

Long working hours and sleep problems among public junior high school teachers in Japan

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Abstract: Long working hours and sleep problems among public junior high school teachers in Japan:

Akira BANNAI, et al. Department of Public Health, Hokkaido University Graduate School of Medicine—Objectives: Long working hours may impact human health. In Japan, teachers tend to work long hours. From 2002 to 2012, the number of leaves of absence due to diseases other than mental disorders, or mental disorders among public school teachers increased by 1.3 times (from 2,616 to 3,381), or 1.8 times (from 2,687 to 4,960), respectively. The present study aimed to investigate the association between long working hours and sleep problems among public school teachers. **Methods:** This cross-sectional study was conducted from mid-July to September 2013 in Hokkaido Prefecture, Japan. Questionnaires were distributed to 1,245 teachers in public junior high schools. Information about basic characteristics including working hours, and responses to the Pittsburgh Sleep Quality Index were collected anonymously. Multiple logistic regression analysis was used to calculate odds ratios (ORs) for the association between long working hours and sleep problems separately by sex. **Results:** The response rate was 44.8% (n=558). After excluding ineligible responses, the final sample comprised 515 teachers (335 males and 180 females). Sleep problems was identified in 41.5% of males and 44.4% of females. Our results showed a significantly increased risk of sleep problems in males working >60 hours per week (OR 2.05 [95% CI 1.01–4.30]) compared with those working ≤40 hours per week. No significant association was found in females. **Conclusions:** There is a significant association between long working hours and sleep problems in male teachers. Reducing working hours may contribute to a reduction in sleep problems. (J Occup Health 2015; 57: 457–464)

Key words: Occupational health, School teacher, Sex,

Sleep, Work time

Long working hours has been shown to have harmful effects on human health in previous studies¹. The 2007 International Labour Organization (ILO) report² estimated that worldwide, approximately 22.0% of workers worked more than 48 hours per week. This report also showed that in 2004–5, 17.7% of workers in Japan worked ≥49 hours per week. In 2010, this proportion increased to 23.1%, and it was 21.7% in 2013³. Regarding the association between long working hours and health, a recent systematic review¹ indicated that there is a robust association between long working hours and coronary heart disease, depressive state, anxiety, and sleep problems.

In Japan, chronic insomnia is common, with a prevalence of about 20%⁴. It is noteworthy that this has a higher prevalence than depression, which has a lifetime prevalence of 3–7% in Japan⁵. Previous meta-analyses found that sleep problems, including short sleep duration, is associated with increased risks of all-cause mortality⁶, cardiovascular diseases⁷, type 2 diabetes⁸, depression⁹, and obesity¹⁰. In addition, Doi *et al.*¹¹ reported that individuals taking sleep medication tended to have diabetes, gastroduodenal ulcer, heart disease, and hypertension compared with those not taking any sleep medication. These findings indicate that it is important to recognize that sleep problems is associated with many physical diseases.

A social issue coming to light in Japan is the increasing number of leaves of absence due to illness among school teachers. From 2002 to 2012, the total number of leaves of absence taken by public school teachers due to illness increased from 5,303 to 8,341^{12, 13}. Of these, the number of leaves of absence due to diseases other than mental disorders, or mental disorders increased by 1.3 times (from 2,616 to 3,381), or 1.8 times (from 2,687 to 4,960), respectively. School teachers in Japan tend to work long hours. Sakai¹⁴ reported results of a survey conducted in 2005 that indicated on average, school teachers worked 53.1 hours of overtime per month. The 2013 Teaching

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and Learning International Survey (TALIS) conducted by the Organisation for Economic Cooperation and Development (OECD) found that school teachers in Japan had the longest average working hours (53.9 hours per week) of the 34 participating countries and regions¹⁵.

Based on these facts, there is a need for a study that investigates the association between long working hours and sleep problems among school teachers. However, to the best of our knowledge, no study is found for school teachers that investigated the association between long working hours and sleep problems. Several previous studies have investigated this association among other groups of workers in Japan, such as civil servants¹⁶ and white-collar workers¹⁷. But, as these studies were conducted over a decade ago, the results may not reflect the current sleep conditions of workers, particularly as the number of patients with sleep disorders has been increasing in Japan each year¹⁸. Previously, we conducted a cross-sectional study that investigated the association between long working hours and psychological distress among public junior high school teachers in Japan¹⁹. The General Health Questionnaire-28 was used to assess psychological distress in that study; however, this questionnaire cannot evaluate sleep problems independently.

