

Factors of Working Conditions and Prolonged Fatigue among Teachers at Public Elementary and Junior High Schools

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Abstract: Prolonged fatigue among elementary and junior high school teachers not only damages their health but also affects the quality of education. The aim of this study was to determine the factors of working conditions associated with prolonged fatigue among teachers at public elementary and junior high schools. We distributed a self-reported, anonymous questionnaire to 3,154 teachers (1,983 in elementary schools, 1,171 in junior high schools) working in public schools in a city in Japan. They were asked to assess 18 aspects of their working conditions using a seven-point Likert scale. Prolonged fatigue was measured using the Japanese version of the checklist individual strength questionnaire. Multiple regression analysis was used to examine the association between working conditions and prolonged fatigue. Gender, age, and school type were introduced as confounders. In all, 2,167 teachers participated in this study. Results showed that qualitative and quantitative workload (time pressure due to heavy workload, interruptions, physically demanding job, extra work at home), communication with colleagues (poor communication, lack of support), and career factors (underestimation of performance by the board of education or supervisors, occupational position not reflecting training, lack of prospects for work, job insecurity) were associated with prolonged fatigue.

Key words: Prolonged fatigue, Elementary and junior high school teachers, Working conditions, Workload, Communication, Career

Introduction

Fatigue among elementary and junior high school teachers can affect their health. When teachers work for prolonged periods with accumulated fatigue, their physical and mental condition may be negatively affect-

ed¹). Moreover, teacher fatigue and poor health may lead to poor education²). Therefore, it is considered important in policy making to identify factors that relate to teacher fatigue and then take measures to prevent such fatigue so as to protect teachers' health and the quality of education their students receive.

Fatigue is diagnostically nonspecific and associated with various health conditions³). Broadly defined as “a feeling of weariness, tiredness, lack of energy⁴”, fatigue is best viewed as a continuum³). Fatigue can be divid-

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ed into two types: acute and prolonged⁵). Acute fatigue is transient and recovery results after an appropriate amount of rest or sleep. However, recovery from prolonged fatigue, which accumulates over a long period, is difficult even with adequate rest and sleep⁶). Prolonged fatigue is shown to be a precursor of disease, injury, and work-related accidents⁶⁻⁸). Furthermore, prolonged fatigue among employees may result in long-term sick leave⁹). Teachers are no exception: prolonged fatigue of teachers may result in health hazards and long-term absence from work²).

Several factors involving working conditions have been reported as relating to health problems among teachers^{1, 2, 10-12}). These factors include heavy workload (e.g., excessive paperwork, class preparation, student evaluations) as well as a lack of communication in the workplace, inaccurate evaluations by the board of education and supervisors, and excessive demands from colleagues and supervisors^{2, 12}). Prolonged fatigue is considered a pre-stage of physical and psychological problems¹³). Previous studies have demonstrated the involvement of working conditions in prolonged fatigue among general workers¹⁴⁻¹⁶). However, few studies have directly investigated factors of working conditions associated with prolonged fatigue among teachers¹). In the present study, we explore these factors among public elementary and junior high school teachers in a city in Japan.

Subjects and Methods

The targeted participants of this study were a total of 3,154 teachers (1,983 in elementary schools, 1,171 in junior high schools) from all 72 public elementary schools and 37 public junior high schools in a suburban city in the Tokyo region. An anonymous, self-administered questionnaire was sent to all participants. The survey was conducted from November 1 to December 31, 2008. Teachers could choose to return the questionnaire either to the researcher directly by post or through the school administration.

The demographic characteristics collected were gender (male/female), age (20-29, 30-39, 40-49, and 50 or over), and school type (elementary or junior high). Determining factors of the teachers' working conditions were mainly based on the actual circumstances of their workplaces, with the effort-reward-questionnaire as a reference^{1, 2, 17}). The questionnaire had 18 items from three categories: qualitative and quantitative workload (constant time pressure due to heavy workload; many interruptions during work; physically demanding job; how often extra work had to be done at home the preceding week; high responsibility; occasional overtime

work; gradual increase in workload over recent years), communication (poor communication with supervisors; poor communication with colleagues; lack of sufficient support from colleagues; unequal opportunities in the workplace; difficulties or worries in dealing with students and parents), and career (concern over work evaluation by the board of education or supervisors; current position inadequately reflecting education and training; considering effort and achievement, lack of associated prospects for future work; feelings of insecurity regarding job prospects owing to health situation; lack of appreciation and popularity despite hard work and effort; considering hard work and effort, dissatisfaction with income).

