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5 Association between Workaholism and Sleep Problems among Hospital Nurses

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27

28 **Short running title:**

29 WORKAHOLISM AND SLEEP PROBLEMS

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Abstract

37 The present study examined the association between workaholism, the tendency to
38 work excessively hard in a compulsive fashion, and sleep problems among Japanese
39 nurses. A cross-sectional survey was conducted among 600 nurses from 2 university
40 hospitals in Japan using a self-reported questionnaire on workaholism, sleep,
41 job-related variables (i.e., job demands, job control, and worksite support), and
42 demographic variables. A total of 394 nurses returned the questionnaire (response rate
43 = 65.7%) and complete data from 312 female nurses were used for analyses (final
44 coverage rate = 52.0%). Workaholics, as measured using the Japanese version of the
45 Dutch Workaholism Scale, were defined as those having high scores on both the “work
46 excessively” and “work compulsively” subscales. Logistic regression analyses
47 revealed that workaholics had higher risks for sleep problems in terms of subjective
48 sleep insufficiency, excessive daytime sleepiness at work, difficulty awakening in the
49 morning, and feeling tired when waking up in the morning (odds ratios [OR] of 4.40,
50 3.18, 3.48, and 4.61, respectively, $p < .05$). These remained significant even after
51 adjusting for demographic and job-related variables (OR 3.41, 5.36, 2.56, and 2.77,
52 respectively). However, no significant associations were found between workaholism
53 and insomnia symptoms. These results suggest that workaholic nurses had higher risks

54 for impaired awakening, insufficient sleep, and workplace sleepiness.

55 **Key words:** workaholism; sleep problems; nurse; cross-sectional study; logistic

56 regression

57

58 **INTRODUCTION**

59 Poor sleep is prevalent in modern industrialized society^{1, 2)}, and its consequences
60 include functional impairments, reduced quality of life, and significant health care
61 costs³⁾. Moreover, among the working population, sleep problems are associated not
62 only with deteriorated health (e.g., psychological distress, physical complaints), but
63 also with poor work functioning, which can result in increased risk of accidents or
64 injuries at work, absenteeism, reduced productivity, and job dissatisfaction^{1, 4)}. Various
65 relevant factors have been identified with regard to sleep problems, including
66 demographics (e.g., age, gender, and socioeconomic)⁵⁾, health status (e.g., heart
67 disease, diabetes, respiratory disease, and depression)⁵⁻⁷⁾, and work-related factors (e.g.,
68 high job demands, low job control, and low social support, low organizational justice,
69 over commitment, and shiftwork^{4, 8-12)}.

70 Previous research has uncovered that cognitive aspects are associated with an
71 increase in poor sleep. For example, research has shown that inability to stop worrying
72 about work during leisure time is associated with reduced sleep quality¹³⁾. In addition,
73 anxiety about duties after working hours and/or during non-work days has been
74 associated with difficulty falling asleep¹⁴⁾. The apprehension of a difficult next day has
75 been linked to decreased amounts of slow wave sleep, impaired subjective sleep

76 quality, and increased difficulty in awakening¹⁵⁾. Previous studies addressed mainly
77 cognitive aspects (i.e., worrying about work, anxiety about duty, and apprehension of a
78 subsequent working day), neglecting the association between behavioral aspects and
79 sleep problems. The health effects of workaholism, or the tendency to work
80 excessively hard (the behavioral dimension), and being obsessed with work, or
81 working compulsively (the cognitive dimension), have received much attention^{16, 17)}.
82 Workaholics have three common characteristics¹⁸⁾. First, they spend a great deal of
83 time on work activities when given the discretion to do so. Second, they are reluctant
84 to disengage from work and think about work persistently and frequently even when
85 they are not at work. Finally, they work beyond what is reasonably expected from them
86 to meet organizational or economic requirements. These three characteristics suggest
87 that workaholics may go as far as actively creating additional work for themselves (i.e.,
88 work excessively), for instance, by performing extra unnecessary work or by refusing
89 to delegate work¹⁷⁾. Therefore, increased job demands can lead to insufficient
90 opportunities to recover from such excessive efforts, leaving workaholics emotionally
91 or cognitively exhausted over time¹⁶⁾. Such persistent cognitive activities (i.e., working
92 compulsively) may also result in automatic arousal and emotional distress.
93 Consequently, workaholics report relatively high levels of psychological distress and

94 physical complaints¹⁹⁾. Since sleep quality is associated with psychological and
95 physical health^{3, 4, 11, 20)}, it can be speculated that workaholism could relate to poor
96 sleep. However, to date, no studies have investigated the direct association between
97 workaholism and sleep.

