

19 items divided into three sections (i.e., team leader, peers, and team), as introduced earlier. The Japanese version of the survey measure of PS was developed according to the procedure specified in the International Society of Pharmacoeconomics and Outcomes Research (ISPOR) task force guidelines [20]. The forward translation was conducted independently by two external translators proficient in Japanese and English. We then performed reconciliation, back-translation, back-translational review, harmonization, and cognitive debriefing. NS and YS conducted reconciliation, and KI chose the appropriate expression of the items. A native English translator back-translated the scale unaware of the original scale. The original developer confirmed and accepted the back-translated measures. Cognitive debriefing sessions were conducted with three Japanese nurses, including HA. Their feedback about difficult wording was used for further modifications. The results from these stages were combined to develop the final measure. The full Japanese version of the survey measure of PS is presented in Supplementary Materials. The final scale contained 19 items, with nine items for the team leader, seven items for peers, and three items for the team as a whole, measured on a seven-point Likert scale. The scale score was calculated by averaging the items. Higher scores indicated greater PS.

Online surveys were administered twice to Japanese employees who had not been appointed as leaders of their team at baseline (January 2022) and at a two-week follow-up (February 2022). The Research Ethics Committee of the Graduate School of Medicine/Faculty of Medicine, The University of Tokyo, approved the study, No. 2019361NI-(3). The study was reported according to the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) guideline, which is used to improve the quality of efforts to develop health-related self-report measurement instruments [21].

Participants living in Japan were invited from the registered panel of an Internet research company (Rakuten Insight Inc., Tokyo, Japan). Equal numbers of HCW and non-HCW were recruited. Participants' inclusion criteria were as below:

- (i) full-time employees 20–65 years old;
- (ii) working for a company with more than five employees;
- (iii) joined a team with more than three members;
- (iv) not a president or manager;
- (v) not a team leader.

All participants at baseline were invited to participate in a two-week follow-up. The follow-up survey was closed after 100 answers were collected.

## 2.2. Measurements

To test the convergent validity, the psychological safety scale for workers developed by Liang et al., social support at work, servant leadership, organization-based self-esteem, and organizational justice were measured.

Psychological safety was measured with the PS scale developed by Liang et al. (2012) that reflects Kahn's [22] focus on the workers' speaking out [15]. The Japanese version of the scale was translated by Ochiai et al. [12]. It contained five items measured on a five-point Likert scale. The items asked workers to rate the extent to which they feel free to express their thoughts and feelings. The scale score was calculated by averaging the items. Higher scores indicated greater PS. Cronbach's alpha was 0.71 in this sample.

Social support at work was measured using the Brief Job Stress Questionnaire (BJSQ) [23] containing items assessed on a four-point Likert scale. Social support at work comprises two subscales: supervisor support (three items) and co-workers' support (three items). A higher score indicated higher social support at work. In this sample, Cronbach's alphas were 0.89 for supervisor support and 0.88 for co-workers' support.

Servant leadership was measured with the Japanese short version of the Servant Leadership Survey (SLS-J) [24] evaluating the employees' supervisors. This scale includes six items measuring empowerment (leader side), three items measuring humility (servant side), three items measuring standing back (servant side), three items measuring stewardship (leader side), and three items measuring authenticity (servant side) on a six-point Likert

scale. The score for each dimension of the SLS-J-short was calculated by averaging the item scores. A higher score indicated stronger servant leadership. Cronbach's alpha was 0.95 for empowerment, 0.91 for humility, 0.84 for standing back, 0.83 for stewardship, and 0.81 for authenticity.

Organization-based self-esteem was measured using the Japanese version of the Organization-based Self-Esteem Scale [25]. This scale has eight items measured on a five-point Likert scale. The scale score was calculated by averaging the items. A higher score indicated higher organization-based self-esteem. Cronbach's alpha was 0.94.

Organizational justice was measured with the Japanese version of the Organizational Justice Questionnaire (OJQ) [26]. The OJQ consists of two subscales: procedural justice and interactional justice. Seven items assess procedural justice, and six items assess interactional justice on a five-point Likert scale. Each factor score was calculated by averaging the items. A higher score indicated a greater degree of organizational justice. Cronbach's alpha was 0.93 for procedural justice and 0.95 for interactional justice.

To examine the associations of the PS scale with mental health and job-related outcomes, psychological distress, work engagement, job performance, and job satisfaction were measured.

Psychological distress was measured with the Japanese version of the K6 scale [27,28]. This scale has six items (felt nervous, hopeless, restless or fidgety, worthless, depressed, and that everything was an effort in the past four weeks) rated on a five-point Likert scale. The total score was calculated by summing all items. The higher score indicated greater distress. Cronbach's alpha was 0.93.

Work engagement was measured using the Japanese version of the Utrecht Work Engagement Scale (UWES-9) [29]. This scale has nine items rated on a seven-point Likert scale. The scale score was calculated by averaging the items. The higher score indicated greater work engagement. Cronbach's alpha was 0.96.

Work performance was evaluated using one item of the Japanese version of the WHO Health and Work Performance Questionnaire (HPQ) [30]. Participants were asked to rate their work performance over the past four weeks. Items were scored on an 11-point scale ranging from 0 (worst) to 10 (best). A high score indicated good work performance.

