J Occup Health 2005; 47: 384–390

Journal of Occupational Health

Association of Sleep Quality and Free Time Leisure Activities in Japanese and British Civil Servants

Ali NASERMOADDELI[1], Michikazu SEKINE[1], Meena KUMARI[2], Tarani CHANDOLA[2], Michael MARMOT[2] and Sadanobu KAGAMIMORI[1]

[1]Department of Welfare Promotion and Epidemiology, Toyama Medical and Pharmaceutical University, Japan and [2]International Centre for Health and Society, Department of Epidemiology and Public Health, University College London, U. K.

Abstract: Association of Sleep Quality and Free Time Leisure Activities in Japanese and British Civil Servants: Ali NASERMOADDELI, *et al*. Department of Welfare Promotion and Epidemiology, Toyama Medical and Pharmaceutical University—Sleep disturbance as a pervasive health problem can directly affect the physical and psychological well-being of individuals. Factors that positively relate to sleep quality can therefore improve healthy functioning. We examined whether leisure time activities are associated with sleep quality in two culturally different samples of civil servants. In this cross-sectional study we evaluated 1,682 Japanese, in Toyama prefecture (T) city, and 6,914 British civil servants from the Whitehall II study undertaken in London. The Japanese version of Pittsburgh sleep quality index (PSQI-J) was used in T city and Jenkins' sleep problem scale was used in the Whitehall II study. Setting a validated cut-off point of 5.5 for the PSQI-J global score and the upper tertile point for the Jenkins' sleep problem scale, we conducted logistic regression analysis to assess the association between leisure time activities and sleep quality. In both populations, those who participated in voluntary activities in clubs or organizations were significantly less likely to have poor sleep quality with Odds ratios (OR) and 95% confidence intervals (95%CI) of 0.73 (95%CI; 0.56–0.97) and 0.85 (95%CI; 0.76–0.95) in Japanese and British civil servants, respectively. Similar findings were apparent for visiting friends and relatives (ORs 0.60 (95%CI; 0.46–0.80) and 0.71 (95%CI; 0.56–0.90) for Japanese and British subjects, respectively). Our findings suggest that engagement in social leisure activities is associated with better sleep quality and consequently better general well-being.
(J Occup Health 2005; 47: 384–390)

Key words: Sleep quality, Leisure time activities, Whitehall II study, Japan

Received Aug 6, 2004; Accepted May 30, 2005
Correspondence to: A. Nasermoaddeli, Department of Welfare Promotion and Epidemiology, Faculty of Medicine, Toyama Medical and Pharmaceutical University, 2630 Sugitani, Toyama 930-0194, Japan (e-mail: moaddeli@ms.toyama-mpu.ac.jp)

Investigations into the determinants of poor sleep quality are important for two major reasons. First, complaints about sleep quality are common and second, poor sleep quality can be an important symptom of many medical disorders. Sleep problems usually take one or more of the following forms: delay of sleep onset, difficulty staying asleep, or awakening too early. Inadequate quantity and quality of sleep have long been observed to be concomitants of a variety of clinical medical and psychiatric conditions. Poor sleep is prospectively associated with an increased risk of myocardial infarction, particularly when combined with increasing resting heart rate[1)]. Poor sleep is also prospectively related to fatal accidents at work and accident risk is considerably increased in relation to irregular work hours[2)]. Good sleep quality has been associated with better physical health[3, 4)] and greater psychological well-being[5, 6)]. Therefore, factors that affect sleep quality could also influence the general well-being of individuals.

Daily life pattern contains both positive and negative constructs which affect physical and psychological well-being: job stress, effort-reward imbalance, social support, social/leisure activities, family-work interface and personal health behaviors.

In this study we assessed whether participating in different leisure or free time activities was associated with sleep quality in two populations of civil servants. Two epidemiological scales for measuring sleep, the Jenkins sleep problems scale[7)] and the Pittsburgh sleep quality

index[8], were developed to discriminate between good and poor sleepers and to provide a clinically useful assessment of a variety of sleep disturbances that might affect sleep quality.

We assumed that since leisure time activities are culturally specific, external validity of the results could be better interpreted if the study were based on data derived from populations with distinct cultures. In this regard we assessed the association in the two different societies of Japanese and British civil servants.

