



School Ijime (Bullying) Experience Is a Possible Risk Factor for Current Psychological Distress among Science City Workers: A Cross-Sectional Study in Tsukuba, Japan

Tomohiko Ikeda,¹ Daisuke Hori,² Yu Ikeda,¹ Tsukasa Takahashi,¹ Nagisa Shiraki,¹ Christina-Sylvia Andrea,¹ Yuh Ohtaki,³ Shotaro Doki,² Yuichi Oi,² Shinichiro Sasahara,² Tamaki Saito² and Ichiyo Matsuzaki^{2,4}

¹Graduate School of Comprehensive Human Sciences, University of Tsukuba, Tsukuba, Ibaraki, Japan

²Faculty of Medicine, University of Tsukuba, Tsukuba, Ibaraki, Japan

³Hospital Bando, Bando, Ibaraki, Japan

⁴International Institute for Integrative Sleep Medicine, Tsukuba, Ibaraki, Japan

Early-life adversities are considered to have long-term impact on health. There have been many studies regarding the experience of being bullied and its harmful psychological influence, but such influence on workers remains to be investigated in Japan. We therefore aimed to examine the prevalence of workers with experiences of being bullied or bullying others during childhood and adolescence and to clarify the relation between those experiences and current psychological distress. A cross-sectional study using an anonymous self-report web questionnaire was conducted in November 2017. The study population was 19,481 workers belonging to the Tsukuba Science City Network, and we analyzed the data of 6,015 participants (3,715 men and 2,300 women, aged between 20 years and 59 years). The percentages of participants with experiences of being bullied were 51.5% for men and 56.2% for women; those with experiences of bullying others were 36.5% of men and 29.4% of women. Relations between experiences of bullying and psychological distress were assessed using Chi-squared tests. Logistic regression analyses with psychological distress as an objective variable and experiences of bullying as explanatory variables were performed using those who had no bullying experiences as control. In both men and women, experiences of being bullied were significantly associated with psychological distress after adjustment socioeconomic factors (the odds ratios were 1.26 for men (95% CI = 1.05-1.52) and 1.72 for women (95% CI = 1.39-2.13)). Consideration of past social experiences, such as being bullied, is useful for mental health management among workers reporting psychological distress.

Keywords: depression; Ijime (bullying); Japan; Tsukuba Science City; worker
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Introduction

Currently, mental stress in workers has become a crucial issue. In the United States, productivity losses due to depression are reported to be comparable to treatment costs of serious diseases, such as cardiovascular diseases and AIDS (Greenberg et al. 1993). In Japan, poor mental health among workers is considered a compelling matter (Ministry of Health, Labour and Welfare 2014). The disease cost for depressive disorders is estimated to be 3,090,050,000,000

yen (direct cost: 209,036,000,000 yen; morbidity cost: 2,012,372,000,000 yen; mortality cost: 868,642,000,000 yen) (Ministry of Health, Labour and Welfare 2010).

Psychological resources possessed by individuals such as self-esteem and self-efficacy, as well as workplace resources such as surrounding support and job demands, are important factors that have been found to affect the psychological health of workers (Schaufeli and Bakker 2004). Psychological resources are known to be affected by early-life adversities (Felitti et al. 1998), with bullying during

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Correspondence: Shinichiro Sasahara, M.D., Ph.D., Faculty of Medicine, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8575, Japan.

e-mail: s-sashara@md.tsukuba.ac.jp

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school-years being one of adversities that has been shown to have a long-term impact on health (Hugh-Jones and Smith 1999). Thus, there might be a relation between bullying experience at school and later psychological distress during adulthood. Regarding the experience of being bullied, the National Basic Academic Skills Survey of children aged 11 to 17 years, conducted in the UK in 2011, revealed that the rate of experiencing bullying was 44% (Benton 2011). In Japan, 47.5% of boys and 50.9% of girls in elementary schools had experiences of being bullied, such as “exclusion from the group, neglect, and backbiting” during the past half year, according to a survey on fourth-grade elementary school to third-grade middle school pupils (Cabinet office 2019).

There are multiple studies on the relation between childhood experiences of being bullied and current depression among working adults. A former study on teachers showed a relation between the experience of being bullied and loneliness (along with difficulty in forming friendships) (Townsend et al. 2017), while another study on soldiers showed a relation between childhood experiences of being bullied and adulthood suicidal ideation (Campbell et al. 2017). In addition to studies focusing on the experience of being bullied, there are also reports focusing on the experience of bullying others. These include a report that childhood bullies had a significantly higher risk of being diagnosed with antisocial personality disorder after reaching adulthood (Copeland et al. 2013), and another study reporting that childhood bullies have significantly higher risks of low education levels, unemployment, or illegal drug use (Sigurdson et al. 2014).

