USA would have been categorized with chronic sleep problems. This was true for all aspects of sleep disorders (sleep induction, maintenance and quality).

Impact of sleep problems

Most individuals with sleep problems considered these to have an impact on their daily functioning (Figure 3),

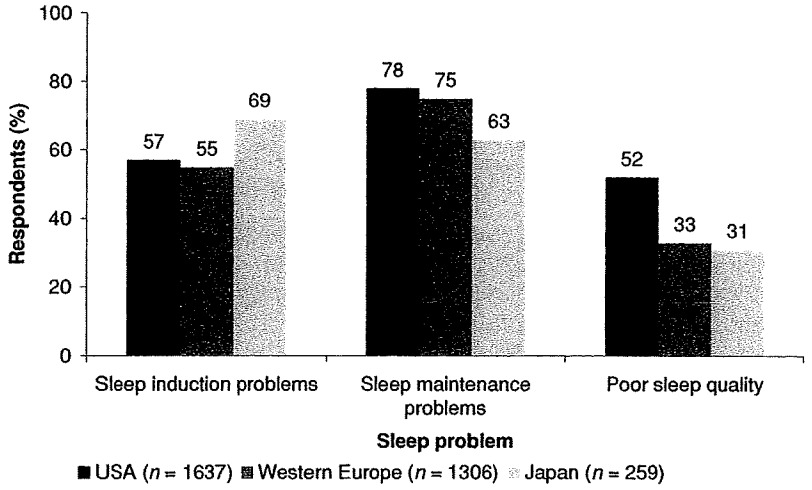

Figure 1. *Types of sleep problems among individuals reporting sleep problems over the previous 12 months. Answers were in response to the following question: 'What sleep problem symptoms do you currently suffer from?'. p-values for trends: USA vs. Western Europe (0.025 < p < 0.05), Western Europe vs. Japan (0.05 < p < 0.1), and USA vs. Japan (p < 0.005)*

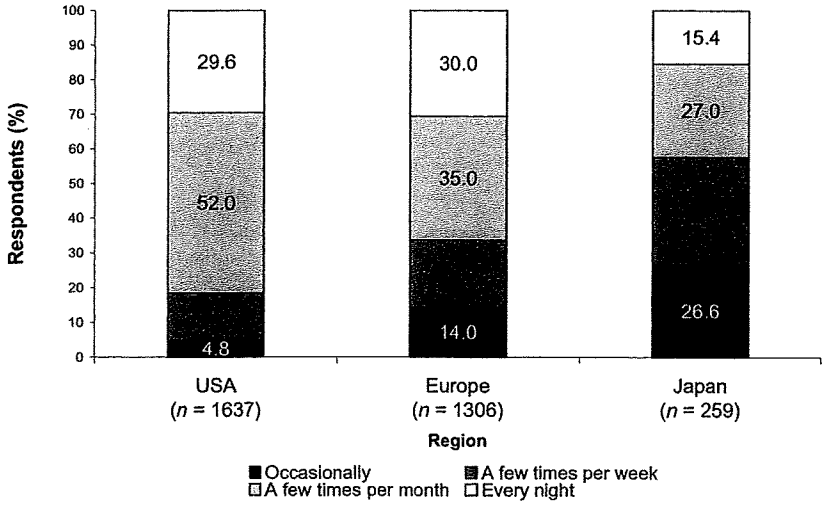

Figure 2. *Frequency of sleep problems among individuals reporting sleep problems over the previous 12 months. Answers were in response to the following question: 'How often do you have these sleeping symptoms?'. p < 0.005 for between-region differences*

including family life, personal activities, professional activities and social relationships (Figure 4). In Japan, professional activities were the daily function aspect that were most affected by sleep problems, while family life was most affected in Western Europe and personal activities were most affected in the USA. Not surprisingly, the impact of sleep problems on daily functioning was linked to the number of symptoms reported by the individual: 91% (95% CI 88–94%) of US respondents experiencing sleep induction, maintenance and quality problems considered sleep to impact their daily function, as did 86% (95% CI 73–99%) of Japanese respondents and 62% (95% CI 56–68%) of Western European respondents.