Methods

Subjects

In this cross-sectional study we evaluated 2,080 civil servants working in departments related to the municipality of T city in Toyama Prefecture, Japan, in the spring of 2001. The response rate was 78.3% as 1,628 participants filled in the questionnaire.

We divided the civil servants into four groups based on the classification system used in the national census (1995): 1) Administrative 2) Professional 3) Clerical and 4) Protective, Transportation and Telecommunication service workers who we put into the Office Support category. We also stratified the age of the participants into five groups: 29 or younger, 30–39, 40–49, 50–59 and 60 yr or older. This study was in collaboration with the Whitehall II study[9] which was set up to investigate the degree and causes of the social gradient in morbidity and mortality in a cohort of civil servants in London. From the Whitehall II civil servants, 6,873 (66.7%) subjects (phase 5, 1997) for whom we had complete information on sleep problem scores were entered into the analysis. For the Whitehall II data socio-economic status of subjects was determined by grade of employment of subjects. Grade of employment was obtained by asking all participants to give their civil service grade title. On the basis of salary 6 grade categories were assigned. Category one represents the highest status jobs and category 6 the lowest. Full details of the screening examination for the Whitehall II study are reported elsewhere[9].

Income data were not accessible for the participants in the T city study, and therefore employment categories are reported as the socio-economic status.

Participants were informed that by answering and returning the questionnaires, they would be giving us their informed consent on data analysis.

Questionnaire

We used the Japanese version of the Pittsburgh Sleep Quality index (PSQI-J)[10]. The PSQI is a self-administered questionnaire, which assesses subjective sleep quality during the previous month. The PSQI generates 7 components (range of score 0–3): sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. The sum of these seven component scores produces one global score of subjective sleep quality. The mean ± standard deviation (SD) for PSQI-J global score was 4.98 ± 2.78. Higher scores indicate poorer sleep quality. Doi[11] reported that a global PSQI-J score of 5.5 provides an optimal cut-off point of sensitivity and specificity for subjective sleep quality in both groups of psychiatric disordered and control Japanese subjects. The cut-off of 5.5 for PSQI-J was the upper tertile point in the distribution of PSQI-J global score.

Jenkins' sleep problem scale was used in the Whitehall II study. This questionnaire asks how many times during the last month the subject had experienced any of the following; (1) "trouble falling asleep," (2) "trouble staying asleep (i.e. wake up far too soon and can't get back to sleep)" (3) "waking up several times per night" (4) "waking up after your usual amount of sleep feeling tired and worn out." The following six response categories were available for each question: Not at all, 1–3 days, 4–7 days, 8–14 days, 15–21 days and 22–31 days. Responses were then coded on a 1–6 scale (not at all=1). All items were equally weighted and summed. The mean ± SD for Jenkins' score was 9.12 ± 4.43. Higher scores indicate more sleep problems. We differentiated poor and good sleepers by the upper tertile score, which was almost the same percentile of poor and good sleepers differentiated by the cut-off point of 5.5 in the Japanese sample.

We asked the participants about the type of leisure activities they were involved in during their spare time for a period of 12 months prior to survey by means of the following items: 1) Having a hobby in general, 2) Reading, 3) Sightseeing and traveling, 4) Visiting and chatting with friends or relatives, 5) Pachinko (a slot machine) game, 6) Karaoke bar and 7) Participating in voluntary activities in the Japanese population; and 1) Religious activities, 2) Involvement in clubs and organizations, voluntary or official, 3) Courses and education, 4) Cultural visits to stately homes, galleries, theatres, cinema or live music events, 5) Social indoor games, cards, bingo, chess etc., 6) Visiting friends and relatives, 7) Going to pubs and social clubs, 8) Individual occupations, e.g. reading, listening to music, 9) Household tasks e.g. maintenance, decorating, 10) Practical activities, making things with your hands e.g. pottery, drawing etc., 11) Gardening and 12) Using a home computer for leisure in the British population.

We also created a summary score for leisure activities, based on one created previously in the Whitehall II study[12], in both populations. The summary scores were classified as being social leisure activities, if they entailed engagement with others, if not they were classified as individual leisure activities. Therefore, items 2, 4–7) for

the Whitehall II study and items 3, 4, 7) for the T city study were regarded as social leisure activities, while items 1, 3, 8–12) for the Whitehall II study and items 2, 5, 6) for the T city study were regarded as individual leisure activities. We scored Yes=1 and No=0 for participating or not participating in each leisure activity. The scores were then summed and the final scores were divided into tertiles (low, moderate and high) for each scale to show whether there was a dose-response relationship with the sleep quality.