98 In line with this discussion, the present study aimed to examine the association
99 between workaholism and sleep problems among hospital nurses in Japan. It was
100 hypothesized that workaholic nurses who are characterized by working excessively as
101 well as compulsively have a higher risk for impaired sleep compared to
102 non-workaholic nurses. Several studies have revealed a positive relationship among
103 psychological distress, physical complaints, and sleep in Japanese nurses⁴⁾, but only
104 few have focused on workaholism. Nursing is among occupations that have the highest
105 risk of poor sleep²¹⁾, which may lead to burnout²²⁾.

106 **SUBJECTS AND METHODS**

107 **Participants**

108 Initially, we approached 3 hospitals located in central Japan, and 2 of the hospitals
109 agreed to participate in our study. A total of 600 registered nurses received a
110 self-administered questionnaire and had two months (from October to November 2008)
111 to complete it. In total, 394 nurses returned the questionnaire, which corresponds to a

112 response rate of 65.7%. Responses from 66 respondents were excluded from the
113 analysis due to missing data and/or existing chronic diseases (i.e., hypertension,
114 diabetes mellitus, depression, cardiovascular disease, and asthma). Data from male
115 respondents (n = 16) were also excluded because 95 percent of those who returned
116 completed questionnaires were females. Thus, the final number of respondents for
117 analysis was 312 (overall coverage rate: 52.0%). The aims and procedures of this study
118 were explained to all nurses prior to commencing the study. The Ethics Committees of
119 The University of Tokyo Graduate School of Medicine approved the procedures of this
120 study.

121 **Measures**

122 **Workaholism.** Workaholism was measured using the Dutch Workaholism Scale
123 (DUWAS) developed by Schaufeli and his colleagues²³⁾. The scale consists of two
124 subscales: work excessively (WE) and work compulsively (WC). Each subscale
125 consists of 5 items rated on a 4-point Likert scale (1 = totally disagree, 4 = totally
126 agree). Example items are: “I seem to be in a hurry and racing against the clock” (WE)
127 and “I feel that there’s something inside me that drives me to work hard” (WC). The
128 Cronbach’s alpha coefficients of the subscales in this study were 0.71 and 0.60 for WE
129 and WC, respectively. The respondents were classified into four quadrant groups using

130 the median scores for WE and WC in the current study: (1) “Relaxed workers”—low
131 on both WE and WC; (2) “Compulsive workers”—low on WE but high on WC; (3)
132 “Hard workers”—high on WE but low on WC; and (4) “Workaholics”—high on both
133 WE and WC^{23, 24)}.

134 **Sleep problems.** Based on previous epidemiological studies of sleep^{1, 2, 25, 26)}, 8
135 self-reported questions related to sleep problems were selected for this study, namely,
136 (1) difficulty initiating sleep (DIS), (2) difficulty maintaining sleep (DMS), (3) early
137 morning awakening (EMA), (4) dozing off or napping in daytime, (5) insufficiency of
138 sleep, (6) excessive daytime sleepiness (EDS) at work, (7) difficulty awakening in the
139 morning (DAM), and (8) tiredness upon awakening in the morning. Each sleep
140 question was dichotomized, and a criterion response was set (see Table 1). Insomnia
141 symptoms were defined as at least one positive response either to (1) DIS, (2) DMS, or
142 (3) EMA question.