Therefore, the present study aimed to investigate the association between long working hours and sleep problems among public school teachers in Japan. We hypothesized that public school teachers working long hours may have sleep problems.

Subjects and Methods

Study design and participants

The present study used data from a cross-sectional study conducted in 2013 in Hokkaido Prefecture, an island located in the north of Japan¹⁹. The participants were public junior high school teachers working in Hokkaido Prefecture, excluding Sapporo City. Out of the total 8,873 teachers who worked in the 534 public junior high schools in the region, 1,245 teachers from 84 schools were invited to participate in this study. Teachers with no specific occupational position, or who did not engage in any distinctive jobs were eligible for participation. This meant that those in positions such as principal, vice-principal, chief teacher, lecturer, school nurse, or nutrition teacher were not eligible to participate in the study.

Selection of participants is described in detail in our previous study investigating the association between long working hours and psychological distress¹⁹. However, in brief, sample size with consideration of the predicted return rate was estimated at 1,200. Hokkaido Prefecture has 14 administra-

tive districts, and the sample size (1,200) was divided by the proportion of the total number of school teachers working in each of these districts. The Hokkaido Government Board of Education randomly selected public junior high schools from all 14 districts, and all teachers working in the selected schools were eligible for participation. The Board continued to select schools in each district until the number of teachers exceeded the number initially set.

A letter explaining the purpose of this study, a stamped return-addressed envelope, and self-administered questionnaires were distributed to all 1,245 teachers via the selected schools in mid-July 2013. Participation in this study was voluntary. Those agreeing to participate completed the questionnaires anonymously, and returned them by post. Teachers who returned the questionnaires were regarded as having provided consent. Data were collected until the end of September 2013. The study protocol was approved by the Ethics Committee of Hokkaido University Graduate School of Medicine.

Working hours and sleep problems

In the questionnaire, we inquired about the working hours of the participants with the following question: "In the month prior to the summer vacation of your students, how many hours on average in a week did you work, including work brought home?". The possible answers were ≤ 40 , >40 and ≤ 50 , >50 and ≤ 60 , or >60 hours per week. In this region, the summer vacation for junior high school students typically starts in late July and lasts until mid-August. Weekly contracted working hours for participants were 38.75 hours per week. The present study defined long working hours as >40 hours per week. Working hours included hours of work brought home, as participants with household duties might have to return home at regular closing hours, taking unfinished work with them.

The Japanese version of the Pittsburgh Sleep Quality Index (PSQ-I)^{20,21} was used to assess sleep problems in this study. The PSQ-I is a self-rated questionnaire consisting of 18 items asking about sleep status during the past one month. The 18 items were used to generate seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component was scored from 0 to 3, with the sum of these scores yielding a global score of the PSQ-I ranging from 0 to 21. Higher scores indicate severer sleep problems. The global scores of ≥ 5.5 were used as the cutoff point for sleep problems²¹. In this study, we also showed total sleeping time among participants from responses of the PSQ-I.

Other data collection

Data relating to personal background such as sex, age (20–29, 30–39, 40–49, or ≥ 50), marital status (married or others), and children living at home (yes or no), as well as socioeconomic status²²⁾ such as educational level (university/graduate school or others) and type of employment (regular or temporary) were collected.

Information about work-related factors were also gathered, including working patterns (working daytime hours on weekdays, working several hours per day on weekdays, or irregular working pattern), classes in the school (≤ 3 classes, 4–6 classes, or ≥ 7 classes), subjects led (general, special support, or others), and work experience in the current school (< 3 years or ≥ 3 years). Working patterns were used to exclude teachers working less than the contracted working time or working irregularly. The number of classes (maximum of 40 students per class) in the school was used to estimate the school size, and these categorizations were originally defined by the Hokkaido Government Board of Education. There are three grades in public junior high schools in Japan; three or fewer classes means that, at most, there is one class for each grade. General subjects included Japanese, social studies, mathematics, science, foreign languages, music, art, physical and health education, technical courses, and home economics. In Japan, more than half (62.0%) of the teachers who took leaves of absence owing to mental disorders in 2012 had less than 3 years of work experience in their school²³⁾, which may suggest that the number of years worked at the current school influences the sleep status of a teacher. Data about lifestyle factors were collected, such as exercise habits (≥ 2 days per week and ≥ 30 minutes per time) (yes, sometimes, or none), and having ≥ 5 hours per week of leisure time (yes or others).