Statistical analysis

We conducted logistic regression analysis to determine the odds ratios (ORs) and 95% confidence interval (95%CI) of sleep quality in association with participation in each leisure time activity. Age, sex and occupational category or grade, were assumed as confounders for multivariate analysis. ORs higher than one indicate more problems with sleep. Goodness of fit was assessed with the Hosmer-Lemeshow test[13]. For the analysis of summary scores, sleep quality scores in the both study populations were handled as a continuous variable. Using a general linear model we checked the differences in the mean scores of low, moderate and high levels of social or individual leisure activities. This model gave us the ability to test an interaction term between social and individual leisure activities. All statistical tests were two-sided. The data were analyzed with SPSS (version 8.0.1J).

Results

Cronbach's alpha for the PSQI-J in the Japanese sample was 0.64 and for the Jenkins' sleep problem scale in British sample was 0.77.

Distributions for basic characteristics (sex, age and employment category or grade) in the two populations of study are presented in Table 1. The proportion of female civil servants was larger in the T city study (44.6%) than that in the Whitehall II study (29.2%). However, the majority of participants in both studies were aged over 40 (mean age of the participants was 46.8 ± 8.87 for the Japanese civil servants, and was 55.9 ± 6.03 for the British civil servants).

ORs (95%CI) of poor sleep quality by age, sex and employment category of civil servants are shown in Table 2. In both populations females were more likely to have poor sleep quality than males. ORs for multivariate logistic regression analysis were 1.28 (95%CI: 1.03–1.59) for Japanese and 1.61 (95%CI: 1.42–1.81) for British civil servants. Compared to the Administrative group, other categories of Japanese civil servants were more likely to have poor sleep quality but this social gradient was not apparent for the Whitehall II participants after multivariate analysis following adjustment for sex and age of the participants. Sleep disturbance was not associated with employment grade if analyzed separately for men and women.

Results from Tables 3 and 4 indicate that in both populations, visiting friends and relatives and participating in voluntary activities were associated with reporting fewer problems with sleep (OR=0.60; 95%CI: 0.46–0.80 and OR=0.71; 95%CI: 0.56–0.90 for visiting friends and relatives while OR=0.73; 95%CI: 0.56–0.97 and OR=0.85; 95%CI: 0.76–0.95 for practicing voluntary activities in clubs or organizations in Japanese and British civil servants, respectively). The other measures of leisure activity were not associated with sleep problems.

In Figure 1, the estimated mean sleep quality scores across the three categories of social and individual leisure activities are shown. These means were adjusted for age, sex and employment grade or category. The interaction terms between individual and social leisure activities were not significant in both study populations. Although a dose-response relationship was seen for individual leisure activities, the differences were not significant. In both populations being in the lowest tertile of practicing social leisure activities was related to poorer sleep quality. The Jenkins' sleep problem scale and PSQI-J scores were 6% and 7% lower for those in the lowest tertile of practicing social leisure activities compared to the highest tertile, in the Whitehall II study and the T city study, respectively.

Table 1. Number (percentage) of participants in Japanese and British civil servants studies

	T city	Whitehall
Sex		
Male	902 (55.4)	4,866 (70.8)
Female	726 (44.6)	2,007 (29.2)
Age		
–29	143 (8.8)	–
30–39	101 (6.2)	–
40–49	733 (45.1)	1,389 (20.2)
50–59	631 (38.7)	3,430 (49.9)
60–	20 (1.2)	2,054 (29.9)
Employment Category		
Administrative	137 (8.4)	–
Professional	492 (30.2)	–
Clerical	673 (41.3)	–
Office Support	326 (20.1)	–
Employment Grade		
1 (High)	–	1,413 (20.6)
2	–	1,528 (22.2)
3	–	953 (13.9)
4	–	1,144 (16.6)
5	–	917 (13.3)
6 (Low)	–	918 (13.4)

Table 2. Odds ratios (95% confidence interval) of poor sleep quality by sex, age and employment (category or grade) in Japanese and British civil servants