Chi-squared analysis showed that there were several demographic or behavioral characteristics that were common to individuals across the regions who perceived their sleeping problems to impact their daily function (Table 2). These included having several symptoms, experiencing symptoms quite often, and suffering from sleep-related comorbidities.

The most frequent disorder caused by sleep problems was physical fatigue, either in the morning or later in the day. Bad mood, poor concentration and mental fatigue were also commonly considered to be caused by sleep problems.

Individuals with sleep problems often had other comorbidities that may have been associated with their sleep. In all three regions, stress and overworking was the most common comorbidity. In the USA, being overweight was also a dominant comorbidity, with joint pain/rheumatism, anxiety/anguish and

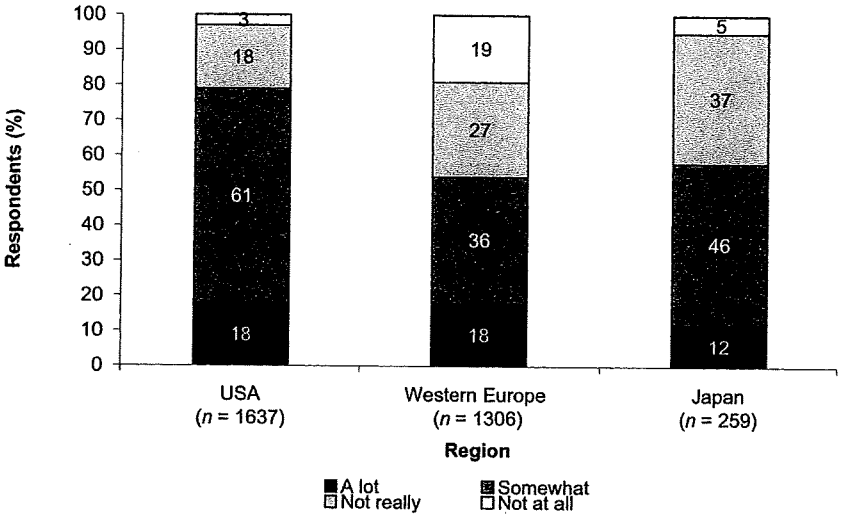

Figure 3. *Perceived consequences of sleep problems on daily functioning. Answers were in response to completing the following statement: 'Would you say that your sleep problems impact your daily functioning...?'* $p < 0.005$ *for between-region differences*

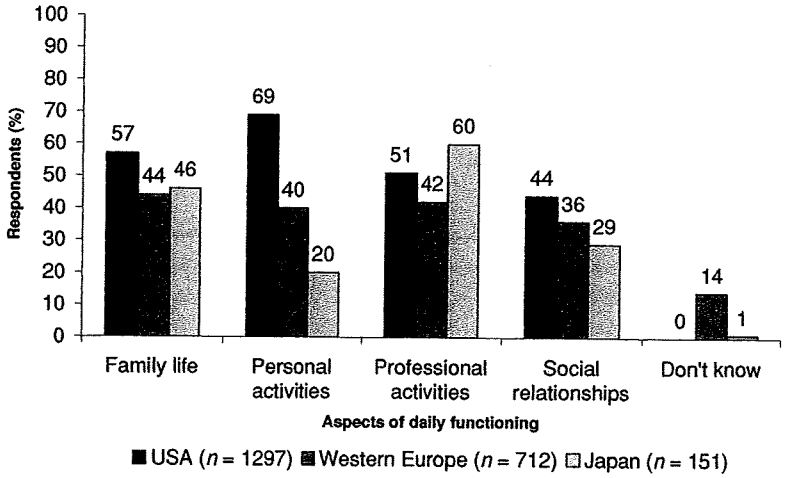

Figure 4. *Perceived consequences of sleep problems on specific aspects of daily functioning. Answers were in response to completing the following statement: 'Would you say that your sleep problems impact...?'* $p < 0.005$ *for between-region differences for each aspect of daily functioning ('Family life', 'Personal activities', 'Professional activities', 'Social relationships')*

Table 2. Chi-squared analysis showing statistically significant demographic or behavioral characteristics of individuals who perceive their sleep problems to impact on their daily functioning