143 -----

144 Table 1 about here

145 -----

146 **Work-related variables.** Job demands, job control, and worksite support were
147 measured using a subscale of the Brief Job Stress Questionnaire²⁷⁾ measured on a

148 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Job demands and job
149 control were calculated by summing the item scores of quantitative job overload (three
150 items) and job control (three items). Additionally, worksite support was calculated by
151 summing the item scores of supervisor support (three items) and coworker support
152 (three items). The Cronbach's alpha coefficients were 0.71, 0.63, and 0.85 for job
153 demand, job control, and worksite support, respectively, which were comparable with
154 previous research²⁷⁾. Respondents were classified into three about equally sized groups
155 based on the sum scores for each scale (i.e., job demands, job control, and worksite
156 support).

157 **Covariates.** Demographic variables included age (21-29; 30-39; 40 or older years),
158 education (professional school; junior college; university or higher), marital status
159 (married; unmarried), shift (2-shift; 3-shift; day shift), ward specialty (surgical;
160 medical; emergency; other), and caffeine intake (cups of coffee or tea per day—a
161 continuous variable).

162 **Statistical analysis**

163 First, χ^2 test was used to examine the association between different workaholism
164 groups and the dichotomized sleep quality. Next, a binary logistic regression analysis
165 was performed to determine (1) any differences among workaholism groups (i.e.,

166 Relaxed workers, Compulsive workers, Hard workers, and Workaholics) on poor sleep
167 quality, and (2) whether those differences remained after adjusting for job-related
168 variables (i.e., job demand, job control, and worksite support). The odds ratios (ORs)
169 and 95% confidence intervals were calculated using the relaxed workers as a reference
170 group. The level of significance was $p < 0.05$ (two-tailed). SPSS 16.0J for Windows
171 was used for the statistical analysis.

172 **RESULTS**

173 **Characteristics of the Respondents**

174 Table 2 shows the demographic characteristics of the respondents in this study. The
175 mean age of the respondents was 30.9 (SD = 7.5, range 21-60) years. All respondents
176 were women, and 95% (n = 296) were scheduled for shift work. Overall, 35.6%
177 worked in the surgical ward, 20.5% in the medical ward, 15.1% in the emergency ward
178 (including the intensive care unit), and 28.8% in other wards.

179 -----

180 Table 2 about here

181 -----

182 **Association between Workaholism and Sleep Problems**

183 Table 3 shows the associations between the workaholism groups and sleep problem

184 measures. Significant differences existed among workaholism groups on (5)
185 insufficiency of sleep, (7) difficulty maintaining sleep (DAM), and (8) tiredness upon
186 awakening in the morning. No significant differences among groups occurred with
187 regards to the remaining sleep problems.

188 -----

189 Table 3 about here

190 -----

191 Table 4 shows the results of logistic regression analyses. In addition to demographic
192 variables, the upper part was adjusted for demographic variables (i.e., age, education,
193 marital status, shift, ward specialty, and caffeine intake) and the lower part was
194 adjusted for job-related variables (i.e., job demands, job control, and worksite support).

195 -----

196 Table 4 about here

197 -----

198 In the demographic-adjusted models, elevated risks of sleep problems were observed
199 among the Workaholics group in terms of (5) insufficiency of sleep, (6) EDS at work,
200 (7) DAM, and (8) tiredness upon awakening in the morning (OR 4.40, 3.18, 3.48, and
201 4.61, respectively). In addition, elevated risks were also observed among Compulsive

202 workers in terms of (7) and (8) (OR 3.27 and 3.66, respectively). Furthermore, in the
203 fully adjusted models, elevated risks of sleep problems were observed among
204 Workaholics in terms of (5), (6), (7), and (8) (OR 3.41, 5.36, 2.56, and 2.77,
205 respectively) and among Compulsive workers in terms of (7) and (8) (OR 3.13 and
206 3.96, respectively). However, no significant ORs were found among the Hard workers
207 group on any sleep indices.

208 **DISCUSSION**

209 This study examined the association among workaholism, the tendency to work
210 excessively hard in a compulsive fashion, and sleep problems among hospital nurses in
211 Japan. It is important to identify individual risk factors, such as workaholism as well as
212 work-related organizational risk factors for inadequate sleep. Whereas previous studies
213 included primarily cognitive aspects, the present study addressed both cognitive as
214 well as behavioral aspects of workaholism and their effect on sleep. To our knowledge,
215 this is the first study to examine nurses' sleep problems as a function of these two
216 aspects.