Furthermore, relations between bullying and socioeconomic factors, such as academic performance and income, in addition to psychological factors, have been surveyed. For example, a UK survey of the relation between adolescent experience of being bullied or bullying others and academic performance and income at ages 23, 33, or 42 years revealed that academic performance was lower in those who bullied or were bullied, and that income was lower in those who were bullied (Brown and Taylor 2008). A follow-up study found that people with experiences of being bullied showed a significantly higher unemployment rate at 50 years of age compared to those without such experiences (Brimblecombe et al. 2018).

In Japan, many studies regarding the experience of being bullied and its harmful psychological influence on pupils as well as university students have been conducted. For example, a study on elementary school pupils showed that those who were bullied experienced emotional instability and decreased aspiration for activity (Kubota 2003). A study on university students demonstrated that students who had experienced a higher degree of distress due to bullying reported more mental and physical disorders (Banzai 1995).

Comparing such Japanese studies with reports from foreign countries has revealed several differences. First, Japanese studies up to date are mostly limited to the exami-

nation of short-term influences on students, while few studies have examined medium- to long-term influences on working adults. It is possible that past experiences of being bullied affect current mental stress in working adults; however, this has not been verified. Second, most Japanese studies have focused only on the experiences of being bullied, but the implications of the experience of bullying others have not yet been explored. In Japan, group-bullying is more prevalent than in Western countries, and there are many cases of bullying by neglect or exclusion from human relations (social exclusion) (Morita 2001). On the other hand, bullying by direct violence is known to be more prevalent in Western countries. Therefore, the medium- to long-term influence of bullying or being bullied may be markedly different between Japan and foreign countries. In other words, although both violence and social exclusion may inflict a psychological burden on people being bullied, it is possible that the psychological burden of group bullying through neglect is lower when compared to using violence.

We deem that clarifying the relation between childhood experiences of bullying and adult mental stress will provide beneficial information for the management of adult workers' mental health in Japan. To take measures for workers' mental health and psychological distress, it is important to focus on both workplace resources and psychological resources (Schaufeli and Bakker 2004). However, we found little evidence about such influence on workers in Japan. In this study, we therefore aimed to provide an insight on the prevalence of people with experiences of being bullied or bullying others during childhood and adolescence, and to clarify the relation between those experiences and current mental stress among adult workers in Japan.

Methods

Study design and participants

This is one of a series of studies that used the data obtained from an anonymous web survey conducted by the Tsukuba Science City Network in 2017. The Tsukuba Science City Network consists of 89 organizations, including research institutes, universities, and local governments. The Tsukuba Science City Network has been conducting the Living Condition and Workplace Stress Survey once every five years from 1986. The purpose of this survey is to investigate the mental health status, living conditions, and workplace environment of workers in Tsukuba. In this research, we secondarily used the data from the 7th living Condition and Workplace Stress Survey conducted in 2017. The survey assessed experiences of bullying (experiences of bullying others and experiences of being bullied), current psychological distress using the K6 scale, the Brief Scale for Job Stress (BSJS), sex, age, marital status, educational background, position, household income, and smoking habits. The study population was 19,481 workers. The methodology has been described in detail in previous reports (Hori et al. 2019; Takahashi et al. 2019). In this study, the

analysis included workers aged between 20 years and 59 years who responded to all survey items.

Questionnaire

Experiences of bullying: Evaluation of experiences of bullying was made based on the responses to the following two questions: “Have you ever bullied other people?” (experience of bullying others) and “Have you ever been bullied by other people?” (experience of being bullied by other people). There were six answer options, “No,” “Experienced while at elementary school,” “Experienced while at middle school,” “Experienced while at high school,” “Experiences while at university or later,” and “No response.” The data were analyzed by using the options of “No” (no experience), “Experienced while at elementary school,” “Experienced while at middle school,” and “Experienced while at high school” (with experience). “Experiences while at university or later” answers were excluded from the analysis as this study focused on examining long-term influences of bullying in childhood and adolescence. “No response” answers were also excluded from analysis.