Job satisfaction was measured by one item from the Brief Job Stress Questionnaire (BJSQ) [23] on a four-point Likert scale. A higher score indicated more job satisfaction.

Demographic variables were gender, age, education attainment, working from home, marital status, company size, occupation (e.g., professions, service workers), and job category (e.g., doctor, nurse) at baseline.

### 2.3. Statistical Analysis

In this study, the HCWs and non-HCWs were analyzed separately. First, the distribution of demographic characteristics as well as means and standard deviations (SDs) for the total scores of the PS scale and its three subscales at baseline and follow-up were calculated. Then, to assess internal consistency and test-retest reliability of the PS scale, Cronbach's  $\alpha$  and intra-class correlation coefficient (ICC) for each of the subscales were calculated, following the COSMIN guidelines [21]. To assess structural validity, a confirmatory factor analysis (CFA) with three factors (i.e., team leader, peers, and team) was conducted to test the goodness of fit of the existing structure of PS. Model fit was assessed using a combination of fit indices including the chi-square ( $\chi^2$ ), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the goodness of fit index (GFI), the Akaike's information criterion (AIC), and the adjusted goodness of fit index (AGFI). If the CFA showed a poor fit, an exploratory factor analysis (EFA), which hypothesized no factor structure with the Promax rotation method, using a robust maximum likelihood estimation, was conducted. To test the hypotheses (expected relationships with other outcomes), convergent validity was examined using Pearson's correlation coefficients ( $r$ ) which were calculated between each score of the PS scale and PS scale for workers developed by



Liang et al., social support at work, servant leadership, organization-based self-esteem, and organizational justice, which was considered to have moderate to high positive correlations with PS scale ( $r > 0.40$ ) [12].

Since both independent and dependent variables were continuous, we conducted multiple linear regression (MLR) analyses to examine the relationship between the PS scale and outcomes (i.e., psychological distress, work engagement, job performance, and job satisfaction). After standardizing these variables, we first examined crude associations. Second, we examined adjusted associations considering the covariates for gender, age, educational attainment, working from home, marital status, company size, occupation, and job category simultaneously. Previous studies related to PS have frequently used MLR analysis [31,32], and this study followed traditional formulas [33,34] to estimate the relationship between theoretically and practically related variables. As literature suggested [1,2], PS can influence outcomes investigated in this study theoretically and conceptually. In addition to the full scale, we examined the relation of three subscales, putting each scale in the model individually (Model 1) and simultaneously (Model 2).

Statistical significance was defined as  $p < 0.05$ . IBM SPSS Statistics® version 28 (IBM, Armonk, NY, USA) and IBM SPSS Amos® version 28 were used for the analyses.

### 3. Results

The demographic characteristics of 400 participants (200 HCW and 200 non-HCW) are presented in Table 1. Among HCWs, 60% of participants were women, 58% were married, and 90% were employed in the medical industry. The mean age was 40.1 (SD = 9.6). HCWs included physicians (14%), nurses/midwives/public health nurses (48%), and others (39%). The number of team members was 20 or more (45%), 11–19 (23%), and 6–10 (21%). Among non-HCWs, 69% of the participants were men, 57% were married, and 25% were employed in the manufacturing industry. The mean age was 43.4 (SD = 10.7). The number of team members was 6–10 (44%), 3–5 (29%), and 11–19 (15%).

Internal consistency and test–retest reliability values of the PS scale are presented in Table 2. For HCWs, the Cronbach's alpha of each section ranged from 0.91 to 0.95, ICC ranged from 0.75 to 0.89, the mean total score was 4.96, and Cronbach's alpha was 0.96. For non-HCWs, Cronbach's alpha ranged from 0.93 to 0.96, ICC ranged from 0.84 to 0.92, the mean total score was 4.63, and Cronbach's alpha was 0.92.

The results of confirmatory factor analyses were  $\chi^2 (149) = 540.001$ , CFI = 0.899, TLI = 0.884, RMSEA = 0.115, SRMR = 0.0444, GFI = 0.764, AIC = 622.001, and AGFI = 0.699 for HCWs. For non-HCWs, the values were  $\chi^2 (149) = 584.778$ , CFI = 0.903, TLI = 0.888, RMSEA = 0.121, SRMR = 0.0472, GFI = 0.733, AIC = 666.778, and AGFI = 0.659. Factor loadings for each item of PS are presented in Table 3. The model fit was poor, so we tried conducting EFA, which hypothesized no factor structure with the Promax rotation method, using a robust maximum likelihood estimation. Table 4 shows the results of the EFA that yielded a two-factor structure. Among HCWs and non-HCWs, Section 2 (peers) and Section 3 (team as a whole) were combined into a single factor.

Table 5 shows correlations between the scores of the PS scales and the scores of the PS scale for workers developed by Liang et al., social support at work, servant leadership, organization-based self-esteem, and organizational justice. The PS score of the full scale and all the three subscales was significantly and positively correlated with the scores of all the scales. For non-HCWs, full scale had a high correlation with PS scale for workers developed by Liang et al. ( $r = 0.735$ ), with supervisor support ( $r = 0.729$ ), with empowerment ( $r = 0.757$ ), and with interactional justice ( $r = 0.723$ ). Section 1 (team leader) had a high correlation with PS scale for workers developed by Liang et al. ( $r = 0.711$ ), supervisor support ( $r = 0.761$ ), empowerment ( $r = 0.753$ ), standing back ( $r = 0.709$ ), and interactional justice ( $r = 0.748$ ). Section 3 (team as a whole) showed high correlation with empowerment ( $r = 0.701$ ). HCW did not achieve high correlations ( $r < 0.70$ ) but showed a similar trend to non-HCW.