A seven-point Likert scale was used for each question (1 = strongly disagree to 7 = strongly agree). To measure the number of days when extra work had been done at home the preceding week, we used six options (1=none, 2=once, 3=two or three times, 4=four times, 5=five times, and 6=six or seven times).

The Japanese version of the checklist individual strength (CIS) questionnaire was used to measure prolonged fatigue^{18, 19}). The CIS has four subscales (subjective feeling of fatigue, concentration, motivation, and physical activity) and consists of 20 questions. Respondents were asked to answer questions about their experience over the preceding two weeks using a seven-point Likert scale. The total scores range from 20 to 140, with higher scores indicating a greater degree of prolonged fatigue.

Multiple regression analysis was used to examine the relation between working conditions and prolonged fatigue. First, a univariate regression of all factors of the teachers' working conditions and prolonged fatigue was performed. Then, a forced-entry multiple regression was performed for factors with $p \leq 0.05$ from each univariate analysis and not reducing multicollinearity when included in the multivariate model. Gender, age, and school type were also introduced as confounding factors, categorizing teachers into men and women with four age groups (20-29, 30-39, 40-49, ≥ 50 yr), and categorizing school type into elementary and junior high school. Assumptions for all analyses were confirmed, such as by applying a normal probability plot and scatter plot to determine the normality of the residual distribution of each regression model²⁰). In the multivariate analysis, multicollinearity was assessed²¹). All analyses were performed using the Japanese version of SPSS 17.0 for Windows (SPSS Inc., Chicago, IL).

Prior to questionnaire distribution, the study was approved by the Institutional Review Board of Kitasato University School of Medicine. Returning the completed questionnaire was considered as signifying consent to

Table 1. Characteristics and scores of the checklist individual strength

	Participants <i>N</i> =2,167 (%)
Gender	
Male	975 (45.0)
Female	1,192 (55.0)
Age	
20–29	390 (18.0)
30–39	398 (18.4)
40–49	411 (19.0)
50 over	968 (44.6)
School type	
Elementary	1,321 (61.0)
Junior high	846 (39.0)
Checklist individual strength scores	
20–39	38 (1.8)
40–59	274 (12.6)
60–79	752 (34.7)
80–99	842 (38.9)
100–119	242 (11.2)
120–140	19 (0.8)

participate in the study.

Results

A total of 2,167 teachers participated in this study. The response rate was 68.7%. The characteristics of the participants and the distribution of CIS scores are shown in Table 1. There were more teachers aged 50 and above than any other age-group. CIS scores were mostly distributed between 60 and 99. The mean CIS score was 76.7 (SD=18.4) for men and 80.8 (SD=17.4) for women.

The rate of indicated scale numbers for working conditions is presented in Table 2. Items related to qualitative and quantitative workload were distributed mostly between scale numbers 5 and 7, indicating that many teachers had a heavy workload. Of the total, 30.5% had been obliged to do extra work at home on six or seven times during the preceding week, and 26.3% had done so on two or three times. Items related to communica-

Table 2. Proportions (%) of indicated scale numbers for factors of working conditions