K6, Japanese version: K6 is a widely used international mental stress scale (Kessler et al. 2002). With regard to the frequency of “nervousness,” “hopelessness,” “uncomfortable,” “feeling down,” “hard to do anything,” and “I feel that I am a worthless person” during the past 30 days, the subjects are required to choose one of the following options: “Not at all” (0 points), “Only a little” (1 point), “Sometimes” (2 points), “Mostly” (3 points), and “Always” (4 points). A higher total score (0-24 points) represents a higher level of depression, and a total score of 5 points or higher indicates the presence of psychological distress. The validity of the Japanese version has been demonstrated by previous studies (Furukawa et al. 2008).

BSJS: BSJS is a questionnaire for evaluating job stress (Nishikido et al. 2000). With regard to the 20 questions, such as “Too much work to do” and “I often have trouble in human relations at the workplace,” respondents are required to answer according to their current work situation by choosing appropriate options from the following: “Yes” (1 point), “Mostly yes” (2 points), “I agree a little” (3 points), and “Not at all” (4 points). The 20 questions are classified into the following six categories: “Workload,” “Mental workload,” “Problems in personal relationships,” “Reward from work,” “Job control,” and “Support from colleagues and superiors” with the mean scores (1.00-4.00 points) for individual categories being calculated. The first three categories are stress-enhancing factors and the last three categories (considered to have sufficient internal validity) are stress-relaxing factors (Nishikido et al. 2000).

Socioeconomic factors: For age groups, we categorized respondent ages into the following four categories: 20s (20-29 years), 30s (30-39 years), 40s (40-49 years), and 50s (50-59 years). Marital status included three options of Married, Divorced/Widowed, and Never married.

Educational background had four options of graduate school, university, college, and high school. Two options of Manager and Non-manager were given for position. Household income per year included four options of 12 million yen or more, 8-12 million yen, 4-8 million yen, and 4 million yen or less. The smoking habits category had three options of never smoked, quit smoking, and currently smoking.

Statistical analysis

All analyses were performed stratified by sex as K6 scores for women tend to show higher values than in men (Tanji et al. 2018). The respondents were classified into four groups based on the presence or absence of experiences of being bullied (and experiences of bullying others) and the percentage of people with psychological distress was calculated using K6. Next, relationships between experiences of bullying and psychological distress, sex, age, marital status, educational background, position, household income, and smoking habits were calculated using the Chi-squared test. Furthermore, logistic regression analyses using controls of those who had no bullying experiences at all were performed using psychological distress as an objective variable and experiences of bullying, socioeconomic factors, smoking habits, and BSJS as explanatory variables. The two-sided significance level was set at 5% in both tests, and SPSS statistics version 24 for Windows was used as the statistical analysis software.

Ethical considerations

The web survey contained clear statements that participation was entirely voluntary, that it was an anonymous survey, that the privacy of the respondent would be respected, and that the data would be strictly controlled. At a later time, the purpose of and the use for the series of the studies conducted became available to the public via internet. This research proposal was reviewed and approved by the Ethics Committee of the Faculty of Medicine, University of Tsukuba (approval #1374). All procedures were conducted in accordance with the ethical standards of the national research committee and the Helsinki Declaration (or equivalent).

Results

A total of 6,015 participants (3,715 men and 2,300 women) was analyzed. The effective analysis rate was 30.9% and the mean age was 42.7 ± 9.4 years. The attributes of the participants in the analysis set and the percentages of participants with experiences of bullying and psychological distress are shown according to sex in Table 1. The percentages of participants with experiences of being bullied were 51.5% for men and 56.2% for women, those with experiences of bullying others were 36.5% of men and 29.4% of women, and those with psychological distress were 47.5% of men and 53.2% of women.

Relationships between experiences of bullying and

Table 1. Descriptive characteristics of the participants by sexes.