	T city		Whitehall	
	Univariate Odds ratio (95%CI)	Multivariate* Odds ratio (95%CI)	Univariate Odds ratio (95%CI)	Mutlivariate* Odds ratio (95%CI)
Sex				
Male	1	1	1	1
Female	1.32 (1.08–1.62)	1.28 (1.03–1.59)	1.62 (1.45–1.81)	1.61 (1.42–1.81)
Age				
–29	1.05 (0.73–1.51)	0.84 (0.56–1.26)	–	–
30–39	1.19 (0.78–1.81)	1.17 (0.75–1.80)	–	–
40–49	1	1	1	1
50–59	0.77 (0.61–0.96)	0.83 (0.65–1.06)	0.99 (0.86–1.13)	0.98 (0.85–1.12)
60–	1.03 (0.41–2.54)	0.84 (0.32–2.22)	0.88 (0.76–1.02)	0.86 (0.74–1.00)
Employment Category				
Administrative	1	1	–	–
Professional	1.78 (1.15–2.75)	1.66 (1.05–2.63)	–	–
Clerical	1.94 (1.27–2.96)	1.71 (1.07–2.74)	–	–
Office support	1.67 (1.06–2.64)	1.65 (1.03–2.64)	–	–
Grade				
1 (High)	–	–	1	1
2	–	–	1.05 (0.89–1.23)	1.02 (0.87–1.20)
3	–	–	1.13 (0.94–1.35)	1.09 (0.91–1.31)
4	–	–	1.28 (1.08–1.52)	1.17 (0.98–1.39)
5	–	–	1.42 (1.18–1.69)	1.17 (0.97–1.41)
6 (Low)	–	–	1.27 (1.06–1.52)	0.95 (0.78–1.15)

*Adjusted for the other two variables in the table.

Table 3. Associations of poor sleep quality and leisure time activities in T city study, 2001

	Number Yes: No	Univariate Odds ratio (95%CI)	Multivariate* Odds ratio (95%CI)
1) Having a hobby in general	1,053:564	0.74 (0.60–0.91)	0.76 (0.60–0.95)
2) Reading	923:708	1.01 (0.82–1.23)	1.09 (0.96–1.24)
3) Sightseeing and traveling	1,208:423	0.77 (0.61–0.96)	0.69 (0.54–0.88)
4) Visiting and chatting with friends or relatives	1,312:312	0.71 (0.55–0.91)	0.60 (0.46–0.80)
5) Pachinko game	274:1,360	1.00 (0.76–1.31)	1.09 (0.80–1.48)
6) Karaoke bar	371:1,254	0.81 (0.63–1.03)	0.78 (0.60–1.02)
7) Voluntary practices	366:1,254	0.68 (0.53–0.87)	0.73 (0.56–0.97)

*Adjusted for age, sex and employment category.