	USA	Western Europe	Japan
Age ≥ 65 years			✓
Female	✓		
Have an occupation			✓
Poor sleep quality			
Have difficulty falling asleep	✓	✓	
Experience several sleep symptoms	✓	✓	✓
Experienced an evolution in sleep problems	✓	✓	
Experience problems as a consequence of insomnia	✓	✓	✓
Experience sleep problems quite frequently	✓	✓	✓
Consider their sleep problems to be chronic	✓	✓	
Experience comorbidities as a result of sleep problems	✓	✓	✓
Have consulted a physician about sleep problems	✓	✓	
Have consulted a psychiatrist about sleep problems			✓
Take a prescribed medication or another means of resolving their sleep problems	✓	✓	
Use a non-prescribed medication			✓

nervousness/irritability occurring comparatively frequently in Western European respondents. The two most common comorbidities in Japanese respondents were stress/overworking and nervousness/irritability, although over a quarter of Japanese respondents did not have an associated comorbidity.

Treatment for sleep problems

Almost half of individuals with sleep problems had never taken any steps to resolve their sleeping problems. The majority of respondents reporting a sleep disorder had not spoken to a physician about it (47% [95% CI 44–50%] in Western Europe, 65% [95% CI 63–67%] in the USA and 67% [95% CI 61–73%] in Japan). Of those respondents who had consulted a physician with regard to their sleep problems, approximately 50% in Western Europe and the USA received a drug prescription, compared with 90% of respondents in Japan. Of those who received a prescription drug, the average length of time taking this treatment was 2 years in the USA, 3 years in Japan and 4 years in Western Europe. In all, 29% of patients in Western Europe, 10% in the US, and 24% in Japan were taking the last treatment prescribed for more than 5 years. Prescription drugs were taken more frequently across all regions than drugs advised by a pharmacist, drugs without any medical advice or treatments other than drugs. In Western Europe, significantly more individuals with sleep maintenance problems were not receiving any form of treatment compared with other symptoms ($p < 0.05$). In contrast, in the USA, more individuals with sleep quality symptoms were not receiving treatment ($p < 0.05$). Chi-squared analysis showed that there were several demographic or behavioral characteristics that were common to individuals across the regions who had a medical treatment prescribed for their sleep problems (Table 3). These included having several symptoms, considering their sleep problems to be chronic, and suffering from sleep-related comorbidities. Another predictive factor was using other strategies to resolve sleep problems, whether this be non-prescription drugs or other remedies. While individuals in Western Europe or the USA were more likely to have experienced a negative change in their symptoms over time, Japanese individuals were more likely to have experienced a positive change in their symptoms.

Discussion

The magnitude of sleep problems in three economically developed parts of the world (Western Europe, Japan and USA) is clearly shown in this study. When extrapolated to the general population, this indicates that 131.3 million people in the USA (± 1.5%), 82.3 million people in Western Europe (± 1.3%), and 25.6 million people in Japan (± 2.4%) have had sleep problems within the past 12 months. Even with a more stringent definition of insomnia , it still concerns 38.1 million people in the USA (± 1.1%), 18.8 million people in Western Europe (± 0.7%) and 5.2 million people in Japan (± 1.2%). Clearly Japan appears to be less effected by sleep problems than the two other continents. It could be speculated that the lower prevalence in Japan may be a function of under-reporting