217 Logistic analyses revealed that, compared to Relaxed workers, Workaholics (defined
218 as having tendencies to both work excessively and compulsively) had significantly
219 higher risks for poor sleep, such as insufficiency of sleep, excessive daytime sleepiness

220 at work, difficulty awakening in the morning, and tiredness upon awakening in the
221 morning. Part of the adverse effects of workaholism is attributable to the fact that
222 workaholics spend more time on their work¹⁸⁾. At the same time, increased job
223 demands may offer less opportunity for recovery from excessive efforts and higher
224 exhaustion²⁸⁾. These associations between workaholism and sleep problems were still
225 observed even after adjusting for demographic and job-related variables, including job
226 demands. This fact suggests that increased sleep problems among workaholics may be
227 independent of demographic and job characteristics.

228 Interestingly, difficulty awakening and tiredness upon awakening in the morning
229 were found to be associated more with the cognitive component (i.e., work
230 compulsively) of workaholism rather than behavioral component (i.e., work
231 excessively), as indicated in the fully adjusted model (see Table 4). Regarding the
232 cognitive component, low psychological detachment from work predicted negative
233 morning activation and fatigue²⁹⁾. This may be because thinking about work
234 persistently and frequently even when not working¹⁸⁾ may cause autonomic arousal and
235 emotional distress through cognitive activation, which in turn might result in greater
236 feelings of fatigue, as expected from the cognitive model of insomnia²⁰⁾. This
237 speculation is in line with observations from previous studies, which suggested that a

238 strong inner drive (i.e., cognitive component of workaholism) may be the most harmful
239 element of workaholism³⁰⁻³²⁾.

240 No significant associations were found between workaholism and sleep problems in
241 terms of difficulty initiating sleep, difficulty maintaining sleep, early morning
242 awakening, or dozing off or napping during the daytime. These findings may be due to
243 the small number of respondents compared to previous studies^{1, 2, 4)}. Additionally, the
244 average age of respondents was relatively low compared to previous studies^{33, 34)}. It is
245 known that the prevalence of insomnia symptoms increases with age⁵⁾; therefore, the
246 relationship between workaholism and sleep problems may have been underestimated.

247 Although the four items that were used represent the primary symptoms of insomnia,
248 percentages of respondents with insomnia were similar to or lower than those reported
249 previously for the same occupation^{4, 35)}. These levels of insomnia would result in
250 insignificant findings. Moreover, shift work is known to exert strong, acute effects on
251 sleep and alertness during night and morning work¹⁰⁾. In the present study, 95% of the
252 participants were shift workers. This may have masked the association between
253 workaholism and insomnia symptoms.

254 **Limitations**

255 Several limitations need to be discussed. First, because of the cross-sectional design

256 of the study, a causal relationship cannot be determined. Long-term effects of
257 workaholism are unknown. A prospective study needs to investigate the causal link
258 between workaholism and sleep problems. Second, all indicators were measured using
259 self-reported questionnaires. In addition to self-report bias due to (for example)
260 negative affect, common method variance might have played a role, although several
261 studies have demonstrated that these influences are not as significant as expected^{36, 37)}.
262 Nevertheless, our present findings should be validated with objective measures (e.g.,
263 sleep polysomnography, blood pressure, objective performance). Third, the participants
264 were all female nurses from only two hospitals in Japan; thus, particular care must be
265 taken when generalizing the findings reported here. However, it is likely that combined
266 data from the two different hospitals increase the generalizability of our findings, as
267 opposed to the data from only one hospital^{4, 35)}. Fourth, some of the odds ratios have
268 95% confidence intervals very close to 1.0 (e.g., EDS at work and DAM in the
269 demographic adjusted models). These results may make it difficult to be confident
270 about the association between workaholism and sleep problems. Indeed, odds ratio for
271 DAM became non-significant in the fully adjusted model. However, note that odds
272 ratio for EDS remained significant even in the fully adjusted model, suggesting that the
273 observed association is stable. Finally, not much consideration was given to

274 unmeasured factors such as smoking, alcohol consumption, leisure time physical
275 activity^{2, 11)}, or other unknown factors. These potential confounders may influence the
276 relationship between workaholism and sleep problems. It is especially notable that
277 previous studies have shown that the smoking rate among Japanese nurses is higher
278 compared to the general population^{38, 39)}.