Statistical analysis

First, we showed the descriptive statistics about the basic characteristics of the participants according to working hours, separately by sex. Second, age-adjusted and multivariate odds ratios (ORs) and 95% confidence intervals (95% CI) were calculated using multiple logistic regression analysis to investigate the association between long working hours and sleep problems. These analyses were conducted by sex, as previous studies^{16, 24)} and a meta-analysis²⁵⁾ indicated that females had a higher vulnerability for sleep problems than males. Participants working ≤ 40 hours per week were set as the reference category. We constructed two models. Model 1 was adjusted for age, marital status, children living at home, educational level, and type of employment; Model 2 was additionally adjusted for classes in the school, subjects

led, work experience in the current school, and exercise habits. Having leisure time was not used as a covariate but was regarded as an intervening variable. Tests for linear or quadratic trends were performed for the associations between the categories of working hours converted into continuous variables (0, 1, 2, 3) and sleep problems.

A two-tailed P-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using JMP Pro 11.0.0 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

A total of 558 questionnaires were returned, giving a response rate of 44.8%. We excluded responses from five school nurses and one teacher working irregularly as well as 34 participants with missing data on working hours, responses of the PSQ-I, sex, age, marital status, subjects led, or exercise habits. We also excluded three teachers without any subjects led. The final study sample comprised 515 teachers (335 males and 180 females) who worked daytime hours and did not have a shift work schedule. The total prevalence of sleep problems was 41.5% for males ($n=139$) and 44.4% for females ($n=80$).

Table 1 shows the characteristics of male and female participants by working hours. The prevalence of sleep problems in males working ≤ 40 hours per week was 34.0%, and it tended to increase as working hours increased. The highest prevalence of sleep problems for males was 47.4% in those working > 60 hours per week. For females, those working > 40 and ≤ 50 hours per week had the lowest prevalence of sleep problems (36.1%). However, females working ≤ 40 or > 60 hours per week showed a relatively similar high prevalence of sleep problems, with the prevalence of 50.0 and 51.5%, respectively.

Male teachers working > 40 hours per week were more likely to be young, to belong to large schools, to have a high educational level, and < 3 years of work experience in their current schools, and were less likely to have sleeping time and leisure time, compared with those working ≤ 40 hours per week. Female teachers working > 40 hours per week were more likely to have a high educational level and exercise habits, and to be regular workers, and less likely to have leisure time, compared with those working ≤ 40 hours per week.

Table 2 shows the association between long working hours and sleep problems by sex. Significant associations were found only in male participants. In the age-adjusted model, males working > 60 hours per week had a significantly increased risk of sleep problems compared with those working ≤ 40 hours per week (OR 1.98 [95% CI 1.01–4.00], p for linear

Table 1. Characteristics of male (n=335) and female (n=180) participants by working hours