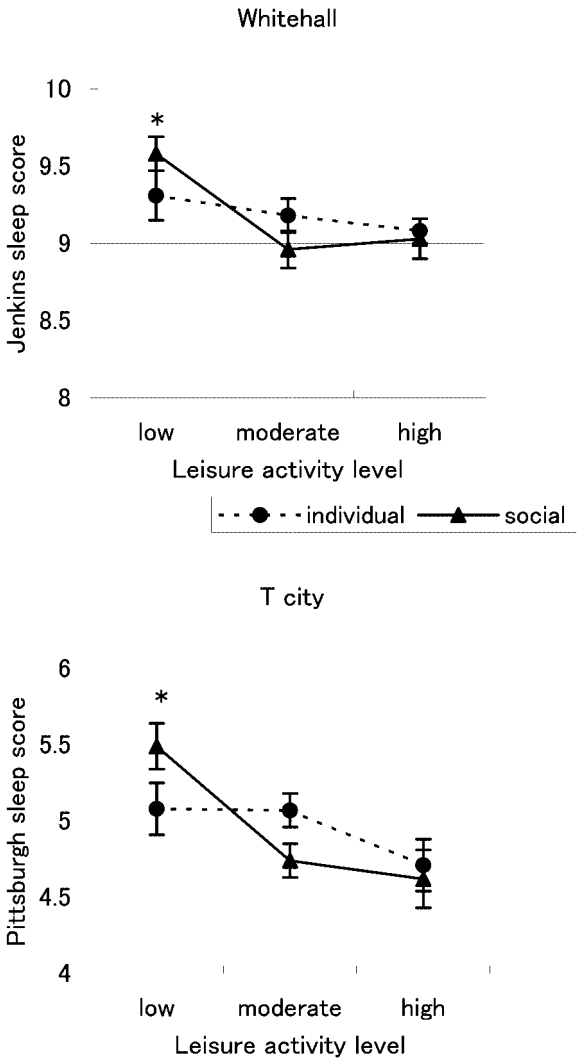
Discussion

The present study describes subjective sleep quality from a cross-sectional study of individuals with relatively stable jobs from two different cultural backgrounds. Since the sleep measurement tools were different in the two populations, we decided to compare intrapopulation differences rather than interpopulation differences to explore common findings. Our findings suggest that there is a social gradient in sleep problems in Japanese Civil servants, but not in British Civil servants. However, despite these differences in the social gradients in sleep

Table 4. Associations of poor sleep quality and leisure time activities in Whitehall II study, phase 5, 1997

	Number Yes: No	Univariate Odds ratio (95%CI)	Multivariate* Odds ratio (95%CI)
1) Religious activities	2,297:4,473	0.99 (0.89–1.10)	0.99 (0.88–1.10)
2) Clubs and organizations voluntary or official	2,968:3,806	0.81 (0.73–0.90)	0.85 (0.76–0.95)
3) Courses and education	1,293:5,381	0.91 (0.79–1.04)	0.87 (0.76–1.00)
4) Visiting cultural places	5,324:1,405	0.92 (0.81–1.05)	0.96 (0.84–1.10)
5) Social indoor games	1,791:4,965	0.87 (0.77–0.98)	0.89 (0.79–1.00)
6) Visiting friends and relatives	6,347:312	0.72 (0.57–0.92)	0.71 (0.56–0.90)
7) Going to pubs and social clubs	3,703:2,954	0.90 (0.81–1.00)	0.96 (0.86–1.07)
8) Reading, listening to music	6,513:264	0.86 (0.66–1.12)	0.83 (0.64–1.08)
9) Household tasks	5,112:1,651	0.76 (0.67–0.85)	0.90 (0.79–1.02)
10) Practical activities and making things by hand	2,048:4,700	0.98 (0.88–1.10)	0.95 (0.84–1.06)
11) Gardening	5,507:1,253	0.85 (0.74–0.97)	0.91 (0.79–1.04)
12) Using a home computer	2,631:4,171	0.82 (0.74–0.92)	0.89 (0.80–1.00)

*Adjusted for age, sex and grade of employment.



problems, we do find that increased social leisure activities are associated with decreased sleep problems in both groups. In both populations being in the moderate to high social leisure activity group resulted in better sleep quality.

Previously, studies have suggested that 'activity' is related to improvements in sleep quality. These activities range from exercise participation[14] (which suggest physiological mechanisms connecting exercise with increased sleep need)[15] to recreational[16] and social[17] activities. Our findings support the notion that social leisure activities, that are not necessarily associated with increased physical activity, are related to improvements in sleep quality.

Potential mechanisms by which social leisure activities might improve sleep quality could be through their contribution to mood and well-being. For example, it has been shown that passive engagement in stimulating daytime activities can significantly affect both sleep architecture and need for sleep[18]. The present author previously reported from the same population of Japanese civil servants that psychological stress at work is related to sleep quality and this effect is moderated by sense of coherence (SOC)[19]. The strength of one's SOC is shaped by three kinds of life experiences: consistency, underload-overload balance, and participation in socially valued decision making[20]. Based on these results it was concluded that exposure to an enriched environment,

Fig. 1. Estimated mean ± SE for sleep quality score by the level of leisure activities. *p<0.05: Low social activity in comparison with moderate and high activity levels. Note: Higher scores indicate poorer sleep quality.

defined as a combination of more opportunities for learning and social interaction, in addition to physical activity, might produce a host of structural and functional changes that lead to changes in sleep problems.