Likert scale	Rate of responses						
	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
Qualitative and quantitative workload							
Constant time pressure due to heavy workload	2.3	2.6	5.0	10.4	21.4	21.4	36.9
Many interruptions during work	2.8	4.3	5.5	12.0	20.6	22.9	31.8
Physically demanding job	2.8	3.6	4.4	11.6	21.8	24.4	31.5
Days when extra work had to be done at home the preceding week	17.0	12.3	26.3	6.7	7.2	30.5	—
High responsibility	0.6	0.6	1.2	4.5	7.8	20.4	64.9
Occasional overtime work	0.6	1.5	0.9	3.0	5.9	12.1	76.0
Gradual increase in workload over recent years	2.3	1.6	2.1	10.6	11.7	18.6	53.1
Communication							
Poor communication with supervisors	21.1	30.2	20.1	16.7	4.5	4.0	3.4
Poor communication with colleagues	21.9	33.5	20.8	15.1	4.2	2.4	2.1
Lack of sufficient support from colleagues	22.2	30.6	22.1	14.1	4.7	3.1	3.2
Unequal opportunities in the workplace	31.2	20.2	9.6	18.6	8.5	6.7	5.2
Difficulties or worries in dealing with students and parents	5.3	7.2	4.6	14.6	16.4	21.9	29.9
Career							
Concern over work evaluation by the board of education or supervisors	23.4	19.7	10.8	23.3	12.1	5.7	5.0
Current position inadequately reflecting education and training	7.2	15.0	20.7	27.6	13.6	9.0	7.0
Considering effort and achievement, lack of associated prospects for future work	3.0	8.1	20.4	38.9	13.3	9.3	7.0
Feelings of insecurity regarding job prospects owing to health situation	11.6	11.4	7.4	14.4	16.2	16.6	22.4
Lack of appreciation and popularity despite hard work and effort	4.3	13.6	21.5	43.9	8.4	5.3	3.0
Considering hard work and effort, dissatisfaction with income	3.0	8.1	20.4	38.9	13.3	9.3	7.0

To measure the days of extra work at home in the previous 7 d, we used six choices (1, none; 2, once; 3, two or three times; 4, four times; 5, five times; 6, six or seven times).

Table 3. Median and interquartile range of the studied variables of working conditions

Median (interquartile range)	
Qualitative and quantitative workload	
Constant time pressure due to heavy workload	6.0 (5.0–7.0)
Many interruptions during work	6.0 (5.0–7.0)
Physically demanding job	6.0 (5.0–7.0)
Many days of extra work at home the preceding week	3.0 (2.0–6.0)
High responsibility	7.0 (6.0–7.0)
Occasional overtime work	7.0 (7.0–7.0)
Gradual increase in workload over recent years	7.0 (5.0–7.0)
Communication	
Poor communication with supervisors	2.0 (2.0–3.0)
Poor communication with colleagues	2.0 (2.0–4.0)
Lack of sufficient support from colleagues	2.0 (2.0–4.0)
Unequal opportunities in the workplace	2.0 (1.0–4.0)
Difficulties or worries in dealing with students and parents	6.0 (4.0–7.0)
Career	
Concern over work evaluation by the board of education or supervisors	3.0 (2.0–4.0)
Current position inadequately reflecting education and training	4.0 (3.0–5.0)
Considering effort and achievement, lack of associated prospects for future work	4.0 (3.0–5.0)
Feelings of insecurity regarding job prospects owing to health situation	5.0 (3.0–6.0)
Lack of appreciation and popularity despite hard work and effort	4.0 (3.0–4.0)
Considering hard work and effort, dissatisfaction with income	4.0 (3.0–5.0)

tion were mostly distributed between 1 and 3, reflecting that most teachers feel they have good communication at work. In contrast, with difficulties or worries in dealing with students and parents, approximately 70% chose 5–7. Among the items related to career, 40% indicated that they did not care how the education board or supervisors evaluated their work. On the other hand, with regard to lack of associated prospects for future work and current position inadequately reflecting education and training, approximately 70% chose 3–5.

The median values of the working condition factors and the interquartile range (25th–75th percentile) are shown in Table 3. Items related to qualitative and quantitative workload had higher median values. Items related to communication had lower median values, but the item relating to difficulties or worries in dealing with students and parents was distributed around 6. Items related to career were distributed between 2 and 5.

Overall, Cronbach's alpha reliability coefficient was 0.772 with the scale including all 18 items, which indicates an acceptable internal consistency. The coefficient did not change by a large degree when any of the 18 factors was deleted.