**Table 1.** Characteristics of Japanese non-manager employees with more than three team members.

	Healthcare Workers (HCW)		Non-HCW	
	Baseline (n = 200)	Follow-Up (n = 100)	Baseline (n = 200)	Follow-Up (n = 100)
	n (%) / Mean (SD)	n (%) / Mean (SD)	n (%) / Mean (SD)	n (%) / Mean (SD)
Gender				
Men	80 (40.0)	41 (41.0)	138 (69.0)	67 (67.0)
Women	120 (60.0)	59 (59.0)	62 (31.0)	33 (33.0)
Age (year)	40.1 (9.6)	40.8 (9.5)	43.4 (10.7)	43.9 (10.3)
Marital status				
Single	66 (33.0)	27 (27.0)	70 (35.0)	37 (37.0)
Married	116 (58.0)	65 (65.0)	114 (57.0)	54 (54.0)
Divorced/widowed	18 (9.0)	8 (8.0)	16 (8.0)	9 (9.0)
Educational attainment				
High school or less	5 (2.5)	5 (5.0)	50 (25.0)	23 (23.0)
Junior college/vocational school	78 (39.0)	42 (42.0)	26 (13.0)	15 (15.0)
University or higher	117 (58.5)	53 (53.0)	124 (62.0)	62 (62.0)
Occupation				
Professional/technician	180 (90.0)	94 (94.0)	54 (27.0)	32 (32.0)
Clerical	8 (4.0)	4 (4.0)	74 (37.0)	37 (37.0)
Manual workers	4 (2.0)	1 (1.0)	25 (12.5)	10 (10.0)
Service workers	1 (0.5)	0 (0.0)	42 (21.0)	19 (19.0)
Others	7 (3.5)	1 (1.0)	5 (2.5)	2 (2.0)
Type of healthcare worker				
Physicians	28 (14.0)	12 (12.0)	n/a	n/a
Nurses	95 (47.5)	47 (47.0)	n/a	n/a
Others	77 (38.5)	41 (41.0)	n/a	n/a
Company size				
1000 or more	73 (36.5)	31 (31.0)	82 (41.0)	39 (39.0)
500–999	25 (12.5)	13 (13.0)	16 (8.0)	10 (10.0)
300–499	35 (17.5)	21 (21.0)	18 (9.0)	10 (10.0)
100–299	38 (19.0)	19 (19.0)	31 (15.5)	14 (14.0)
50–99	8 (4.0)	1 (1.0)	23 (11.5)	13 (13.0)
20–49	4 (2.0)	2 (2.0)	15 (7.5)	7 (7.0)
5–19	17 (8.5)	13 (13.0)	15 (7.5)	7 (7.0)
Number of team members				
20 or more	89 (44.5)	40 (40.0)	26 (13.0)	12 (12.0)
11–19	46 (23.0)	24 (24.0)	30 (15.0)	12 (12.0)
6–10	41 (20.5)	21 (21.0)	87 (43.5)	46 (46.0)
3–5	24 (12.0)	15 (15.0)	57 (28.5)	30 (30.0)
Status of team leader				
Manager	79 (39.5)	36 (36.0)	89 (44.5)	46 (46.0)
Not a manager	121 (60.5)	64 (64.0)	111 (55.5)	54 (54.0)
Working style				
Commuting	198 (99.0)	98 (98.0)	134 (67.0)	64 (64.0)
Working from home (WFH)	0 (0.0)	0 (0.0)	15 (7.5)	9 (9.0)
Hybrid	1 (0.5)	1 (1.0)	50 (25.0)	27 (27.0)
Other	1 (0.5)	1 (1.0)	1 (0.5)	0 (0.0)

SD: standard deviation.

**Table 2.** The mean scores of the survey measures of psychological safety and internal and test-retest reliability.

Subscales [Possible Range]	HCW				Non-HCW			
	Baseline (n = 200)		Follow-Up (n = 100)		Baseline (n = 200)		Follow-Up (n = 100)	
	Mean (SD)	Cronbach's $\alpha$	Mean (SD)	ICC	Mean (SD)	Cronbach's $\alpha$	Mean (SD)	ICC
Section 1 (team leader) [1–7]	4.89 (1.32)	0.95	4.76 (1.24)	0.89	4.76 (1.39)	0.96	4.58 (1.50)	0.92
Section 2 (peers) [1–7]	5.04 (1.26)	0.94	4.90 (1.20)	0.83	4.71 (1.41)	0.96	4.73 (1.51)	0.84
Section 3 (team as a whole) [1–7]	4.98 (1.36)	0.91	4.80 (1.24)	0.75	4.59 (1.50)	0.93	4.58 (1.59)	0.90
Full scale [1–7]	4.96 (1.17)	0.96	4.82 (1.11)	0.88	4.71 (1.28)	0.97	4.63 (1.40)	0.92

HCW: healthcare workers. ICC: intra-class correlation coefficient. SD: standard deviation.