While significant associations were found between specific sorts of leisure activities and sleep quality, due to the cross-sectional nature of the analysis we cannot discern from these data the temporal order or causal direction of these relationships. In this regard there is also room to argue that poor sleep quality is the cause of low mood and therefore participating in fewer social leisure activities, but there is a growing body of knowledge to support the idea that engaging in meaningful and productive activities is a key component in promoting health in later life[21–24]. Nakanishi[25] also reported from a prospective community-residing sample of elderly people that discontinuing or not participating in social activities were associated with higher mortality rates in comparison to those who continued to participate, after controlling for changes in disability.

The role of depression in mediating some of the relationships we observe needs to be considered. Although with mild to moderate depression there has been a reported disturbance in leisure time activities[26], the relationship is not necessarily one-way. Findings from a longitudinal study on a sample of the Finnish population aged 60 yr or over showed that having poor emotional relations predicted depression within five years among initially non-depressed men[27]. In the Whitehall II study we found that leisure activities remained associated with sleep disturbance following adjustment for General Health Questionnaire caseness for depressive mood, suggesting that not all of the relation of social activities to sleep disturbance is attributable to psychological distress (results not shown). We have not examined other measures of mood or well being that may mediate these associations.

Higher likeliness of poor sleep quality in female civil servants in both populations may point to the burden of psychological stress at work and family responsibilities in the hours after work. In comparison to the Administrative group other employment categories were more likely to have poor sleep quality in both univariate and multivariate analysis in the Japanese sample, which suggests that socioeconomic circumstances should be taken into consideration as a factor that influences sleep quality. Among the Whitehall II participants we also observed an association between lower grade of employment and poor sleep quality in a univariate analysis, but the significant association disappeared when the strong confounder of gender entered the model. These findings for British civil servants are in concordance with what Moore[28] reported on a community sample of 1,139 working Americans in which higher income was associated with better sleep quality.

The strengths and limitations of our study need to be considered. We have shown in two large samples that leisure activities are related to sleep quality. However, the scales used to assess sleep quality were different. Our findings indicate that, despite this mismatch we see associations in both populations suggesting that it is the 'common' aspects of sleep disturbance captured by both scales that are associated with leisure activities. In the present study there is no information on the frequency of the practice of each leisure activity, but the results for the summary scores make us believe that cumulative social leisure activities are important for better sleep quality. Additionally, as discussed our analyses are cross-sectional and thus require the collection of longitudinal data to dissect the temporal nature of the associations with precision.

In conclusion, this cross-cultural report highlights the importance of social leisure activities and their associations with sleep quality and sleep related problems. These findings have important health promotion implications.

Acknowledgments: The authors are very grateful to all participating civil servants in the Whitehall II study and in T city in Toyama Prefecture, Japan. We thank all the study team and in particular Yoriko Yoshida for data collection and clerical support. We also thank all participating civil service departments and their welfare, personnel and establishment officers; the Occupational Health and Safety Agency; the Council of Civil Service Unions; and all members of the Whitehall II study team.

The T city study was partially supported by a Grant-in-aid for Scientific Research (B) (grant No. 11470104) from the Japanese Ministry of Education, Culture, Sports, Science and Technology. The Whitehall II study was supported by grants from the Medical Research Council; British Heart Foundation; Health and Safety Executive; Department of Health; National Heart Lung and Blood Institute (HL36310), US, NIH: National Institute on Aging (AG13196), US, NIH; Agency for Health Care Policy Research (HS06516); and the John D and Catherine T MacArthur Foundation Research Networks on Successful Midlife Development and Socio-economic Status and Health. MM is supported by an MRC Research Professorship.

References

1) P Nilsson, JA Nilsson, B Hedblad and G Berglund: Sleep disturbances in association with elevated pulse rate for the prediction of mortality—consequences of mental strain. J Inter Med 250, 521–529 (2001)
2) T Akerstedt, P Fredlund, M Gillberg and B Jansson: A prospective study of fatal occupational accidents-relationship to sleeping difficulties and occupational factors. J Sleep Res 11, 69–71 (2002)
3) J Barton, E Spelten, P Totterdell and L Smith: Is there