Table 4 shows the pairwise correlations of all 18 variables included in the multiple regression analysis as well as the total CIS score. Most of them reached significance owing to the large sample size; however, based on the coefficients, no factor highly correlated

with the others, using a coefficient of 0.7 as the cutoff value. From these findings, all 18 factors were used in multivariate analysis at the first step. The results of the univariate and multiple regression analysis of prolonged fatigue and related working condition factors are shown in Table 5. Multiple regression model 1, including all 18 variables as well as age, gender, and school type, resulted in multicollinearity since several factors showed reversals of signs in the beta coefficients with the simple regression models, although the variance inflation factor (VIF) of any item did not exceed 3. Multiple regression model 2 was then performed by excluding three factors with wrong signs in the multiple regression model 1. As a result, four items related to qualitative and quantitative workload (constant time pressure due to heavy workload; interruptions while working; physically demanding job; many days when extra work had to be done at home) were included and showed positive association with prolonged fatigue ($p < 0.001$). Two communication items (poor communication with colleagues; lack of sufficient support from colleagues) were also positively associated with prolonged fatigue ($p < 0.001$ and $p = 0.02$, respectively). Similarly, four career items (concern over work evaluation by the board of education or supervisors; current position inadequately reflecting education and training; lack of prospects for future work; feelings of insecurity regarding job prospects owing to health) were positively associated with pro-

Table 4. Correlations of variables included in multiple regression analysis

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	1																		
2	0.37**	1																	
3	0.29**	0.51**	1																
4	0.31**	0.52**	0.33**	1															
5	0.07**	0.36**	0.10**	0.30**	1														
6	0.13**	0.41**	0.29**	0.40**	0.20**	1													
7	0.24**	0.49**	0.30**	0.46**	0.33**	0.51**	1												
8	0.21**	0.50**	0.38**	0.42**	0.22**	0.34**	0.40**	1											
9	0.26**	0.04	0.05*	0.03	0.04*	-0.07**	-0.03	-0.03	1										
10	0.25**	-0.01	0.04*	-0.01	0.01	-0.11**	-0.09**	-0.06**	0.65**	1									
11	0.23**	0.04	0.07**	-0.01	-0.02	-0.12**	-0.12**	0.01	0.40**	0.58**	1								
12	0.22**	0.14**	0.18**	0.10**	0.04	-0.02	0.01	0.13**	0.35**	0.32**	0.39**	1							
13	0.24**	0.28**	0.24**	0.27**	0.14**	0.21**	0.26**	0.16**	0.07**	0.04	-0.01	0.10**	1						
14	0.13**	0.10**	0.07**	0.08**	0	0.04*	0.02	0.02	0.12**	0.09**	0.09**	0.26**	0.19**	1					
15	0.23**	0.07**	0.09**	0.06**	0.02	-0.03	-0.01	-0.03	0.17**	0.17**	0.18**	0.10**	0.09**	0.01	1				
16	0.31**	0.07**	0.10**	0.07**	0.03	-0.02	-0.65**	0.03	0.26**	0.23**	0.25**	0.20**	0.10**	0.06**	0.31**	1			
17	0.52**	0.41**	0.28**	0.39**	0.21**	0.17**	0.19**	0.32**	0.19**	0.14**	0.15**	0.21**	0.32**	0.13**	0.13**	0.26**	1		
18	0.23**	0.03	0.05*	0.08**	0.04*	-0.04*	-0.01	-0.03	0.31**	0.29**	0.27**	0.26**	0.11**	0.10**	0.37**	0.50**	0.16**	1	
19	0.15**	0.14**	0.16**	0.13**	0.05**	0.05*	0.06**	0.15**	0.11**	0.09**	0.14**	0.16**	0.05*	0.08**	0.14**	0.28**	0.09**	0.23**	1

1. CIS total score; 2. Constant time pressure due to heavy workload; 3. Many interruptions during work; 4. Physically demanding job; 5. Many days of extra work at home the preceding week; 6. High responsibility; 7. Occasional overtime work; 8. Gradual increase in workload over recent years; 9. Poor communication with supervisors; 10. Poor communication with colleagues; 11. Lack of sufficient support from colleagues; 12. Unequal opportunities in the workplace; 13. Difficulties or worries in dealing with students and parents; 14. Concern over work evaluation by the board of education or supervisors; 15. Current position inadequately reflecting education and training; 16. Considering effort and achievement, lack of associated prospects for future work; 17. Feelings of insecurity regarding job prospects owing to health situation; 18. Lack of appreciation and popularity despite hard work and effort; 19. Considering hard work and effort, dissatisfaction with income.