**Table 3.** Factor loading scores from the confirmatory factor analysis based on three-factor model.

	Factor Loading Scores	
	HCW (Baseline n = 200)	Non-HCW (Baseline n = 200)
Section 1 (team leader)		
1 If I had a question or was unsure of something in relation to my role at work, I could ask my team leader.	0.81	0.80
2 I can communicate my opinions about work issues with my team leader.	0.88	0.85
3 I can speak up about personal problems or disagreements to my team leader.	0.78	0.85
4 I can speak up with recommendations/ideas for new projects or changes in procedures to my team leader.	0.84	0.86
5 If I made a mistake on this team, I would feel safe speaking up to my team leader.	0.83	0.87
6 If I saw a colleague making a mistake, I would feel safe speaking up to my team leader.	0.81	0.82
7 If I speak up/voice my opinion, I know that my input is valued by my team leader.	0.87	0.92
8 My team leader encourages and supports me to take on new tasks or to learn how to do things I have never done before.	0.86	0.85
9 If I had a problem in this company, I could depend on my team leader to be my advocate.	0.89	0.84
Section 2 (peers)		
1 If I had a question or was unsure of something in relation to my role at work, I could ask my peers.	0.82	0.79
2 I can communicate my opinions about work issues with my peers.	0.86	0.88
3 I can speak up about personal issues to my peers.	0.73	0.76
4 I can speak up with recommendations/ideas for new projects or changes in procedures to my peers.	0.89	0.90
5 If I made a mistake on this team, I would feel safe speaking up to my peers.	0.88	0.94
6 If I saw a colleague making a mistake, I would feel safe speaking up to this colleague.	0.85	0.90
7 If I speak up/voice my opinion, I know that my input is valued by my peers.	0.86	0.92
Section 3 (team as a whole)		
1 It is easy to ask other members of this team for help.	0.87	0.95
2 People keep each other informed about work-related issues in the team.	0.95	0.90
3 There are real attempts to share information throughout the team.	0.83	0.86

HCW: healthcare workers.

**Table 4.** Exploratory factor analysis without assuming the number of factors by using maximum likelihood method with Promax rotation.

	Factor Loading Score	
	Factor 1	Factor 2
HCW (baseline n = 200)		
(peers) 5 If I made a mistake on this team, I would feel safe speaking up to my peers.	<b>0.927</b>	−0.061
(peers) 2 I can communicate my opinions about work issues with my peers.	<b>0.921</b>	−0.096
(peers) 4 I can speak up with recommendations/ideas for new projects or changes in procedures to my peers.	<b>0.846</b>	0.043
(peers) 1 If I had a question or was unsure of something in relation to my role at work, I could ask my peers.	<b>0.813</b>	0.012
(peers) 3 I can speak up about personal issues to my peers.	<b>0.812</b>	−0.105
(peers) 6 If I saw a colleague making a mistake, I would feel safe speaking up to this colleague.	<b>0.794</b>	0.069
(peers) 7 If I speak up/voice my opinion, I know that my input is valued by my peers	<b>0.779</b>	0.106
(team as a whole) 2 People keep each other informed about work-related issues in the team.	<b>0.725</b>	0.167
(team as a whole) 1 It is easy to ask other members of this team for help.	<b>0.645</b>	0.180
(team as a whole) 3 There are real attempts to share information throughout the team.	<b>0.519</b>	0.295
(team leader) 9 If I had a problem in this company, I could depend on my team leader to be my advocate.	−0.064	<b>0.948</b>
(team leader) 7 If I speak up/voice my opinion, I know that my input is valued by my team leader.	−0.092	<b>0.946</b>
(team leader) 8 My team leader encourages and supports me to take on new tasks or to learn how to do things I have never done before.	0.030	<b>0.848</b>
(team leader) 6 If I saw a colleague making a mistake, I would feel safe speaking up to my team leader.	−0.029	<b>0.832</b>
(team leader) 4 I can speak up with recommendations/ideas for new projects or changes in procedures to my team leader.	0.065	<b>0.778</b>
(team leader) 1 If I had a question or was unsure of something in relation to my role at work, I could ask my team leader.	0.036	<b>0.778</b>
(team leader) 2 I can communicate my opinions about work issues with my team leader.	0.071	<b>0.747</b>
(team leader) 5 If I made a mistake on this team, I would feel safe speaking up to my team leader.	0.141	<b>0.728</b>
(team leader) 3 I can speak up about personal problems or disagreements to my team leader	0.093	<b>0.703</b>
Non-HCW (baseline n = 200)		
(peers) 6 If I saw a colleague making a mistake, I would feel safe speaking up to this colleague.	<b>0.975</b>	−0.109
(peers) 5 If I made a mistake on this team, I would feel safe speaking up to my peers.	<b>0.960</b>	−0.037
(peers) 4 I can speak up with recommendations/ideas for new projects or changes in procedures to my peers.	<b>0.886</b>	0.018
(peers) 7 If I speak up/voice my opinion, I know that my input is valued by my peers.	<b>0.880</b>	0.048
(peers) 3 I can speak up about personal issues to my peers.	<b>0.863</b>	−0.144
(peers) 2 I can communicate my opinions about work issues with my peers.	<b>0.844</b>	0.033
(peers) 1 If I had a question or was unsure of something in relation to my role at work, I could ask my peers.	<b>0.777</b>	0.013
(team as a whole) 1 It is easy to ask other members of this team for help.	<b>0.679</b>	0.271
(team as a whole) 2 People keep each other informed about work-related issues in the team.	<b>0.661</b>	0.239
(team as a whole) 3 There are real attempts to share information throughout the team.	<b>0.611</b>	0.221
(team leader) 3 I can speak up about personal problems or disagreements to my team leader.	−0.131	<b>0.952</b>
(team leader) 7 If I speak up/voice my opinion, I know that my input is valued by my team leader.	−0.008	<b>0.929</b>
(team leader) 2 I can communicate my opinions about work issues with my team leader.	−0.022	<b>0.881</b>



Table 4. Cont.