Characteristics	Men		Women	
	n	(%)	n	(%)
Overall	3,715	(100.0)	2,300	(100.0)
Ijime (bullying) experience				
Neither bullies nor bullied	1,374	(37.0)	854	(37.1)
Bullies only	428	(11.5)	153	(6.7)
Bullied only	983	(26.5)	771	(33.5)
Both bullies and bullied	930	(5.9)	522	(22.7)
Psychological distress				
No ($K6 < 5$)	1,952	(52.5)	1,076	(46.8)
Yes ($K6 \geq 5$)	1,763	(47.5)	1,224	(53.2)
Age group				
20-29	333	(9.0)	266	(11.6)
30-39	1,000	(26.9)	675	(29.3)
40-49	1,178	(31.7)	860	(37.4)
50-59	1,204	(32.4)	499	(21.7)
Marital status				
Married	2,716	(73.1)	1,467	(63.8)
Divorced/widowed	91	(2.4)	141	(6.1)
Never married	908	(24.4)	692	(30.1)
Educational attainment				
Graduate school	2,313	(62.3)	642	(27.9)
University	760	(20.5)	849	(36.9)
College etc.	194	(5.2)	500	(21.7)
High school	448	(12.1)	309	(13.4)
Position				
Manager	1,121	(30.1)	152	(6.6)
Non-manager	2,594	(69.8)	2,148	(93.4)
Annual household income, JPY				
12 million or more	591	(15.9)	355	(15.4)
8-12 million	1,459	(39.3)	618	(26.9)
4-8 million	1,338	(36.0)	779	(33.9)
4 million or less	327	(8.8)	548	(23.8)
Smoking status				
Never smoked	2,364	(63.6)	2,004	(87.1)
Quit smoking	813	(21.9)	209	(9.1)
Currently smoking	538	(14.5)	87	(3.8)

psychological distress, as well as socioeconomic factors such as educational background and household income, are shown according to sex in Table 2 and Table 3. The percentages of psychological distress were significantly higher in both men and women who had been bullied. However, the presence or absence of experience in bullying others was not significantly related to psychological distress. No significant relationships between experiences of being bullied or bullying others and the aforementioned socioeconomic factors were observed.

The odds of psychological distress caused by experiences of bullying are shown according to sex in Table 4. In both men and women, statistically significant positive rela-

tionships were observed between experiences of being bullied and psychological distress after adjustment for age, socioeconomic factors, smoking habits, and BSJS. For those who had been bullied alone, the odds ratios after adjustment for age, socioeconomic factors, smoking habits, and BSJS were 1.26 (95% CI = 1.05-1.52) for men and 1.72 (95% CI = 1.39-2.13) for women. For those who had both been bullied and bullied others, the odds ratio was 1.33 (95% CI = 1.10-1.60) for men and 1.70 (95% CI = 1.34-2.17) for women. No significant differences were observed in the relationship between solo bullying and psychological distress.

Table 2. Associations between school Ijime (bullying) experience, psychological distress and other factors (men).

	Neither bullies nor bullied (n = 1,374)	Bullies only (n = 428)	Bullied only (n = 983)	Both bullies and bullied (n = 930)	p value
Psychological distress					
No (K6 < 5)	57.7%	57.7%	47.8%	47.5%	< 0.01
Yes (K6 ≥ 5)	42.3%	42.3%	52.2%	52.5%	
Age group					
20-29	9.2%	9.8%	8.6%	8.5%	0.20
30-39	27.9%	27.1%	26.0%	26.2%	
40-49	30.6%	26.2%	33.8%	33.8%	
50-59	32.2%	36.9%	31.5%	31.5%	
Marital status					
Married	74.0%	75.2%	71.8%	72.2%	0.07
Divorced/widowed	2.2%	3.0%	1.6%	3.4%	
Never married	23.8%	21.7%	26.6%	24.4%	
Educational attainment					
Graduate school	64.0%	57.7%	64.6%	59.4%	0.08
University	19.7%	22.0%	18.3%	23.1%	
College etc.	4.4%	6.3%	5.4%	5.7%	
High school	11.9%	14.0%	11.7%	11.8%	
Position					
Manager	30.9%	34.3%	27.7%	29.8%	0.08
Non-manager	69.1%	65.7%	72.3%	70.2%	
Annual household income, JPY					
12 million or more	15.8%	18.9%	15.6%	15.1%	0.49
8-12 million	39.7%	37.4%	39.8%	38.9%	
4-8 million	35.0%	37.4%	35.6%	37.3%	
4 million or less	9.5%	6.3%	9.1%	8.7%	
Smoking status					
Never smoked	63.3%	57.7%	68.4%	61.8%	< 0.01
Quit smoking	21.3%	25.0%	20.0%	23.3%	
Currently smoking	15.4%	17.3%	11.6%	14.8%	
BSJS (Mean (SD))					
Workload	2.32 (0.83)	2.34 (0.86)	2.47 (0.89)	2.38 (0.89)	
Mental workload	2.39 (0.80)	2.40 (0.78)	2.57 (0.84)	2.49 (0.82)	
Problems in personal relationships	1.92 (0.76)	1.97 (0.72)	2.11 (0.83)	2.10 (0.77)	
Job control	2.89 (0.75)	2.91 (0.72)	2.80 (0.77)	2.81 (0.74)	
Reward from work	2.93 (0.84)	2.91 (0.84)	2.91 (0.86)	2.84 (0.82)	
Support from colleagues and superiors	2.80 (0.67)	2.92 (0.60)	2.70 (0.71)	2.73 (0.67)	

Statistical analyses were conducted with Chi-squared test.