279

280 **Practical implications**

281 Table 5 shows possible solutions for employees at risk of workaholism. In order to
282 modify the tendency to work excessively, training programs focusing on time
283 management and problem solving skills might be helpful because workaholics take
284 more work than they can handle and accept new tasks before completing previous
285 ones¹⁹⁾. Cognitive reconstruction might also be effective in changing the workaholics'
286 characteristics of not only being reluctant to disengage from work, but also of thinking
287 about work persistently and frequently, even during their leisure time¹⁸⁾.

288

289 **Conclusion**

290 The present study indicated that workaholic nurses who have the tendency to work
291 excessively hard in a compulsive fashion have higher risks for impaired awakening,

292 insufficient sleep, and workplace sleepiness. This suggests the importance of focusing
293 on both behavioral and cognitive aspects of workaholism. Future research should
294 examine the effects of work style as well as work environment on improving sleep
295 quality among nurses.

296

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404

Table1. Sleep questions and criterion responses.

Question	Criterion response					
(1) How long does it usually take you to fall asleep in bed? 1) 0-10 min 2) 11-30 min 3) 31-59 min 4) 1-2 hours 5) 2+ hours	Over 30 minutes					
(2) How often do you have difficulty staying asleep? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than three times a week					
(3) How often do you wake up too early and can't fall asleep again? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than three times a week					
(4) How often do you take a nap while commuting time or during lunch break? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than three times a week					
(5) Do you think your daily sleep is sufficient? 1) very much sufficient 2) fairly sufficient 3) somewhat insufficient 4) definitely insufficient	Somewhat insufficient					
(6) How often do you feel very drowsy when you are at work? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than three times a week					
(7) Do you feel difficulty waking up in the morning? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than once a week					
(8) Do you feel restless when you wake up in the morning? 1) never (or almost never) 2) few times a year 3) more than once a month 4) more than once a week 5) more than three times a week 6) almost every day	More than once a week					

Table2. Demographic characteristics among participants of this study (only female; N=312).

		n(%)
Age(years)		
21-29		168(53.8)
30-39		103(33.0)
40 or older		41(13.1)
Marital status		
married		92(29.5)
unmarried		220(70.5)
Education		
professional school		154(49.4)
junior college		59(18.9)
university or higher		99(31.7)
Shift		
two-shift		114(36.5)
three-shift		182(58.3)
day shift		16(5.1)
Ward specialty		
surgical ward		111(35.6)
medical ward		64(20.5)
emergency ward		47(15.1)
others		90(28.8)
Caffeine intake(cups of coffee or tea/day)		
almost none		47(15.1)
one		84(26.9)
two		81(26.0)
three		52(16.7)
four or more		48(15.4)

Table3. Associations between workaholism groups and sleep problem measures among hospital nurses in Japan (crude data; N=312). †

	N	DIS ‡	DMS ‡	EMA ‡	Dozing off or napping in daytime	Insufficiency of sleep	EDS at work ‡	DAM ‡	Tiredness awakening in the morning	Insomnia symptoms§
		n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Workaholism ††										
Relaxed workers	113	26(23.0)	4(3.5)	2(1.8)	9(8.0)	61(54.0)	8(7.1)	54(47.8)	58(51.3)	28(24.8)
Compulsive workers	64	21(32.8)	6(9.4)	4(6.3)	3(4.7)	41(64.1)	3(4.7)	47(73.4)	50(78.1)	23(35.9)
Hard workers	46	15(32.6)	2(4.3)	1(2.2)	2(4.3)	29(63.0)	2(4.3)	32(69.6)	29(63.0)	15(32.6)
Workaholics	89	23(25.8)	9(10.1)	7(7.9)	10(11.2)	73(82.0)	13(14.6)	63(70.8)	71(79.8)	27(30.3)
total	312	85(27.2)	21(6.7)	14(4.5)	24(7.7)	204(65.4)	26(8.3)	196(62.8)	208(66.7)	93(29.8)
χ^2 (df=3)		2.78	4.58	5.36	3.12	17.54	6.89	17.34	22.9	2.70
p value		0.43	0.21	0.15	0.37	0.00**	0.07	0.00**	0.00**	0.44