	Factor Loading Score	
	Factor 1	Factor 2
(team leader) 1 If I had a question or was unsure of something in relation to my role at work, I could ask my team leader.	−0.098	<b>0.875</b>
(team leader) 4 I can bring recommendations/ideas for new projects or changes in procedures to my team leader.	0.013	<b>0.856</b>
(team leader) 5 If I made a mistake on this team, I would feel safe speaking up to my team leader.	0.061	<b>0.829</b>
(team leader) 8 My team leader encourages and supports me to take on new tasks or to learn how to do things I have never done before.	0.128	<b>0.750</b>
(team leader) 6 If I saw a colleague making a mistake, I would feel safe speaking up to my team leader.	0.145	<b>0.708</b>
(team leader) 9 If I had a problem in this company, I could depend on my team leader to be my advocate.	0.184	<b>0.696</b>

Note: Bold-faced font emphasized the larger loading scores between Factor 1 and 2.

Table 5. Pearson's correlation coefficients between each subscale on the psychological safety scale and other psychometric scales (convergent validity).

Scales [Possible Range]	HCW (n = 200)				Non-HCW (n = 200)			
	Full Scale	Section 1 (Team Leader)	Section 2 (Peers)	Section 3 (Team as a Whole)	Full Scale	Section 1 (Team Leader)	Section 2 (Peers)	Section 3 (Team as a Whole)
Psychological Safety Scale for Workers [1–5]	0.657 *	0.628 *	0.536 *	0.603 *	0.735 *	0.711 *	0.589 *	0.700 *
Social support at work (BJSQ)								
Supervisor support [1–4]	0.640 *	0.696 *	0.425 *	0.553 *	0.729 *	0.761 *	0.537 *	0.647 *
Coworkers support [1–4]	0.557 *	0.389 *	0.612 *	0.593 *	0.672 *	0.501 *	0.694 *	0.715 *
Servant leadership survey								
Empowerment [1–6]	0.655 *	0.680 *	0.481 *	0.560 *	0.757 *	0.753 *	0.589 *	0.701 *
Humility [1–6]	0.494 *	0.547 *	0.315 *	0.428 *	0.644 *	0.654 *	0.500 *	0.567 *
Standing back [1–6]	0.564 *	0.609 *	0.384 *	0.486 *	0.694 *	0.709 *	0.538 *	0.597 *
Stewardship [1–6]	0.574 *	0.580 *	0.440 *	0.496 *	0.625 *	0.595 *	0.525 *	0.573 *
Authenticity [1–6]	0.572 *	0.616 *	0.398 *	0.471 *	0.660 *	0.649 *	0.538 *	0.581 *
Organization-based self-esteem [1–5]	0.421 *	0.387 *	0.403 *	0.306 *	0.529 *	0.477 *	0.466 *	0.512 *
Organizational justice								
Procedural justice [1–5]	0.570 *	0.586 *	0.419 *	0.505 *	0.594 *	0.586 *	0.471 *	0.548 *
Interactional justice [1–5]	0.596 *	0.654 *	0.397 *	0.501 *	0.723 *	0.748 *	0.547 *	0.629 *

HCW: healthcare workers; BJSQ: Brief Job Stress Questionnaire; \*  $p < 0.01$ .

The results of the MLR analyses are shown in Table 6. In HCWs, the full scale showed significant associations with low psychological distress (adjusted  $\beta = -0.508$ ,  $p < 0.001$ ), high work engagement (adjusted  $\beta = 0.462$ ,  $p < 0.001$ ), high job performance (adjusted  $\beta = 0.476$ ,  $p < 0.001$ ), and high job satisfaction (adjusted  $\beta = 0.592$ ,  $p < 0.001$ ). In Model 1 (individually entered), all three subscales of the scale (team leader, peer, and team as a whole) were significantly associated with low psychological distress, high work engagement, high job performance, and high job satisfaction. In Model 2 (simultaneously entered), Section 1 (team leader) was significantly associated with high work engagement, high job performance, and high job satisfaction in the adjusted model. Section 2 (peers) was significantly associated with low psychological distress. Section 3 (team as a whole) was significantly associated with high job satisfaction.

**Table 6.** Associations of psychological safety scale with psychological distress, work engagement, job performance, and job satisfaction.