* $p < 0.05$ ** $p < 0.01$.

Table 5. Univariate and multivariate analyses of prolonged fatigue with the studied variables

Variables	Univariable		Model Multivariable 1		Model Multivariable 2	
	Beta	p value	Beta	p value	Beta	p value
Age	0.12	<0.001	0.35	0.07	0.04	0.03
Gender	-0.11	<0.001	-0.2	0.29	-0.01	0.45
School type	-0.01	<0.001	-0.01	0.44	-0.02	0.39
(Qualitative and quantitative workload)						
Constant time pressure due to heavy workload	0.37	<0.001	0.13	<0.001	0.11	0.00
Many interruptions during work	0.29	<0.001	0.07	<0.001	0.06	0.00
Physically demanding job	0.31	<0.001	0.08	<0.001	0.05	0.01
Many days of extra work at home the preceding week	0.21	<0.001	0.07	<0.001	0.06	0.00
High responsibility	0.07	<0.001	-0.08	<0.001		
Occasional overtime work	0.13	<0.001	-0.03	0.2		
Gradual increase in workload over recent years	0.24	<0.001	0.02	0.29	0.01	0.75
(Communication)						
Poor communication with supervisors	0.26	<0.001	0.04	0.08	0.04	0.07
Poor communication with colleagues	0.25	<0.001	0.09	<0.001	0.09	0.00
Lack of sufficient support from colleagues	0.24	<0.001	0.04	0.06	0.05	0.02
Unequal opportunities in the workplace	0.22	<0.001	-0.003	0.88		
Difficulties or worries in dealing with students and parents	0.24	<0.001	0.04	0.036	0.03	0.10
(Career)						
Concern over work evaluation by the board of education or supervisors	0.13	<0.001	0.04	0.038	0.04	0.03
Current position inadequately reflecting education and training	0.24	<0.001	0.09	<0.001	0.10	0.00
Considering effort and achievement, lack of associated prospects for future work	0.31	<0.001	0.1	<0.001	0.11	0.00
Feelings of insecurity regarding job prospects owing to health situation	0.53	<0.001	0.32	<0.001	0.33	0.00
Lack of appreciation and popularity despite hard work and effort	0.24	<0.001	0.02	0.4	0.02	0.39
Considering hard work and effort, dissatisfaction with income	0.16	<0.001	0.01	0.46	0.01	0.50
Adjusted R2			0.391			0.386

Beta indicates standardized beta coefficient.

Adjusted R2 stands for adjusted coefficient of determination of each model.

Multivariate model 1 included all 18 factors neglecting multicollinearity. Multivariable model 2 excluded factors showing reversals of signs with their simple regression models.

longed fatigue ($p=0.03$ for the first item; $p<0.001$ elsewhere) with a multiple regression model. The adjusted R-square was 0.39 and 0.38 for each multiple regression model.

Discussion

The present study indicates that prolonged fatigue among public elementary and junior high school teachers in one Japanese city is related to working conditions, including qualitative and quantitative workload, communication, and career prospects. Factors of qualitative and quantitative workload include the following: constant time pressure due to heavy workload; many interruptions during work; physically demanding job; and many days when extra work is required at home. Communication factors include poor communication with colleagues and lack of sufficient colleague support. Career factors include the following: underestimation of performance by supervisors; lack of opportunities to utilize abilities; lack of future job prospects; and insecurity regarding job prospects owing to health. Prior studies have also addressed the relationship between prolonged fatigue and qualitative and quantitative workload^{15, 22}. It came as no surprise to find similar trends among teachers in the present study. In addition, our study demonstrates factors related to prolonged fatigue that have not yet been thoroughly examined, e.g., poor communication and career prospects.

The characteristics of the study sample (gender and age by school type) are consistent with those described for the whole population of Japanese teachers by the Ministry of Education, Culture, Sports, Science and Technology²³.