Working hours (h/wk)	Male (n=335)				Female (n=180)			
	n	≤40 50	>40 and ≤50 44	>50 and ≤60 87	>60 154	≤40 16	>40 and ≤50 36	>50 and ≤60 60
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Sleep problems ^a	17 (34.0)	17 (38.6)	32 (36.8)	73 (47.4)	8 (50.0)	13 (36.1)	24 (40.0)	35 (51.5)
Sleeping time (h/d) (Mean ± SD)	6.5 ± 1.0	6.6 ± 0.8	6.3 ± 0.8	6.1 ± 0.9	6.1 ± 0.9	6.3 ± 1.1	6.1 ± 1.2	5.9 ± 0.9
Age (years)								
20–29	4 (8.0)	7 (15.9)	18 (20.7)	25 (16.2)	3 (18.8)	6 (16.7)	14 (23.3)	15 (22.1)
30–39	13 (26.0)	11 (25.0)	33 (37.9)	65 (42.2)	4 (25.0)	9 (25.0)	16 (26.7)	22 (32.3)
40–49	20 (40.0)	17 (38.6)	24 (27.6)	52 (33.8)	5 (31.2)	15 (41.6)	23 (38.3)	20 (29.4)
≥50	13 (26.0)	9 (20.5)	12 (13.8)	12 (7.8)	4 (25.0)	6 (16.7)	7 (11.7)	11 (16.2)
Marital status								
Married	38 (76.0)	29 (65.9)	60 (69.0)	109 (70.8)	7 (43.8)	22 (61.1)	23 (38.3)	28 (41.2)
Children living at home								
Yes	29 (58.0)	18 (40.9)	43 (49.4)	82 (53.2)	5 (31.3)	17 (47.2)	17 (28.3)	14 (20.6)
Educational level								
University/graduate school	48 (96.0)	42 (95.4)	86 (98.8)	153 (99.3)	8 (50.0)	27 (75.0)	52 (86.7)	57 (83.8)
Type of employment								
Regular worker	48 (96.0)	40 (90.9)	79 (90.8)	151 (98.0)	13 (81.2)	34 (94.4)	55 (91.7)	66 (97.1)
Classes in the school								
≤3 classes	8 (16.0)	5 (11.4)	11 (12.7)	9 (5.9)	2 (12.5)	8 (22.2)	6 (10.0)	6 (8.8)
4–6 classes	14 (28.0)	15 (34.1)	17 (19.5)	31 (20.1)	3 (18.8)	14 (38.9)	18 (30.0)	18 (26.5)
≥7 classes	28 (56.0)	24 (54.5)	59 (67.8)	114 (74.0)	11 (68.7)	14 (38.9)	36 (60.0)	44 (64.7)
Subjects led								
General ^b	37 (74.0)	33 (75.0)	62 (71.3)	131 (85.1)	9 (56.2)	22 (61.1)	40 (66.7)	41 (60.3)
Special support	4 (8.0)	7 (15.9)	14 (16.1)	9 (5.8)	2 (12.5)	3 (8.3)	8 (13.3)	10 (14.7)
Others ^c	9 (18.0)	4 (9.1)	11 (12.6)	14 (9.1)	5 (31.3)	11 (30.6)	12 (20.0)	17 (25.0)
Work experience in the current school								
<3 years	19 (38.0)	23 (52.3)	58 (66.7)	83 (53.9)	10 (62.5)	25 (69.4)	41 (68.3)	39 (57.3)
Exercise habits ^d								
Yes	17 (34.0)	16 (36.4)	32 (36.8)	61 (39.6)	2 (12.5)	6 (16.7)	12 (20.0)	14 (20.6)
Sometimes	21 (42.0)	15 (34.1)	40 (46.0)	66 (42.9)	2 (12.5)	11 (30.5)	18 (30.0)	17 (25.0)
None	12 (24.0)	13 (29.5)	15 (17.2)	27 (17.5)	12 (75.0)	19 (52.8)	30 (50.0)	37 (54.4)
Having ≥5 h/wk of leisure time								
Yes	25 (50.0)	14 (31.8)	39 (44.8)	56 (36.4)	9 (56.2)	12 (33.3)	30 (50.0)	25 (36.8)

h/d: hours per day; h/wk: hours per week. ^aSleep problems mean the global scores of the Pittsburgh Sleep Quality Index of ≥5.5. ^bGeneral subjects include Japanese, social studies, mathematics, science, foreign languages, music, art, physical and health education, technical courses, and home economics. ^cOthers mean teachers who led multiple subjects simultaneously. ^dExercise habits mean ≥2 days per week and ≥30 minutes per time.

trend=0.03). After adjusting for age, marital status, children living at home, educational level, and type of employment in Model 1, the risk of sleep problems among males working >60 hours per week was also significant compared with those working ≤40 hours per week (OR 2.01 [95% CI 1.02–4.10], *p* for linear trend=0.03). Even after adjusting for all potential covariates in Model 2, males working >60 hours per week still had a significantly increased risk of sleep problems compared with those working ≤40 hours per week (OR 2.05 [95% CI 1.01–4.30], *p* for linear trend=0.02). No significant results were found in female participants in all models including trend tests.

Discussion

This is the first study for school teachers that investigated the association between long working hours and sleep problems. Significant associations were found only in male participants.