because of the possible cultural reticence among Japanese people to associate sleep problems and psychiatric disorders[27]. Indeed, the relatively short mean time spent in bed (6.5 h) reported previously in the Japanese adult population[13] might lead to reduced difficulty maintaining sleep, as bedtime restriction has been shown to improve sleep efficiency[28]. The prevalence of insomnia we found in the Japanese is consistent with that found by Doi and colleagues in a nationwide sample of 2800 subjects: 17.3% in males and 21.5% in females[29]. However in young people, Kaneita and colleagues recently found in a survey of 102 451 Japanese adolescents that insomnia concerns 23.5% of the sample, which was more than in our study[30]. Interestingly, the reported prevalence in this study is notably greater than in the previous survey (37%, 27%, 28%, and 6.6% in France, Italy, the USA and Japan, respectively)[27]. The relatively dramatic difference in the prevalence in the USA in this study may be a consequence of an increased awareness and perception of sleeping problems in the general population due to national public and private education on sleep disorders; however, it is interesting that it appears to have had a limited effect on physician consultation rates or prescriptions. Although cultural factors are likely to influence responses, the prevalence in the USA obtained in this study does not differ substantially from the findings of previous surveys, in which approximately a third to one-half of respondents reported sleep disturbances. The 2002 National Sleep Foundation poll reported that 58% of adults said that they had at least one symptom of insomnia at least a few times per week. However, these people did not necessarily experience daytime sleepiness as a consequence of their insomnia. The higher prevalence in the Japanese population in this study compared with the previous survey may be linked to the inclusion of individuals aged ≥65 years in the Japanese sample in this study (who were not included in the previous sample). The prevalence of sleep problems obtained in the present survey is also consistent with the findings of a previous epidemiological study including 3030 participants recruited throughout Japan[12]. In Western Europe, there has only been a limited change in the prevalence of insomnia between this survey and the previous one and the frequency of sleep disorders and insomnia found in this study are similar to those reported in previous epidemiological studies carried out in Western Europe (19–25% for sleep disorders, 9–12% for severe insomnia)[6,10,31].

The distribution of sleep problems according to age varied between regions; in Japan, but not in Western Europe and in the USA, respondents aged ≥65 years experienced a high prevalence of problems. This is not consistent with previous studies which regularly found higher percentages of sleep problems in the elderly. We have no explanation for this unusual result. Conversely the fact that more females than males reported sleep problems is consistent with previous studies investigating the epidemiology of sleep disorders[5–10,32].

The most frequently reported sleep problem varied according to region: in Japan, sleep induction was the most prevalent problem, as was found by Doi *et al.*[29],

Table 3. *Chi-squared analysis showing statistically significant demographic or behavioral characteristics of individuals who are prescribed a medical treatment for their sleep problems*

	USA	Western Europe	Japan
Age ≥65 years	✓		
Female	✓	✓	
Have an occupation			✓
Have difficulty falling asleep	✓	✓	
Experience night-time awakenings			✓
Experience several sleep symptoms	✓	✓	✓
Experienced an evolution in sleep problems		✓	
Experienced a negative evolution in sleep problems	✓	✓	
Experienced a positive evolution in sleep problems			✓
Experience an impact on daily functioning	✓	✓	
Experienced problems as a consequence of insomnia	✓		✓
Have frequent and long-lasting sleep problems	✓	✓	
Consider their sleep problems to be chronic	✓	✓	✓
Experience comorbidities as a result of sleep problems	✓	✓	✓
Use sleep remedies frequently	✓	✓	
Use a non-prescribed medication	✓		
Use other means of medication			✓

while in Western Europe and the USA, more individuals had problems with sleep maintenance. Taken together, it is clear that the most prevalent global sleep problem is sleep maintenance, with 75 million people in the USA, 51 million people in Western Europe and 15 million people in Japan likely to report difficulties with sleep maintenance. The majority of respondents reported problems with more than one sleep parameter. Sleep problems changed in severity over time in just under half of participants in each region: in Western Europe and the USA, a considerable proportion of respondents considered that their sleep had deteriorated, while most Japanese respondents reported their sleep problems improving over time. Many factors may explain this change. One simple one is age, as we know that sleep quality decreases with age[33]. Potential differences in time spent in bed, which is strongly influenced by the regional culture and socioeconomic status of the population, might explain the variation in types of sleep problems that were reported by participants in this study from different countries. Environmental issues, transportation and security consideration may also have an influence on sleep[34]. We do not have enough sociocultural data in this study to explain why the development of a sleep disorder differs from one country to another. Interestingly, while most sleep problems may have changed in severity, they rarely changed in nature, with the predominant symptom remaining the same for most individuals.

One of the most interesting observations from this survey is the perception that many individuals have regarding the chronic nature of their sleeping problems. Almost half of respondents did not consider their symptoms to be chronic, despite having experienced them for a considerable length of time. This suggests that the perception of chronic status may be more linked to the frequency of the symptom rather than its duration, and possibly partially explains the under-reporting and under-treatment of these symptoms.