A total CIS score of over 76 has been shown to be related to a tendency to take sick leave and for work disability^{19, 24}. The mean CIS score in this study was 76.7 (SD=18.4) for men and 80.8 (SD=17.4) for women; this may suggest that the sample in the present study, namely teachers replying to our questionnaire, showed a higher prolonged fatigue level compared with the overall population.

In this study, we discovered that constant time pressure due to heavy workload was related to prolonged fatigue. An association between workload and prolonged fatigue has been reported in another study²⁵. Teachers usually have many responsibilities in addition to teaching classes, including counseling students on their behavior, dealing with parents, evaluating the scholastic aptitude of students, and participating in training sessions and meetings in and outside school. If excessive, these workload factors are reported as impacting both the physical and mental health of teachers².

Having to perform so many duties within a limited working period may be related to prolonged fatigue. To help avoid this problem, discussions should be held whereby certain responsibilities might be eliminated in consideration of individual workloads.

According to our study, approximately 70% of teachers are often interrupted during work, and this was associated with a higher level of prolonged fatigue. Some reports have found that work interruptions can be stress factors^{26, 27}. Classes are often interrupted or delayed owing to student problems. Moreover, teachers may be unable to carry out planned tasks after school because of unscheduled visits by parents. Such unexpected interruptions of work and the resulting delays are associated with higher prolonged fatigue. This situation might be improved by implementing appropriate organizational policies for teachers in the workplace.

Previous studies have indicated that physical burden increases fatigue^{28, 29}. In this study, finding the job physically demanding was associated with prolonged fatigue. It has been reported that 60% of elementary and junior high school teachers are unable to take regular breaks². Fatigue accumulates when one cannot recover from transient fatigue for a long period of time, as in this situation, and prolonged fatigue results.

A higher number of days when extra work had to be done at home was associated with greater prolonged fatigue. Among teachers of the first through sixth options, 30.5% indicated six or seven times as when extra work had to be done at home. This means that the teachers had to work not only on weekdays but also on weekends and possibly holidays. An excessive number of days with extra work has been identified as a physical burden for teachers^{1, 2}. When teachers cannot complete their work during normal hours and are obliged to bring it home, they have to sacrifice their evenings and days off, which is of course when they should be able to rest. It is possible that owing to this reduction in rest time, teachers cannot fully recover from acute fatigue and thus begin to suffer from prolonged fatigue. To counter this kind of problem, work demands should be closely examined; ideally, reductions in the number of days of extra work at home should be introduced, which could result in a reduction of fatigue.

Another finding was that lack of communication with colleagues is related to prolonged fatigue. Effective communication is an essential tool in maintaining and improving interpersonal relations. One study demonstrated that poor relations with colleagues are associated with high levels of prolonged fatigue²⁵, and poor relationships in the workplace create a stressful environment³⁰. In the present study, although approximately 70% of the respondents indicated that there was a good

level of communication in the workplace, nearly 10% said there was a lack of good communication. Since the respondents in this latter group were believed to have higher degrees of prolonged fatigue, we can deduce that interpersonal issues due to poor communication may be related to prolonged fatigue. In addition, lack of sufficient support from colleagues also reached statistical significance with prolonged fatigue in our final model, which is in accordance with previous studies³¹). Other studies have also highlighted such issues as intimidation and harassment at work^{32, 33}). Since the present study did not assess these factors in the teaching context, further research is necessary.

Teachers who were concerned about evaluations given by the board of education or their supervisors had a higher degree of prolonged fatigue. However, it was remarkable that approximately 50% of respondents were unconcerned about such evaluations. When the results are examined by age-group, more teachers aged 50 and above responded that they did not care about these evaluations. Thus, because approximately 45% of the respondents were at least 50 yr old, more teachers in this study responded that they did not care about being evaluated. Furthermore, 32.8% of the teachers in their 20s indicated that they were concerned about these evaluations, though this figure was only 19.3% among teachers 50 yr or older. A previous study has demonstrated that teachers who think their abilities are underestimated by their supervisors tend to be less mentally healthy¹¹). Since these evaluations have an impact on personnel changes and job-promotion assessments, it is natural that young teachers should be concerned about whether they are being appropriately evaluated. Inappropriate evaluations are known to have a psychological impact³⁴). Therefore, such evaluations might be a cause of prolonged fatigue for younger teachers who may have little experience of personnel changes or promotion assessments.