Discussion

The present study surveyed the experiences of being bullied and bullying others during childhood and adolescence and current psychological distress in adult workers. The percentages of being bullied during childhood and adolescence was 51.5% in men and 56.2% in women, higher than the 29.9% reported in a previous survey of 15,686 pupils in the US (Nansel et al. 2001) and 44% in a previous survey in the UK (Cassidy 2009). However, our study's results were consistent with a Japanese survey conducted in

elementary children (Cabinet office 2019).

Experience of bullying during childhood and adolescence and current psychological distress showed a significantly positive relationship after adjustment with socioeconomic factors and BSJS. According to a previous study (Farrington et al. 2012) that meta-analyzed 75 reports obtained from 49 longitudinal studies using 19 web search systems and 63 journals, the adjusted odds ratio of experiences of being bullied during school days and depression later in life was 1.71 (95% CI = 1.49-1.96), which was similar to our result. This suggests that the experience of being

Table 3. Associations between school ltime (bullying) experience, psychological distress and other factors (women).

	Neither bullies nor bullied (n = 854)	Bullies only (n = 153)	Bullied only (n = 771)	Both bullies and bullied (n = 522)	p value
Psychological distress					
No (K6 < 5)	54.7%	54.9%	40.7%	40.4%	< 0.01
Yes (K6 ≥ 5)	45.3%	45.1%	59.3%	59.6%	
Age group					
20-29	12.4%	15.0%	9.6%	12.1%	< 0.01
30-39	28.3%	28.1%	28.0%	33.3%	
40-49	34.3%	29.4%	39.6%	41.6%	
50-59	24.9%	27.5%	22.8%	13.0%	
Marital status					
Married	65.2%	58.8%	63.2%	63.8%	0.73
Divorced/widowed	5.7%	6.5%	6.9%	5.6%	
Never married	22.9%	34.6%	30.0%	30.7%	
Educational attainment					
Graduate school	28.6%	24.8%	28.1%	27.4%	0.44
University	35.7%	45.8%	37.9%	34.9%	
College etc.	22.8%	17.0%	20.5%	23.2%	
High school	12.9%	12.4%	13.5%	14.6%	
Position					
Manager	6.3%	7.8%	6.7%	6.5%	0.91
Non-manager	93.7%	92.2%	93.3%	93.5%	
Annual household income, JPY					
12 million or more	14.4%	17.6%	14.9%	17.2%	0.91
8-12 million	27.4%	24.2%	27.9%	25.3%	
4-8 million	34.4%	34.6%	32.9%	34.1%	
4 million or less	23.8%	23.5%	24.3%	23.4%	
Smoking status					
Never smoked	87.9%	85.0%	89.2%	83.3%	<0.05
Quit smoking	8.9%	9.2%	7.5%	11.7%	
Currently smoking	3.2%	5.9%	3.2%	5.0%	
BSJS (Mean (SD))					
Workload	1.84(0.81)	1.85(0.80)	1.93(0.83)	1.88(0.81)	
Mental workload	1.86(0.80)	1.96(0.83)	1.95(0.87)	1.93(0.80)	
Problems in personal relationships	1.87(0.80)	2.08(0.82)	2.02(0.79)	2.07(0.80)	
Job control	2.66(0.75)	2.82(0.70)	2.62(0.78)	2.64(0.79)	
Reward from work	2.63(0.84)	2.63(0.85)	2.62(0.88)	2.61(0.88)	
Support from colleagues and superiors	2.90(0.73)	2.94(0.69)	2.81(0.72)	2.81(0.71)	

Statistical analyses were conducted with Chi-squared test.

bullied during childhood and adolescence has a long-term influence on the affected people even after they reach working age. Thus, our results suggest the importance of considering not only current job stress but also past social issues, such as experiences of being bullied, in the health management of workers complaining of psychological distress. As a practical application, it could be useful to consider the effects of past experiences such as school bullying when occupational physicians or nurses interview depressed workers.