Our findings for males in Table 2 were consistent with the conclusion of a previous review¹⁾ and previous cross-sectional studies that used the PSQ-I^{16, 17)}. Sekine *et al.*¹⁶⁾ found that male civil servants working >11 hours per day had a significantly increased risk of sleep problems compared with those working 7–9 hours per day. Nakashima *et al.*¹⁷⁾ also reported

Table 2. Odds ratios for the association between long working hours and sleep problems by sex (male n=335, female n=180). Results from the multiple logistic regression analysis

Working hours (h/wk)	Male (n=335)						Female (n=180)							
	n (Case ^c)	Age adjusted		Model 1 ^a		Model 2 ^b		n (Case ^c)	Age adjusted		Model 1 ^a		Model 2 ^b	
		OR	(95% CI)	OR	(95% CI)	OR	(95% CI)		OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
≤40	50 (17)	1.00		1.00		1.00		16 (8)	1.00		1.00		1.00	
>40 and ≤50	44 (17)	1.27	(0.54–2.98)	1.28	(0.54–3.04)	1.14	(0.47–2.77)	36 (13)	0.58	(0.17–1.96)	0.59	(0.16–2.11)	0.64	(0.17–2.45)
>50 and ≤60	87 (32)	1.26	(0.60–2.69)	1.29	(0.61–2.76)	1.20	(0.55–2.65)	60 (24)	0.72	(0.23–2.27)	0.73	(0.22–2.42)	0.65	(0.19–2.30)
>60	154 (73)	1.98	(1.01–4.00)	2.01	(1.02–4.10)	2.05	(1.01–4.30)	68 (35)	1.17	(0.38–3.62)	1.27	(0.39–4.21)	1.26	(0.37–4.40)
<i>p</i> for linear trend ^d			<i>p</i> =0.03		<i>p</i> =0.03		<i>p</i> =0.02			<i>p</i> =0.26		<i>p</i> =0.21		<i>p</i> =0.29
<i>p</i> for quadratic trend ^d			<i>p</i> =0.52		<i>p</i> =0.55		<i>p</i> =0.34			<i>p</i> =0.17		<i>p</i> =0.14		<i>p</i> =0.13

CI: confidence intervals, h/wk: hours per week, OR: odds ratio. ^aAdjusted for age (20–29, 30–39, 40–49, ≥50), marital status (married, others), children living at home (yes, no), educational level (university/graduate school, others), and type of employment (regular, temporary). ^bModel 1+ Additionally adjusted for classes in the school (≤3, 4–6, ≥7), subjects led (general, special support, others), work experience in the current school (<3 years, ≥3 years), and exercise habits (≥2 days per week and ≥30 minutes per time) (yes, sometimes, none). ^cCase means the global scores of the Pittsburgh Sleep Quality Index of ≥5.5. ^dThe trend tests were calculated for the associations between categories of working hours per week converted into continuous variables and sleep problems.

significantly increased risks among male white-collar workers working 50–62 or ≥63 hours of overtime per month compared with those working <26 hours of overtime per month.

Conversely, the present study found no significant association for females. This was inconsistent with the conclusion of a review¹⁾ and the results of Sekine *et al.*¹⁶⁾, which indicated a significantly increased risk of sleep problems among females working >11 hours per day compared with those working 7–9 hours per day. We inferred several possible reasons for these inconsistencies. One possible reason relates to the characteristics of females working ≤40 hours per week in our study, which were set as the reference category. Those working ≤40 hours per week were found to have the second highest prevalence of sleep problems among females. As shown in Table 1, they showed the lowest proportion of educational level above university and also had highest proportion of no exercise habits. These two characteristics are related to high prevalence of sleep problems, which may have affected the results of females. A second possible reason relates to shift workers; shift workers were not included in the present study but were included in a previous study¹⁶⁾. Shift work schedules have been identified as having detrimental effects on sleep²⁶⁾, meaning the presence of shift workers in a study sample may have influenced the results for females, even if appropriate adjustments were made in the statistical analyses. Finally, the relatively small number of female participants in the present study may not be representative of female teachers, thus contributing to the results being inconsistent.

Several possible explanations for the association between long working hours and sleep problems are inferred from previous studies. Jansen *et al.*²⁷⁾

showed that workers with long working hours need more time to recover from work-induced fatigue. However, long working hours reduces the amount of private time available to them, which may result in reduced sleeping time. Our findings support this explanation. From Table 1, sleeping time for males and females working ≤40 hours per week were 6.5 and 6.1 hours per day, respectively. However, both males and females working >40 hours per week showed decreased sleeping time (6.2 and 6.0 hours per day, respectively). For recovery from fatigue, not only sleep but also relaxation is needed, for example, spending time with family and friends, resting, or reading²⁸⁾, but long working hours may also reduce relaxation time. Our findings in Table 1 showed that 50.0% of males and 43.8% of females working ≤40 hours per week did not have leisure time. This proportion increased to 61.7% for males and 59.1% for females in those working >40 hours per week. A previous study²⁹⁾ indicated the importance of relaxation for prevention of sleep-onset insomnia or fine sleep quality. Therefore, reduced private time for workers due to long working hours may lead to insufficient sleeping and relaxation time, and cause sleep problems.