Meanwhile, teachers who felt that their current job did not reflect their level of education or training tended to have more fatigue. Other studies also recognized that not using acquired skills becomes a mental burden^{30, 35}). Teachers are not necessarily always appointed to jobs in which they can best use their skills and experience. Approximately 30% of the respondents thought that their work did not fully utilize their education or training, which would suggest that the prevalence of prolonged fatigue would tend to be higher among such individuals. It may further be speculated that working under new working conditions could increase prolonged fatigue.

Approximately 30% of the respondents believed that they did not have good future work prospects, and this

has been reported as being associated with fatigue³⁶). Those who responded as lacking future prospects may have been suffering from fatigue at the time of the survey. Further studies are needed to elucidate the impact of lack of future prospects on mental health.

Our findings suggest that feelings of insecurity regarding job prospects owing to health were related to prolonged fatigue. Previous studies have indicated that job insecurity can lead to health problems^{37, 38}). Such insecurity may be considered a potential factor when dealing with prolonged fatigue of teachers.

In univariate analysis, factors of high responsibility, occasional overtime work, and unequal opportunities in the workplace were positively related to prolonged fatigue; however, they were excluded from our final model because of reversals of signs between the simple and multiple regression models, and thus it was difficult to ascertain the effect of any one variable. The probable reason is that the relation among these three factors and prolonged fatigue was hidden in the bivariate correlations with other factors under evaluation; we were, however, unable to define exactly which factor(s) led to the result. We were likewise unable to conclude whether they were unrelated to prolonged fatigue. From our final model, the following were not significantly associated with prolonged fatigue a gradual increase in workload over recent years; poor communication with supervisors; difficulties or worries in dealing with students and parents; lack of appreciation and popularity despite hard work and effort; considering hard work and effort, dissatisfaction with income. There is, however, the possibility of the suppression effect affecting the significance of the results.

This study focused on the factors that may relate to prolonged fatigue. Although overall, Cronbach's alpha reliability coefficient showed an acceptable internal consistency reliability, we analyzed the data using individual factors instead of a summated score. This approach may introduce the problem of unknown reliability for each factor. Weak or nonexistent association of the above factors might also result from low reliability of the measure. With respect to the factors not included in our final model or showing no significance from the model of the present study, some have been identified in previous studies^{39, 40}) as affecting the psychological and physical health of teachers. In the light of such findings, we will have to evaluate these factors in future studies before drawing any conclusions.

The present study has some limitations. First, it is cross-sectional, and the observed associations have to be interpreted cautiously, the main reason being that the study is observational in nature, not experimental. Second, this study was conducted in a single city in

Japan, so the results obtained here may not apply to teachers working in other areas or in different types of schools. Third, this study investigated only incumbent teachers and excluded teachers who had retired or taken leave for health reasons. It is possible that the subjects in this study were in a better state of mental health than retired teachers. In addition, it may have been that the nonrespondents in this study did not take part because they were too busy⁴¹), and these individuals may have been suffering more from fatigue than those who did take part. The factors of working conditions relating to prolonged fatigue among the nonrespondents were unknown. However, we could not exclude the possibility that including populations of the aforementioned cases might give a similar or a more significant result.

The CIS has four subscales, which are subjective feelings of fatigue, concentration, motivation, and physical activity. This study was designed to evaluate prolonged fatigue only using summated ratings relating to these subscales. It would be interesting if some working conditions were risk factors for one sub-domain of fatigue but not for another so as to define which domain could be predicted best by factors of working conditions. We intend to address this issue in a future study.

Despite these limitations, we were able to evaluate the factors of teachers' working conditions associated with prolonged fatigue. Our results suggest that prolonged fatigue is associated with diverse components of the professional environment. These components relate not only to workload, but also to career and communication in the school. Further studies evaluating factors of work conditions for teachers indicated by the present investigation, and elucidating the causal relationship between these factors and prolonged fatigue, would greatly benefit schools and local education boards as well as the teachers themselves to determine whether a policy towards improving working conditions should be implemented to prevent fatigue.

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