In the present study, significant relationship between

experiences of bullying others during childhood and adolescence and current psychological distress were not observed. This finding differs from a previous study (Farrington et al. 2012), which reported that the adjusted odds ratio of experiences of bullying others during school-days and depression later in life was 1.41 (95% CI = 1.22-1.64). Bullying, or the “direct action by a small number of people” frequently observed in Western countries (Morita 2001), often develops into anti-social actions, such as violence and extortion, sometimes even becoming an object of police involvement that may result in psychological distress for the bullies as

Table 4. Odds ratios for psychological distress ($K6 \geq 5$) associated with Ijime (bullying) experience by sexes.

Category of Ijime (bullying) experience	Crude model OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)
Men (n = 3,715)			
Neither bullies nor bullied	(ref.)	(ref.)	(ref.)
Bullies only	1.00 (0.80-1.25)	1.01 (0.81-1.25)	1.00 (0.78-1.28)
Bullied only	1.49 (1.26-1.76)	1.50 (1.27-1.77)	1.26 (1.05-1.52)
Both bullies and bullied	1.51 (1.28-1.78)	1.52 (1.28-1.80)	1.33 (1.10-1.60)
Nagelkerke R ²	0.01	0.02	0.29
Women (n = 2,300)			
Neither bullies nor bullied	(ref.)	(ref.)	(ref.)
Bullies only	0.99 (0.70-1.40)	0.98 (0.69-1.48)	0.87 (0.60-1.27)
Bullied only	1.76 (1.44-2.14)	1.80 (1.48-2.20)	1.72 (1.39-2.13)
Both bullies and bullied	1.78 (1.43-2.22)	1.76 (1.41-2.21)	1.70 (1.34-2.17)
Nagelkerke R ²	0.03	0.04	0.22

Statistical analyses were conducted with binomial logistic regression.

Model 1. Adjusted for age group.

Model 2. Adjusted for age group, marital status, educational attainment, annual household income, smoking status, position and the Brief Scale for Job Stress.

well. On the other hand, in Japan, “indirect action by many people”, such as neglect and exclusion from the group, is often observed in bullying situations (Morita 2001). Such indirect type of bullying seems less likely to be linked with antisocial actions and subsequent police involvement, considering that the number of arrests of pupils (primary, middle, and high schools) due to bullying over the past 10 years continues to decrease (National Police Agency 2017). Thus, we speculate that the level of psychological distress inflicted upon those who have experiences of bullying others is low in Japan. This variance in the nature of the prevalent bullying styles between Japan and Western countries may be the reason for differences in the results of our present study compared to previous studies.

Unlike the results of previous studies (Sarah and Karl 2008), significant relationships between the experiences of being bullied or bullying others and socioeconomic factors (such as educational background and household income) were not observed in the present study. Previous studies showed that experiences of being bullied or bullying others were associated with low academic performance and that experiences of being bullied were associated with low income later in life (Sarah and Karl 2008). This could be due to the fact that Western countries predominantly suffer from violent bullies and it is known that children subjected to violent actions suffer from decreased volition and concentration (Ammermueller 2012). Therefore, it is inferred that the experience of being subjected to violent actions decreases volition and concentration for learning, leading to lower educational background and decreased annual income. On the other hand, Japanese bullies use actions such as neglect and exclusion from the group, making the relationship between being subjected to bullying and decreased volition/concentration unclear. In the present

study, we did not survey the specific actions that constitute bullying. However, we infer that the type of bullying predominant in Japan, as discussed above, is one of the reasons why the relationship between the experiences of being bullied, and educational background and household income was not observed. Based on the above findings, it will be important to investigate the relationship between experiences of bullying and being bullied and the rates of delinquency and unemployment according to the specific types of bullying.

One of the strengths of the present study is that we conducted a large-scale epidemiological survey of adult workers regarding experiences of bullying during childhood and adolescence for the first time in Japan. Additionally, this study not only investigated the influences of the total experience of bullying (giving and receiving), but also adjusted for the influences of socioeconomic factors (such as educational background, position, and household income), as well as job stress, which may affect current mental stress.

The limitations of this study are as follows. This is a cross-sectional study and, therefore, the causal relationships were unclear. Most of the study respondents were researchers, i.e., intellectual workers who graduated from universities, and their mean annual household income was higher than that of most workers. Therefore, the relationship between being bullied and annual household income may have been underestimated and generalization of our results to all workers requires caution. The definition of “bullying” was not set out in the questionnaire, possibly causing differential interpretation of the phenomenon among participants. This could explain the higher prevalence in the results. Also, we did not consider the time frame and the severity of the behavior, which could be vital to define bullying behav-

ior versus any other form of aggression. Because of the past-centric nature of the survey, objective evaluation of the presence or absence of bullying was not possible and recall bias may have affected the results. There might be a possibility that bullying experience has had an effect on one's stress coping skills. Factors, such as most recent life events, might have also adversely affected current psychological distress in respondents.