Another explanation for the association between long working hours and sleep problems relates to the occupational stress arising from long working hours. Previous studies showed that long working hours has been associated with high strain³⁰⁾ and effort–reward imbalance³¹⁾. It is well known that the hypothalamic-pituitary-adrenal (HPA) axis is one of the stress response systems, and chronic stress induces dysregulation of the HPA axis. Hyperactivity of the HPA axis results in hyperarousal of the nervous system and decreases sleeping time and sleep quality³²⁾. School

teachers are involved in relationships with not only students but also students' parents, colleagues, and superiors. They work in a stressful occupational environment, and long working hours may exacerbate the stress arising from their occupation, which may lead to sleep problems.

In the present study, the prevalence of sleep problems tended to be higher in females than males (41.5% for males and 44.4% for females). This finding is consistent with other previous studies^{16, 33, 34}. In addition, a meta-analysis²⁵ indicated that females had a risk of insomnia 1.41 times higher than males. Possible reasons for this may be inferred by referring to the previous study by Yoshioka *et al.*³³. The first reason is related to the biological difference between males and females with regard to reproductive hormones such as estrogens, progesterones, and androgens. Estrogens increase rapid eye movement (REM) sleep and shorten the onset of sleep latency³⁵. Progesterones have sedative effects and increase non-REM sleep³⁵. Androgens have a mild positive influence on the amount of REM sleep but induce sleep apnea onset in males and females³⁵. The complex interaction of these hormones, including the menstrual cycle, may lead to the sex difference in a prevalence of sleep problems. The second reason is related to sociological differences between males and females. Females often have a greater share of household responsibilities, particularly with regard to time-consuming activities such as child-rearing, preparing meals, and cleaning, which may lead to problems falling asleep or staying asleep. OECD statistics³⁶ may also support this reason, as females in Japan were found to spend more time in unpaid work (299 minutes per day) than males (62 minutes per day).

Our study has several strengths. First, this study is considered the first research for school teachers that documented the association between long working hours and sleep problems. Second, this study clearly defined long working hours as >40 hours per week, consisted of workers with non-shift work schedules, and set the reference group as those working ≤40 hours per week, following the previous review¹. The clear definition of long working hours enables us to compare the results among studies directly. As our study did not include shift workers, our results were not affected by the deleterious effects on sleep due to shift work schedules²⁶. We believe that these approaches contributed to clear interpretation of findings. Finally, we used the PSQ-I to assess sleep problems. This questionnaire was already confirmed its validity and reliability^{20, 21}, and it has been used worldwide.

Some limitations of our study should be taken into account. First, as this study was conducted in a

cross-sectional manner, a causal relationship between long working hours and sleep problems cannot be inferred. Second, sample size calculation based on the assumptions of the previous study¹⁹ and the relatively small number of participants may have resulted in low statistical power. Therefore, we may not have found the significant results other than those obtained. Third, working hours were self-reported and might have been inaccurate in some cases. Because this may lead to non-differential misclassification, ORs might be attenuated to get close to 1.0. Nonetheless, this study found the risk of sleep problems associated with long working hours. Fourth, our study might have included the participants with a medical history of sleep disorders. Therefore, our results may be under- or overestimated, depending on whether or not participants were undergoing medical treatment. Finally, the relatively low response rate (44.8%) may make it difficult to interpret our results as representative of public junior high school teachers. However, our study is a first step toward elucidating the association between long working hours and sleep problems among school teachers.

In conclusion, this cross-sectional study investigated the association between long working hours and sleep problems among public junior high school teachers in Japan. Our results revealed that males working >60 hours per week had a significantly increased risk of sleep problems compared with those working ≤40 hours per week. Although our study design did not allow us to infer a causal relationship between long working hours and sleep problems, reducing working hours may contribute to a reduction in sleep problems. Further studies are needed, including prospective cohort studies with a large sample size.

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