† χ^2 test was used. ** $p < 0.01$.

‡ DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; EDS, excessive daytime sleepiness; DAM, difficulty awakening in the morning.

§ Insomnia symptoms defined as at least one positive response to questions regarding DIS, DMS or EMA.

†† The participants were classified into four quadrant groups using the median scores for WE (work excessively) and WC (work compulsively). (1) “Relaxed workers” – low on both WE and WC; (2) “Compulsive workers” – low on WE and high on WC; (3) “Hard workers” – high on WE and low on WC and (4) “Workaholics” – high on both WE and WC.

Table 4. Associations between workaholism groups, job demands, job control, worksite support and sleep problem measures after adjusting for demographic and fully adjusted models among hospital nurses in Japan (N=312). †																						
	DIS ‡‡		DMS ‡‡		EMA ‡‡		Dozing off or napping in daytime		Insufficiency of sleep		EDS at work ‡‡	DAM ‡‡		Tiredness awakening in the morning		Insomnia symptoms ‡‡						
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)		OR	(95%CI)	OR	(95%CI)	OR	(95%CI)					
The demographic adjusted models‡																						
Workaholism ‡‡																						
Relaxed workers	1.00		1.00		1.00		1.00		1.00		1.00	(1.61-6.67)	**	3.66	(1.74-7.68)	**	1.73	(0.85-3.54)				
Compulsive workers	1.63	(0.78-3.38)	3.35	(0.85-13.17)	4.33	(0.73-25.83)	0.50	(0.12-2.02)	1.50	(0.77-2.92)	0.59	(0.14-2.44)	3.27	(1.61-6.67)	**	1.57	(0.72-3.41)	1.33	(0.59-2.99)			
Hard workers	1.47	(0.64-3.35)	1.25	(0.21-7.67)	1.66	(0.13-20.87)	0.53	(0.10-2.83)	1.79	(0.82-3.91)	0.69	(0.13-3.75)	2.27	(1.01-5.08)	*	1.57	(0.72-3.41)	1.33	(0.59-2.99)			
Workaholics	1.11	(0.55-2.25)	3.08	(0.85-11.21)	5.11	(0.95-27.58)	1.81	(0.63-5.17)	4.40	(2.12-9.13)	**	3.18	(1.09-9.23)	*	3.48	(1.76-6.87)	**	4.61	(2.26-9.43)	**	1.21	(0.61-2.39)
The fully adjusted models§																						
Workaholism																						
Relaxed workers	1.00		1.00		1.00		1.00		1.00		1.00	(1.50-6.56)	**	3.96	(1.82-8.63)	**	1.71	(0.81-3.58)				
Compulsive workers	1.61	(0.76-3.44)	3.77	(0.92-15.50)	5.19	(0.78-34.40)	0.32	(0.07-1.43)	1.48	(0.74-2.94)	0.44	(0.10-1.96)	3.13	(1.50-6.56)	**	1.83	(0.96-3.48)	0.75	(0.39-1.44)			
Hard workers	1.62	(0.66-3.99)	1.23	(0.17-8.81)	1.05	(0.06-17.57)	0.38	(0.06-2.32)	1.32	(0.56-3.08)	1.12	(0.18-6.92)	1.67	(0.69-4.00)	0.91	(0.38-2.19)	1.38	(0.57-3.35)				
Workaholics	1.11	(0.51-2.44)	3.28	(0.78-13.79)	3.76	(0.60-23.61)	1.50	(0.43-5.26)	3.41	(1.56-7.46)	**	5.36	(1.46-19.67)	*	2.56	(1.20-5.48)	*	2.77	(1.27-6.05)	*	1.15	(0.54-2.46)
Job demand																						