Variables	Psychological Distress (K6)						Work Engagement (UWES-9)						Job Performance (HPQ)						Job Satisfaction (BJSQ)					
	Crude			Adjusted <sup>(c)</sup>			Crude			Adjusted <sup>(c)</sup>			Crude			Adjusted <sup>(c)</sup>			Crude			Adjusted <sup>(c)</sup>		
	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
<b>HCWs</b>																								
Full scale	−0.507	<0.001 *	−0.508	<0.001 *	0.465	<0.001 *	0.476	<0.001 *	0.462	<0.001 *	0.476	<0.001 *	0.476	<0.001 *	0.597	<0.001 *	0.592	<0.001 *	0.592	<0.001 *	0.592	<0.001 *	0.592	<0.001 *
Model 1 <sup>(a)</sup>																								
Section 1 (team leader)	−0.422	<0.001 *	−0.431	<0.001 *	0.428	<0.001 *	0.428	<0.001 *	0.422	<0.001 *	0.479	<0.001 *	0.477	<0.001 *	0.542	<0.001 *	0.543	<0.001 *	0.543	<0.001 *	0.543	<0.001 *	0.543	<0.001 *
Section 2 (peers)	−0.508	<0.001 *	−0.497	<0.001 *	0.409	<0.001 *	0.409	<0.001 *	0.413	<0.001 *	0.390	<0.001 *	0.390	<0.001 *	0.500	<0.001 *	0.495	<0.001 *	0.495	<0.001 *	0.495	<0.001 *	0.495	<0.001 *
Section 3 (team as a whole)	−0.448	<0.001 *	−0.445	<0.001 *	0.411	<0.001 *	0.411	<0.001 *	0.409	<0.001 *	0.366	<0.001 *	0.381	<0.001 *	0.605	<0.001 *	0.590	<0.001 *	0.590	<0.001 *	0.590	<0.001 *	0.590	<0.001 *
Model 2 <sup>(b)</sup>																								
Section 1 (team leader)	−0.128	0.141	−0.138	0.131	0.243	0.008 *	0.243	0.008 *	0.210	0.026 *	0.396	<0.001 *	0.365	<0.001 *	0.251	0.002 *	0.245	0.003 *	0.245	0.003 *	0.245	0.003 *	0.245	0.003 *
Section 2 (peers)	−0.363	0.001 *	−0.332	0.002 *	0.140	0.193	0.140	0.193	0.162	0.140	0.131	0.219	0.106	0.309	−0.030	0.754	−0.013	0.889	−0.013	0.754	−0.013	0.889	−0.013	0.889
Section 3 (team as a whole)	−0.075	0.473	−0.093	0.384	0.135	0.215	0.135	0.215	0.143	0.195	−0.006	0.955	0.056	0.590	0.459	<0.001 *	0.439	<0.001 *	0.439	<0.001 *	0.439	<0.001 *	0.439	<0.001 *
<b>Non-HCWs</b>																								
Full scale	−0.458	<0.001 *	−0.424	<0.001 *	0.524	<0.001 *	0.524	<0.001 *	0.510	<0.001 *	0.516	<0.001 *	0.494	<0.001 *	0.598	<0.001 *	0.587	<0.001 *	0.587	<0.001 *	0.587	<0.001 *	0.587	<0.001 *
Model 1 <sup>(a)</sup>																								
Section 1 (team leader)	−0.405	<0.001 *	−0.372	<0.001 *	0.504	<0.001 *	0.504	<0.001 *	0.496	<0.001 *	0.498	<0.001 *	0.484	<0.001 *	0.580	<0.001 *	0.574	<0.001 *	0.574	<0.001 *	0.574	<0.001 *	0.574	<0.001 *
Section 2 (peers)	−0.422	<0.001 *	−0.391	<0.001 *	0.413	<0.001 *	0.413	<0.001 *	0.395	<0.001 *	0.425	<0.001 *	0.397	<0.001 *	0.479	<0.001 *	0.467	<0.001 *	0.467	<0.001 *	0.467	<0.001 *	0.467	<0.001 *
Section 3 (team as a whole)	−0.422	<0.001 *	−0.396	<0.001 *	0.522	<0.001 *	0.522	<0.001 *	0.509	<0.001 *	0.474	<0.001 *	0.454	<0.001 *	0.567	<0.001 *	0.552	<0.001 *	0.552	<0.001 *	0.552	<0.001 *	0.552	<0.001 *
Model 2 <sup>(b)</sup>																								
Section 1 (team leader)	−0.185	0.049 *	−0.152	0.103	0.280	0.002 *	0.280	0.002 *	0.278	0.002 *	0.318	<0.001 *	0.318	<0.001 *	0.361	<0.001 *	0.362	<0.001 *	0.362	<0.001 *	0.362	<0.001 *	0.362	<0.001 *
Section 2 (peers)	−0.195	0.086	−0.172	0.133	−0.104	0.327	−0.104	0.327	−0.137	0.209	0.045	0.677	0.006	0.959	−0.032	0.750	−0.035	0.731	−0.035	0.750	−0.035	0.731	−0.035	0.731
Section 3 (team as a whole)	−0.127	0.304	−0.146	0.241	0.405	<0.001 *	0.405	<0.001 *	0.423	<0.001 *	0.207	0.082	0.222	0.064	0.332	0.003 *	0.322	0.004 *	0.322	0.003 *	0.322	0.004 *	0.322	0.004 *

<sup>(a)</sup> Three subscales of psychological safety scale (team leader, peer, and team as a whole) were individually entered. <sup>(b)</sup> Three subscales of psychological safety scale (team leader, peer, and team as a whole) were simultaneously entered. <sup>(c)</sup> The adjusted model additionally adjusted for sex, age, industry, type of healthcare worker, working style (e.g., work from home), educational attainment, company size, and occupation among HCWs, and adjusted for the same variables excluding type of healthcare workers among non-HCWs. K6: Kessler 6; UWES: Utrecht Work Engagement Scale; HCW: healthcare worker; HPQ: Health and Work Performance Questionnaire; BJSQ: Brief Job Stress Questionnaire; \*  $p < 0.05$ .