In conclusion, as in previous foreign studies, we confirmed that the experiences of being bullied during childhood and adolescence led to higher rates of current psychological distress. By contrast, no significant association was observed between experiences of bullying others during childhood and adolescence and current psychological distress. In addition, significant relation between the experiences of being bullied or bullying others and educational background and household income were not observed. These differences may be reflective of the variance in the meaning of "bullying" between Western countries and Japan, i.e., "bullying" in Western countries predominantly means violent action often necessitating police involvement, whereas "bullying" in Japan predominantly means non-violent exclusion from human relations, such as neglect. The novelty of the findings includes the consideration of not only job stress but also past human relations, such as experiences of being bullied, as useful for mental health management in workers complaining of psychological distress. The present study also suggests that preventing the onset of mental health disorders, a major challenge in modern occupational health, may be achieved by addressing countermeasures against bullying during childhood and adolescence.

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Conflict of Interest

Tomohiko Ikeda, Daisuke Hori, Yu Ikeda, Tsukasa Takahashi, Nagisa Shiraki, Christina-Sylvia Andrea, Yuh Ohtaki, Shotaro Doki, Yuichi Oi, Shinichiro Sasahara, Tamaki Saito and Ichiyo Matsuzaki are volunteer members of the working group for the survey conducted by Tsukuba Science City Network. Daisuke Hori, Yuichi Oi, Shotaro Doki, Shinichiro Sasahara and Ichiyo Matsuzaki are volunteer members of the Occupational Health Committee of Tsukuba Science City Network.

References

Ammermueller, A. (2012) Violence in European schools: a widespread phenomenon that matters for educational production. *Labour Econ.*, **19**, 908-922.
 Banzai, T. (1995) Long term effects from bullying on a victim and

the differences between the victim's self-perception and the victim's perception of other victim. *Syakai Shinrigaku Kenkyu*, **11**, 105-115.
 Benton, T. (2011) Sticks and stones may break my bones, but being on left on my own is worse: an analysis of reported bullying at school within NFER attitude survey, National Foundation for Educational Research, UK.
<https://www.nfer.ac.uk/publications/ASUR01/ASUR01.pdf>
 [Accessed: March 10, 2020].
 Brimblecombe, N., Evans-Lacko, S., Knapp, M., King, D., Takizawa, R., Maughan, B. & Arseneault, L. (2018) Long term economic impact associated with childhood bullying victimization. *Soc. Sci. Med.*, **208**, 134-141.
 Brown, S. & Taylor, K. (2008) Bullying, education and earnings: evidence from the National Child Development Study. *Econ. Educ. Rev.*, **27**, 387-401.
 Cabinet office (2019) Reiwa gannendo kodomo wakamono hakusho.
https://www8.cao.go.jp/youth/whitepaper/r01honpen/pdf/b1_02_02_03.pdf
 [Accessed: March 10, 2020] (in Japanese).
 Campbell, S.L., Kessler, R.C., Ursano, R.J., Rosellini, A.J., Afifi, T.O., Colpe, L.J., Heeringa, S.G., Nock, M.K., Sampson, N.A., Sareen, J., Schoenbaum, M., Sun, X., Jain, S. & Stein, M.B.; Army STARRS Collaborators (2017) Associations of childhood bullying victimization with lifetime suicidal behaviors among new U.S. Army soldiers. *Depress. Anxiety*, **34**, 701-710.
 Cassidy, A.J. (2009) Bullying and victimisation in school children: the role of social identity, problem-solving style, and family and school context. *Soc. Psychol. Educ.*, **12**, 63-76.
 Copeland, W.E., Wolke, D., Angold, A. & Costello, E.J. (2013) Adult psychiatric outcomes of bullying and being bullied by peers in childhood and adolescence. *JAMA Psychiatry*, **70**, 419-426.
 Farrington, D.P., Lösel, F., Tfofi, M.M. & Theodorakis, N. (2012) School bullying, depression and offending behaviour later in life: an updated systematic review of longitudinal studies.
https://www.bra.se/download/18.1ff479c3135e8540b29800014815/2012_Bullying_perpetration_webb.pdf
 [Accessed: March 10, 2020].
 Felitti, V.J., Anda, R.F., Nordenberg, D., Williamson, D.F., Spitz, A.M., Edwards, V., Koss, M.P. & Marks, J.S. (1998) Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am. J. Prev. Med.*, **14**, 245-258.
 Furukawa, T.A., Kawakami, N., Saitoh, M., Ono, Y., Nakane, Y., Nakamura, Y., Tachimori, H., Iwata, N., Uda, H., Nakane, H., Watanabe, M., Naganuma, Y., Hata, Y., Kobayashi, M., Miyake, Y., et al. (2008) The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int. J. Methods Psychiatr. Res.*, **17**, 152-158.
 Greenberg, P.E., Stiglin, L.E., Finkelstein, S.N. & Berndt, E.R. (1993) Depression: a neglected major illness. *J. Clin. Psychiatry*, **54**, 419-424.
 Hori, D., Takao, S., Kawachi, I., Ohtaki, Y., Andrea, C.S., Takahashi, T., Shiraki, N., Ikeda, T., Ikeda, Y., Doki, S., Oi, Y., Sasahara, S. & Matsuzaki, I. (2019) Relationship between workplace social capital and suicidal ideation in the past year among employees in Japan: a cross-sectional study. *BMC Public Health*, **19**, 919.
 Hugh-Jones, S. & Smith, P.K. (1999) Self-reports of short- and long-term effects of bullying on children who stammer. *Br. J. Educ. Psychol.*, **69**, 141-158.
 Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., Normand, S.L., Walters, E.E. & Zaslavsky, A.M. (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol. Med.*, **32**,