The relevance of cultural issues with regard to the concepts explored by the questionnaire, and also in the observed results are very interesting. Are the differences observed between countries only due to cultural habits and perception, or is it possible to say that the Japanese sleep better than people in other countries? It is particularly interesting to observe that when patients with insomnia are recognized in Japan, 90% are treated with a hypnotic. One hypothesis to explain the difference would be to imagine that sleep disorders are less frequent and better treated in Japan. Another would be that, taking account of cultural issues, the Japanese are less likely to report/complain of insomnia than Western Europeans or Americans, and are treated only if the complaints are severe (particularly if they impact on work ability).

Zammit and colleagues have previously shown that sleep problems impair ability to perform work and daily activities[21], as have several other studies[18,19]. In our study, chi-squared analysis found a number of common predictive factors for impairing ability to perform daily activities across the regions. These included experiencing several symptoms, experiencing symptoms frequently, and experiencing problems or comorbidities related to sleeping problems. In the USA and Western Europe, those who had impaired daily function were more likely to take a prescribed medication (hypnotic) or another means of resolving sleeping problems, whereas in Japan, individuals were more likely to take other kinds of medications. This difference may be due to the fact that Japanese physicians often prefer to use the terms 'sleep-inducing drug', or 'hypnotic tranquilizer' rather than 'hypnotic' when prescribing benzodiazepines or newer non-benzodiazepine hypnotics, because in Japan the term 'hypnotic' is associated with the older, relatively harmful hypnotic barbiturates.

Participants in the USA were more likely to report a disorder attributed to their sleeping problems, particularly fatigue or tiredness. Very few participants considered that they did not have any disorders associated with their sleeping problems. Stress and overwork were commonly associated with sleeping problems across all regions. In the USA, being overweight was a common association (as has been recently shown by Vorona *et al.*[35]), while nervousness and irritability was more pronounced in Western Europe. Japanese respondents were more likely to report that they did not have any associated comorbidity compared with respondents from Western Europe and the USA. This is possibly a function of different cultural and societal practices across regions. Individuals who experienced comorbidities were more frequently treated for their sleeping problems than those without comorbidities.

Importantly, and unsurprisingly, this study reinforces the findings of the previous survey[27] that show that sleep problems are under-reported and under-treated across all regions. Extrapolation to the general population highlights the level of under-treatment: 31.9 million (±0.9%), 49.1 million (±1.3%), and 8.2 million (±1.5%) people with sleep problems in Western Europe, the USA, and Japan, respectively, have never taken any steps to resolve their sleep problems and 49.6 million (±1.1%), 80.3 million (±1.5%), and 17.2 million (±2.1%) people with sleep problems have not taken a prescription drug for their sleeping problem in the past 12 months, respectively. The reasons for this have yet to be clearly established; however, previous studies have suggested that this might be attributed to the short duration of primary-care consultations, lack of recognition of sleep problems as a medical concern and lack of knowledge and understanding of available treatments[36–38]. Japanese respondents who did consult a physician regarding their sleep problems were considerably more likely to receive a

prescription medication than those in Western Europe or the USA. Those who experienced several sleep symptoms, who considered their problems to be chronic, or who experienced comorbidities as a result of sleep problems, were more likely to receive a drug prescription across all regions. Interestingly, those in Japan who experienced an improvement in their symptoms were more likely to have a prescription medication, whereas those in Western Europe and the USA who experienced a worsening were more likely to have a prescription medication for their sleep problems. This difference may be due to the time restriction of 28 days for the prescription of hypnotics in Western Europe which means that when sleep problems and comorbidities improve, physicians tend to limit the prescription.

As a result of the international scope of this project, the study had several limitations.

Different types of interviewing technique (internet, telephone or questionnaires via post) were used depending on the country and may impact the results obtained. We understand that these different techniques of interviewing people may deeply impact the responses of subjects and that it is a limitation of the study. However, these different techniques were used in an attempt to follow the cultural habits of each participating country and to try and match as closely as possible the usual conventions of interviewing people. Several comparative studies have also shown that using DC channel is low. When asking a respondent if they have difficulties falling asleep, the answer is similar by phone, by post, or by internet. However, if the DC channel is not adapted to the specific culture of each country, the risk of introducing a bias in the recruitment is high (particularly with an elderly population).

The authors are also conscious that interviewing people about sleep problems may substantially influence their answer on daytime correlates and functioning. It is, however, difficult to avoid this kind of bias in focused epidemiological studies.

