Impact of a reduction in overtime hours on sleep duration among Japanese employees

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Increasing attention has been paid to long working hours for their association with coronary heart disease and stroke1) and health-related behaviors such as short sleep duration2). In Japan, the government has enforced several regulations associated with the prevention of karoshi, sudden death from overworking, since 20143). Owing to this government intervention, many enterprises have been required to reduce their overtime hours, expecting improvements in employees’ lifestyles, including sleep habits. However, to our knowledge, no study has been conducted to evaluate the influence of workplace reform with reducing long working hours on health-related behaviors in Japan and other countries. Through this natural experiment4), we examined the effect of the regulating long working hours (intervention of reducing long working hours) on sleep duration among employees in Japan. We expected that the prevalence of short sleep duration had decreased in workplaces where intensive regulation of long working hours had been implemented, whereas less changes were expected at workplaces with weak regulation.

We conducted a questionnaire survey at one company (from the electrical equipment industry) participating in the Japan Epidemiology Collaboration on Occupational Health (J-ECOH) Study; the details of the J-ECOH Study are described elsewhere5). The study protocol was approved by the ethics committee of the National Center for Global Health and Medicine, Japan. Questionnaires regarding health-related behaviors were distributed to all employees in 2014 (before the intervention) and 2017 (after the intervention). Of 4,964 participants who completed the questionnaire in 2014, the data of 3,134 with complete information of sleep duration and covariates in 2017 were used for analysis. Characteristics of participants are shown in Supplementary Table 1. Sleep duration during weekdays was assessed using a single question with six response options (< 5, 5 to < 6, 6 to < 7, 7 to < 8, 8 to < 9, and ≥ 9 hours per day).

A drastic reduction in overtime hours was initiated in this company in 2016, and supervisors were directed to manage their subordinates and not exceed the overtime limit. Considering the difference in workload and prevalence of employees with heavy work load was the greatest in sector C), the upper limits of overtime were set as 45 h/month (sector A; office), 60 h/month (sector B; work site), and 80 h/month (sector C; work site). Sectors B and C were further required to lower the upper limit of overtime to 45 h/month within 2 or 3 years. In sector A, the intensity of the regulation to reduce overtime hours was light (sector A), whereas the intensities were medium in sector B and vigorous in sector C. Multivariable-adjusted logistic regression was performed to calculate
the odds ratio and its 95% confidence interval for the changes in the prevalence of short sleep duration (<6 h/day) according to the intensity of the regulation to reduce overtime work. Model 1 included the following variables: intervention type (low, medium, and high), survey year (baseline [time 0] and follow-up [time 3]), and interaction term of intervention and survey year. The Stata program of model 1 is shown as Supplementary Information 1.

Model 2 was additionally adjusted for age (years), sex, and sleep duration (hours). Model 3 was additionally adjusted for marital status, job position, and history of cardiovascular disease at follow-up.

Table 1 shows the relationship between workplace intervention and changes in short sleep duration. The prevalence of short sleep duration tended to increase slightly over 3 years. The rate of the increase was inversely associated with the intensity of the regulation, although this was not statistically significant. The corresponding multivariable-adjusted odds ratios of short sleep duration were 1.00 (reference), 0.88 (95% confidence interval [CI], 0.55–1.42), and 0.77 (95% CI, 0.47–1.26), respectively (Model 3).

In this natural experimental study conducted in Japan, we found that an intensive intervention to reduce long working hours did not significantly improve sleep habits. The present finding seems disanalogous to that of a cohort study showing a positive association between long working hours and short sleeping hours. Furthermore, the prevalence of short sleep duration slightly increased regardless of the regulation, although the prevalence of long overtime work was reduced largely. The slight increase in the prevalence of short sleep duration might reflect aging of the population over 3 years. The present findings suggest that simply reducing working hours may not lead to lifestyle modifications in Japan. To improve short sleep duration, it may be important to implement sleep hygiene education to all employees, in addition to a reduction in overtime hours. One of the limitations of our study is that the prevalence of overtime hours and short sleep duration differed across the intensity of work reform levels at baseline (Table 1). Caution should be exercised in interpreting the results. Second, sleep duration was assessed using a self-reported questionnaire and may be inaccurate compared with objectively measured sleep duration. However, this kind of question has been widely used in epidemiologic studies and has shown good correlation with objectively measured sleep duration. Third, the present sample size was not sufficient to detect a modest difference in the change of the prevalence of short sleep across workplace intervention with statistical significance. Lastly, the present study was performed in one company from a specific industry; generalizability of the present findings to the companies in other industries is unclear. Further studies with longer follow-up periods are needed to inform how work reform can help improve workers’ lifestyles and health over the life course.

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Conflict of Interest

The authors declare that no competing interests are present. TI, IK, and SD are health professionals in the corporations.
Author Contributions
The authors’ responsibilities were as follows: TI and KK contributed equally to the work and should be considered co-first authors; SD and TM conceived and designed the J-ECOH Study; KK, TI, and TM performed data collection; TI provided the databases for the research; KK, TI, IK, TM, and SD drafted the plan for data analysis; KK conducted the data analysis; TI drafted the manuscript; all authors were involved in the interpretation of the results and revision of the manuscript; and all approved the final version of the manuscript.

Supplementary material
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