For non-HCWs, the full scale showed significant associations with low psychological distress (adjusted  $\beta = -0.424$ ,  $p < 0.001$ ), high work engagement (adjusted  $\beta = 0.510$ ,  $p < 0.001$ ), high job performance (adjusted  $\beta = 0.494$ ,  $p < 0.001$ ), and high job satisfaction (adjusted  $\beta = 0.587$ ,  $p < 0.001$ ). In Model 1 (individually entered), all three subscales showed significant associations similar to those observed in HCWs. In Model 2 (simultaneously entered), Section 1 was significantly associated with high work engagement, high job performance, and high job satisfaction in the adjusted model. Section 3 (team as a whole) was associated with high work engagement and job satisfaction. No section showed a significant association with low psychological distress in the adjusted model, but Section 1 in the crude model did show significance.

#### 4. Discussion

The Japanese version of the survey measure of PS developed by O'Donovan et al. demonstrated acceptable high internal consistency, test–retest reliability, and convergent validity. Structural validity remained an issue. The full survey measure of PS showed significant associations with low psychological distress, high work engagement, high job performance, and high job satisfaction. These results were found for both HCWs and non-HCWs. Overall, the Japanese version of the survey measure of PS proved to be reliable and valid for use in all working populations.

In terms of internal consistency, Cronbach's alpha of the full scale exceeded the stringent criterion of 0.80 [35]. The ICC for test–retest (two weeks) reliability was acceptable, except for HCWs in Section 3 (team as a whole). Because Section 3 had a small number of items, discrepancies in the evaluation of one item may easily be reflected in a lower ICC.

In CFA, the three-factor model did not have a good fit theoretically. The indicators of the fit model in CFA showed a low to moderately acceptable fit of the three-factor model. Rather, EFA suggested a two-factor structure. Peers and team as a whole were combined into one factor, suggesting that the Japanese population might imagine colleagues (peers) when they see the word “team”. A future study is needed to examine the structure in another sample.

The factor loading pattern was almost identical for factor 1 (peers and team) among both HCWs and non-HCWs. However, the pattern differed slightly for factor 2 (leader), while “speaking up is valued by team leader” (no. 7) loaded highly on both. For HCWs, a “sense of trust in team leader” (no. 9) and “support for the new task and learning (no.8) had high loadings, while for non-HCWs, “feeling safe discussing personal problems and disagreements” (no. 3) and “communicating about work issues” (no. 2) had high loadings. In clinical settings, patient safety and speaking are likely to be prioritized regardless of leaders' attitudes. While leaders' behavioral integrity affected the reported treatment errors [36], trust in leaders may influence the PS atmosphere among Japanese HCWs. Support for learning new tasks may characterize leaders who create psychologically safe workplaces in Japanese clinical settings. In non-HCWs, a previous study suggested that being allowed to express opinions and doing so were different experiences among Japanese workers [12]. Leaders' willingness to allow and encourage employees to speak up and employees' perceptions of doing so may both be required to ensure PS among non-HCWs.

Convergent validities were also well supported, as we expected. The findings were in line with previous research showing the positive association of PS with supervisor support, co-workers' support, and organizational factors [12]. A supportive work environment may make workers feel safe in taking interpersonal risks. PS has been known to mediate the relationship between servant or inclusive leadership and job-related outcomes (e.g., job performance) [5–8]. Concerning servant leadership, subscales of empowerment showed the greatest associations for both HCWs and non-HCWs. Empowerment in leadership was defined as a motivational concept aimed at fostering a pro-active, self-confident attitude among followers and giving them a sense of personal power by encouraging self-directed decision making, information sharing, and coaching for innovative performance [24]. In Japan, leaders who can empower their team members also facilitate PS. For non-HCWs,

PS was highly correlated ( $r > 0.70$ ) with supervisor factors, such as supervisor support, leadership (especially empowerment), and interactional justice. For HCWs, no measure achieved high correlations. The leader's supportive attitude, examined in previous research, may correspond with PS for non-HCW, and other workplace factors may influence clinical settings. Another reason may be that measurement scales tested for convergent validity were developed for workers (not specifically for HCWs). Overall, theoretical associations suggested good convergent validity for both HCWs and non-HCWs.

The full scale of the survey measure of PS was significantly associated with low psychological distress, high work engagement, high job performance, and high job satisfaction, as we expected. This finding empirically demonstrated the theoretical framework stated in the previous literature [1]. Model 2 (simultaneous entry) showed significant associations between Section 1 (team leader) and work engagement, job performance, and job satisfaction for both HCWs and non-HCWs. Given the Japanese corporate culture that emphasizes hierarchical relationships [37], the team leader may be listening to and respecting others to enhance these job-related positive outcomes. At the same time, low psychological distress was significantly associated with Section 2 (peers) only for HCWs. As mentioned earlier, speaking up is especially important in clinical settings to prioritize patient safety [36]; therefore, for HCWs, an environment where they cannot admit their mistakes or point out those of their peers may cause frustration and psychological distress. A previous study reported that the ability of nurses to forgive themselves and others was significantly associated with PS [38]. Lack of PS from peers may increase the risk of mental health deterioration among HCWs. Peers' role may be more essential for mental health in clinical settings than in other workplaces. PS was associated with high work engagement and job performance in this study. A safe atmosphere where workers can ask questions, communicate opinions, raise issues, and suggest new ideas may increase their motivation.