We also understand that the translation of the questionnaire into different languages is a very difficult issue. Local questionnaires have been validated by sleep specialists and double-checked by the national poll institutes on the linguistic aspect. However we did not use the complete process of validating a questionnaire (translation forward and translation backward, use in pilot group...) and it is possible that this limitation had an impact on the differences found between countries.

Another issue is excluding subjects suffering from other sleep troubles from the survey. We are conscious that sleep apnea and restless legs syndrome are underdiagnosed and that people may not be conscious that their sleep disorders may be related to them. However this study was not based on objective measures of sleep, and it was not possible to avoid this bias.

The results of the five European countries were combined in this paper to aid the comprehension of the global results. We believe, however, that it would be of value in a future paper to show the differences between these culturally different countries in more detail.

Conclusions

In conclusion, this survey highlights the considerable burden of sleep problems across Europe, the USA and Japan, with sleep maintenance of particular concern to individuals in Western Europe and the USA and sleep induction a particular issue in Japan. Sleep problems continue to be under-reported and under-treated. While Japanese individuals who consult their physician about their sleeping problems generally receive a drug prescription, only half of those in Western European or the USA who consult their doctor are likely to receive a prescription, even if they complain about deterioration in their ability to perform daily activities. Primary care physicians may be the most effective means of diagnosing sleep problems in their patients and initiating the appropriate treatment strategy; however, greater education and provision of guidelines for primary care physicians may be required to ensure that this occurs.

Future research focusing on the impact of educating primary care physicians on the prevalence and severity of chronic insomnia would be of value.

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Declaration of interest: Dr Léger has served as a consultant to Sanofi-Aventis, Lundbeck, GSK and Takeda. Dr Poursain is a consultant for the pharmaceutical industry (several major pharmaceutical companies) as an expert in Market Research & Business Intelligence. Dr Neubauer has served as a consultant to Neurocrine Biosciences, Pfizer, Sanofi-Aventis and Takeda Pharmaceuticals. Dr Uchiyama is a medical expert for Takeda Pharmaceuticals, Astellas and Integrated Development Associates; and is a consultant for Banyu Pharmaceuticals.

All authors have participated in the design and the analysis of this study.

References

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4 edn. Washington, DC: American Psychiatric Association, 1994