959-976.

- Kubota, M. (2003) The effect of the bullying experience on the physical and mental condition of elementary school students-focusing on classroom group recognition. *Seito Shidogaku Kenkyu*, **2**, 78-88.
- Ministry of Health, Labour and Welfare (2010) Seishin shikkan no syakaiteki cost no suikei. <https://www.mhlw.go.jp/bunya/shougaihoken/cyousajigyoudl/seikabutsu30-2.pdf> [Accessed: March 10, 2020] (in Japanese).
- Ministry of Health, Labour and Welfare (2014) Shokuba ni okeru mental health taisaku no suishin ni tsuite. <https://www.mhlw.go.jp/file/05-Shingikai-10901000-Kenkoukyoku-Soumuka/0000060315.pdf> [Accessed: March 10, 2020] (in Japanese).
- Morita, Y. (2001) *Ijime no kokusai hikaku kenkyu*, Kaneko Shobo, Japan.
- Nansel, T.R., Overpeck, M., Pilla, R.S., Ruan, W.J., Simons-Morton, B. & Scheidt, P. (2001) Bullying behaviors among US youth: prevalence and association with psychosocial adjustment. *JAMA*, **285**, 2094-2100.
- National Police Agency (2017) Heisei 29 nenchu ni okeru shounen no hodo oyobi hogo no gaiyo. https://www.npa.go.jp/safetylife/syonen/hodouhogo_gaikyou/H29.pdf [Accessed: March 10, 2020] (in Japanese).
- Nishikido, N., Kageyama, T. & Kobayashi, T. (2000) Assessment of job-stress using a brief questionnaire: its relations to depression among male workers of an information processing company. *Sangyo Seishin Hoken*, **8**, 73-82.
- Sarah, B. & Karl, T. (2008) Bullying, education and earnings: evidence from the National Child Development Study. *Econ. Educ. Rev.*, **27**, 387-401.
- Schaufeli, W.B. & Bakker, A.B. (2004) Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. *J. Organiz. Behav.*, **25**, 293-315.
- Sigurdson, J.F., Wallander, J. & Sund, A.M. (2014) Is involvement in school bullying associated with general health and psychosocial adjustment outcomes in adulthood? *Child Abuse Negl.*, **38**, 1607-1617.
- Takahashi, T., Hori, D., Ikeda, T., Ikeda, Y., Shiraki, N., Andrea, C.S., Ohtaki, Y., Doki, S., Oi, Y., Sasahara, S. & Matsuzaki, I. (2019) Non-regular employment status is associated with psychological distress among young researchers: a cross-sectional study in tsukuba, Japan. *Tohoku J. Exp. Med.*, **249**, 57-64.
- Tanji, F., Tomata, Y., Zhang, S., Zhang, S., Otsuka, T. & Tsuji, I. (2018) Psychological distress and completed suicide in Japan: a comparison of the impact of moderate and severe psychological distress. *Prev. Med.*, **116**, 99-103.
- Townsend, N., Powers, J. & Loxton, D. (2017) Bullying among 18 to 23-year-old women in 2013. *Aust. NZ J. Public Health*, **41**, 394-398.