Low	1.00		1.00		1.00		1.00		1.00		1.00	(0.68-2.40)	1.83	(0.96-3.48)	0.75	(0.39-1.44)	1.00					
Middle	0.77	(0.39-1.50)	0.74	(0.21-2.63)	2.21	(0.40-12.11)	0.70	(0.21-2.31)	1.36	(0.73-2.54)	0.44	(0.14-1.36)	1.28	(0.68-2.40)	1.83	(0.96-3.48)	0.75	(0.39-1.44)	1.00			
High	0.98	(0.43-2.22)	1.26	(0.31-5.20)	4.29	(0.63-29.13)	1.11	(0.28-4.42)	2.69	(1.12-6.43)	*	0.19	(0.04-0.93)	*	2.42	(1.02-5.76)	*	5.47	(2.10-14.25)	**	1.02	(0.46-2.26)
Job control																						
Low	1.00		1.00		1.00		1.00		1.00		1.00	(0.85-2.95)	1.01	(0.53-1.93)	1.44	(0.77-2.69)	1.00					
Middle	1.75	(0.91-3.38)	0.72	(0.23-2.30)	0.42	(0.09-1.88)	0.46	(0.17-1.26)	0.92	(0.50-1.68)	0.74	(0.27-2.07)	1.59	(0.85-2.95)	1.01	(0.53-1.93)	1.44	(0.77-2.69)	1.00			
High	1.40	(0.62-3.14)	1.49	(0.41-5.44)	1.66	(0.35-7.87)	0.27	(0.07-1.16)	1.54	(0.72-3.31)	0.54	(0.14-2.04)	0.67	(0.32-1.41)	1.18	(0.53-2.61)	1.08	(0.49-2.38)	1.00			
Worksite support																						
Low	1.00		1.00		1.00		1.00		1.00		1.00	(0.50-1.66)	0.91	(0.38-1.31)	0.44	(0.24-0.80)	1.00					
Middle	0.53	(0.28-0.99)	*	0.59	(0.21-1.67)	0.28	(0.07-1.16)	0.66	(0.22-2.00)	0.80	(0.44-1.45)	1.04	(0.36-3.00)	0.91	(0.50-1.66)	0.70	(0.38-1.31)	0.61	(0.30-1.23)	1.00		
High	0.79	(0.39-1.61)	0.30	(0.07-1.26)	0.25	(0.04-1.40)	1.72	(0.54-5.45)	1.04	(0.51-2.14)	3.18	(0.96-10.58)	0.91	(0.45-1.85)	0.50	(0.24-1.05)	0.61	(0.30-1.23)	1.00			

† Binary logistic regression was used. OR, odds ratio; CI, confidence interval. Estimates for demographic variables were not shown. * $p < 0.05$, ** $p < 0.01$.

‡ Adjusted for age, education, marital status, shift, ward specialty, and caffeine intake.

§ Additionally adjusted for job demand, job control, and worksite support.

†† DIS, difficulty initiating sleep; DMS, difficulty maintaining sleep; EMA, early morning awakening; EDS, excessive daytime sleepiness; DAM, difficulty awakening in the morning.

Insomnia symptoms defined as at least one positive response to questions regarding DIS, DMS or EMA.

‡‡ The participants were classified into four quadrant groups using the median scores for WE (work excessively) and WC (work compulsively). (1) “Relaxed workers” – low on both WE and WC;

(2) “Compulsive workers” – low on WE and high on WC; (3) “Hard workers” – high on WE and low on WC and (4) “Workaholics” – high on both WE and WC.

Table 5. The examples of training program for employee who are at the risk of workaholism.

Work excessively (behavioral aspects)	Work compulsively (cognitive aspects)
Time management	Modifying irrational belief
Problem solving skill	Cognitive reconstruction
Assertive skill	
Seeking support skill	