2. Chesson A, Jr., Hartse K, Anderson WM, et al. Practice parameters for the evaluation of chronic insomnia. An American Academy of Sleep Medicine report. Standards of Practice Committee of the American Academy of Sleep Medicine. Sleep 2000;23:237-41
3. Insomnia: assessment and management in primary care. Sleep 1999;22(Suppl 2):S402-8
4. Edinger JD, Bonnet MH, Bootzin RR, et al. Derivation of research diagnostic criteria for insomnia: report of an American Academy of Sleep Medicine Work Group. Sleep 2004;27:1567-96
5. Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. Sleep Med Rev 2002;6:97-111
6. Ohayon MM. Prevalence and correlates of nonrestorative sleep complaints. Arch Intern Med 2005;165:35-41
7. Ohayon MM, Roth T. What are the contributing factors for insomnia in the general population? J Psychosom Res 2001;51:745-55
8. Ohayon MM, Smirne S. Prevalence and consequences of insomnia disorders in the general population of Italy. Sleep Med 2002;3:115-20
9. Ohayon MM, Zulley J. Correlates of global sleep dissatisfaction in the German population. Sleep 2001;24:780-7
10. Léger D, Guilleminault C, Dreyfus JP, et al. Prevalence of insomnia in a survey of 12,778 adults in France. J Sleep Res 2000;9:35-42
11. Kim K, Uchiyama M, Liu X, et al. Somatic and psychological complaints and their correlates with insomnia in the Japanese general population. Psychosom Med 2001;63:441-6
12. Kim K, Uchiyama M, Okawa M, et al. An epidemiological study of insomnia among the Japanese general population. Sleep 2000;23:41-7
13. Liu X, Uchiyama M, Kim K, et al. Sleep loss and daytime sleepiness in the general adult population of Japan. Psychiatry Res 2000;93:1-11
14. Taylor DJ, Lichstein KL, Durrence HH. Insomnia as a health risk factor. Behav Sleep Med 2003;1:227-47
15. Okuji Y, Matsuura M, Kawasaki N, et al. Prevalence of insomnia in various psychiatric diagnostic categories. Psychiatry Clin Neurosci 2002;56:239-40
16. Katz DA, McHorney CA. Clinical correlates of insomnia in patients with chronic illness. Arch Intern Med 1998;158:1099-107
17. Gander PH, Marshall NS, Harris RB, Reid P. Sleep, sleepiness and motor vehicle accidents: a national survey. Aust N Z J Public Health 2005;29:16-21
18. Léger D, Guilleminault C, Bader G, et al. Medical and socio-professional impact of insomnia. Sleep 2002;25:625-9
19. Metlaine A, Léger D, Choudat D. Socioeconomic impact of insomnia in working populations. Ind Health 2005;43:11-19
20. Baldwin CM, Griffith KA, Nieto FJ, et al. The association of sleep-disordered breathing and sleep symptoms with quality of life in the Sleep Heart Health Study. Sleep 2001;24:96-105
21. Zammit GK, Weiner J, Damato N, et al. Quality of life in people with insomnia. Sleep 1999;22(Suppl 2):S379-85
22. Léger D, Scheuermaier K, Philip P, et al. SF-36: evaluation of quality of life in severe and mild insomniacs compared with good sleepers. Psychosom Med 2001;63:49-55
23. Walsh JK, Engelhardt CL. The direct economic costs of insomnia in the United States for 1995. Sleep 1999;22(Suppl 2): S386-93
24. Léger D, Levy E, Paillard M. The direct costs of insomnia in France. Sleep 1999;22(Suppl 2):S394-401
25. Chilcott LA, Shapiro CM. The socioeconomic impact of insomnia. An overview. Pharmacoeconomics 1996;10 (Suppl 1):1-14
26. Estivill E. Behaviour of insomniacs and implication for their management. Sleep Med Rev 2002;6(Suppl 1): S3-6
27. Léger D, Poursain B. An international survey of insomnia: under-recognition and under-treatment of a polysymptomatic condition. Curr Med Res Opin 2005;21:1785-92
28. Guilleminault C, Powell NB, Martinez S, et al. Preliminary observations on the effects of sleep time in a sleep restriction paradigm. Sleep Med 2003;4:177-84
29. Doi Y, Minowa M, Okawa M, Uchiyama M. Prevalence of sleep disturbance and hypnotic medication use in relation to sociodemographic factors in the general Japanese adult population. J Epidemiol 2000;10:79-86
30. Kaneita Y, Ohida T, Osaki Y, Tanihata T, Minowa M, Suzuki K, Wada K, Kanda H, Hayashi K. Insomnia among Japanese adolescents: a nationwide representative survey. Sleep. 2006;29:1543-50
31. Chevalier H, Los F, Boichut D, et al. Evaluation of severe insomnia in the general population: results of a European multinational survey. J Psychopharmacol 1999;13(4 Suppl 1): S21-4)
32. Kawada T, Yosiaki S, Yasuo K, Suzuki S. Population study on the prevalence of insomnia and insomnia-related factors among Japanese women. Sleep Med 2003;4:563-7
33. Wolkove N, Elkholy O, Baltzan M, Palayew M. Sleep and aging 2: Management of sleep disorders in older people. CMAJ 2007;176:1449-54
34. Rashke F. Arousals and aircraft noise - environmental disorders of sleep and health in terms of sleep medicine. Noise Health 2004;6:15-26
35. Vorona RD, Winn MP, Babineau TW, et al. Overweight and obese patients in a primary care population report less sleep than patients with a normal body mass index. Arch Intern Med 2005;165:25-30
36. Neubauer DN. Insomnia. Prim Care 2005;32:375-88
37. Doghramji PP. Recognizing sleep disorders in a primary care setting. J Clin Psychiatry 2004;65(Suppl 16):23-6
38. Billiard M, Bentley A. Is insomnia best categorized as a symptom or a disease? Sleep Med 2004;5(Suppl 1):S35-40

Appendix

A detailed description of the questionnaire used for this study is available as electronic supplementary data (doi:10.1185/030079908X253825) published with the online version of this article.

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