an optimum number of night shifts? Relationship between sleep, health and well-being. Work Stress 9, 109–123 (1995)
4) DS Lewin and RE Dahl: Importance of sleep in the management of pediatric pain. Dev Behav Pediatr 20, 244–252 (1999)
5) JL Shaver and VM Paulsen: Sleep, psychological distress, and somatic symptoms in perimenopausal women. Fam Pract Res J 13, 373–384 (1993)
6) NG Bliwise: Factors related to sleep quality in healthy elderly women. Psychol Aging 7, 83–88 (1992)
7) CD Jenkins, BA Stanton, SJ Niemcryk and RM Rose: A scale for the estimation of sleep problems in clinical research. J Clin Epidemiol 41, 313–321 (1988)
8) DJ Buysse, CF Reynolds III, TH Monk, SR Berman and DJ Kupfer: The pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res 28, 193–213 (1989)
9) MG Marmot, GD Smith, S Stansfeld, C Patel, F North, J Head, I White, E Brunner and A Feeney: Health inequalities among British civil servants: the Whitehall II study. Lancet 337, 1387–1393 (1991)
10) Y Doi, M Minowa, M Okawa and M Uchiyama: Development of the Japanese version of the Pittsburgh Sleep Quality Index. Jpn J Psychiatr Treat (Seishinka Chiryogaku) 13, 755–763 (1998) (in Japanese)
11) Y Doi, M Minowa, M Uchiyama, M Okawa, K Kim, K Shibui and Y Kamei: Psychometric assessment of subjective sleep quality using the Japanese version of the Pittsburgh sleep quality index (PSQI-J) in psychiatric disordered and control subjects. Psychiatry Res 97, 165–172 (2000)
12) A Singh-Manoux, M Richards and M Marmot: Leisure activities and cognitive function in middle age: evidence from the Whitehall II study. J Epidemiol Community Health 57, 907–913 (2003)
13) Hosmer DW and Lemeshow S. Applied logistic regression. New York, John Wiley & Sons, 1989.
14) DL Sherrill, K Kotchou and SF Quan: Association of physical activity and human sleep disorders. Arch Int Med 158, 1894–1898 (1998)
15) HS Driver and SR Taylor: Exercise and sleep. Sleep Med Rev 4, 387–402 (2000)
16) E Jansen, O Dehlin, B Hagberg and G Samuelsson: Insomnia in an 80 year old population: relationship to medical, psychological and social factors. J Sleep Res 7, 183–189 (2001)
17) E Habte-Gabr, RB Wallace, PL Colsher, JR Hulbert, LR White and IM Smith: Sleep patterns in rural elders: demographic, health and psychobehavioural correlates. J Clin Epidemiol 44, 5–13 (1991)
18) JA Horne and A Minard: Sleep and sleepiness following a behaviourally active day. Ergonomics 18, 567–575 (1985)
19) A Nasermoaddeli, M Sekine, S Hamanishi and S Kagamimori: Job strain and sleep quality in Japanese civil servants with special reference to sense of coherence. J Occup Health 44, 337–342 (2002)
20) A Antonovsky: The salutogenic model as a theory to guide health promotion. Health Promot Internation 11, 11–18 (1996)
21) JS House, KR Landis and D Umberson: Social relationships and health. Science 241, 540–545 (1988)
22) K Avlund, MT Damsgaard and BE Holstein: Social relations and mortality. An eleven year follow-up study of 70-year-old men and women in Denmark. Soc Sci Med 47, 635–643 (1998)
23) C Lennartsson and M Silverstein: Does engagement with life enhance survival of elderly people in Sweden? The role of social and leisure activities. J Gerontol B Psychol Sci Soc Sci 56, S335–342 (2001)
24) R Lund, J Modvig, P Due and BE Holstein: Stability and change in structural social relations as predictor of mortality among elderly women and men. Eur J Epidemiol 16, 1087–1097 (2000)
25) N Nakanishi, H Fukuda and K Tatara: Changes in psychosocial conditions and eventual mortality in community-residing elderly people. J Epidemiol 13, 72–79 (2003)
26) G De Lisio, I Maremmani, G Perugi, GB Cassano, J Deltito and HS Akiskal: Impairment of work and leisure in depressed outpatients. A preliminary communication. J Affect Disord 10, 79–84 (1986)
27) SL Kivela: Depression and physical and social functioning in old age. Acta Psychiatr Scand Suppl 377, 73–76 (1994)
28) PJ Moore, NE Adler, DR Williams and JS Jackson: Socioeconomic status and health: The role of sleep. Psychosom Med 64, 337–344 (2002)