This study had several limitations. It was conducted online, and participants were recruited from the research company panel, decreasing the generalizability. In addition, the self-reporting style could have biased the results; for example, people with high distress may have rated the items differently. Finally, the cross-sectional nature of the analysis precluded the assessment of causal relationships. Future studies could explore the associations of PS with outcomes using longitudinal design and workers from more diverse backgrounds.

## 5. Conclusions

The Japanese version of the survey measure of PS developed by O'Donovan et al. had acceptable reliability and validity for both HCWs and non-HCWs groups, while structural validity remained an issue and needs further examination. This measure is the first Japanese scale that can evaluate the multidimensional PS of leaders, peers, and teams in the workplace. The associations with other important factors [2] (e.g., creativity, learning behavior) and the mediator role of PS, which recent studies examined [5–11], were not investigated in this study. Such evidence should be replicated in the future, using this scale in Japan. Despite the limitation of the cross-sectional analysis, PS showed positive associations with good mental health and positive job-related outcomes in this study. Considering the present findings that there was a slight difference in impacts of PS in HCWs and non-HCWs on employees' mental health, future research may be able to develop effective interventions to improve PS by industry. Examining multiple aspects of PS may also improve the workplace environment by considering specific issues in each workplace context.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/ijerph19169879/s1>, The final version of the Japanese Psychological Safety Scale.



**Author Contributions:** K.I. was in charge of this study, supervising the process and providing his expert opinion. N.S., A.I., H.A. and K.I. organized the study design and analyzed the data. Collaborators Y.S., D.N. and A.T. ensured that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved. All authors participated in conducting the survey. N.S. wrote the first draft of the manuscript, and all other authors critically revised it. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was supported by AMED under Grant No. 22de0107006h0002. The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; the preparation, review, or approval of the manuscript; and the decision to submit the manuscript for publication.

**Institutional Review Board Statement:** This study was approved by the Research Ethics Committee of the Graduate School of Medicine/Faculty of Medicine, The University of Tokyo, No. 2019361NI-(3).

**Informed Consent Statement:** Online informed consent was obtained from all participants with full disclosure and explanation of the purpose and procedures of this study. We explained that their participation was voluntary, and they could withdraw consent for any reason simply by not completing the questionnaire.

**Data Availability Statement:** The data supporting this study's findings are available from the corresponding author, KI, upon reasonable request.

**Acknowledgments:** We appreciate the support of O'Donovan, the original developer of the scale.

**Conflicts of Interest:** D.N. reports personal fees from Startia, Inc., en-power, Inc., MD.net, AIG General Insurance Company, Ltd., outside the submitted work.

## References

1. Newman, A.; Donohue, R.; Eva, N. Psychological safety: A systematic review of the literature. *Hum. Resour. Manag. Rev.* **2017**, *27*, 521–535. [\[CrossRef\]](#)
2. Frazier, M.L.; Fainshmidt, S.; Klinger, R.L.; Pezeshkan, A.; Vacheva, V. Psychological Safety: A Meta-Analytic Review and Extension. *Pers. Psychol.* **2017**, *70*, 113–165. [\[CrossRef\]](#)
3. Edmondson, A. Psychological Safety and Learning Behavior in Work Teams. *Adm. Sci. Q.* **1999**, *44*, 350–383. [\[CrossRef\]](#)
4. Edmondson, A.C.; Lei, Z. Psychological Safety: The History, Renaissance, and Future of an Interpersonal Construct. *Annu. Rev. Organ. Psychol. Organ. Behav.* **2014**, *1*, 23–43. [\[CrossRef\]](#)
5. Wang, W.; Kang, S.-W.; Choi, S.B. Servant Leadership and Creativity: A Study of the Sequential Mediating Roles of Psychological Safety and Employee Well-Being. *Front. Psychol.* **2021**, *12*, 807070. [\[CrossRef\]](#)
6. Ahmed, F.; Xiong, Z.; Faraz, N.A.; Arslan, A. The interplay between servant leadership, psychological safety, trust in a leader and burnout: Assessing causal relationships through a three-wave longitudinal study. *Int. J. Occup. Saf. Ergon.* **2022**, 1–13. [\[CrossRef\]](#)
7. Li, T.; Tang, N. Inclusive Leadership and Innovative Performance: A Multi-Level Mediation Model of Psychological Safety. *Front. Psychol.* **2022**, *13*, 934831. [\[CrossRef\]](#)
8. Fu, Q.; Cherian, J.; Ahmad, N.; Scholz, M.; Samad, S.; Comite, U. An Inclusive Leadership Framework to Foster Employee Creativity in the Healthcare Sector: The Role of Psychological Safety and Polychronicity. *Int. J. Environ. Res. Public Health* **2022**, *19*, 4519. [\[CrossRef\]](#)
9. Gao, Y.; Liu, H.; Sun, Y. Understanding the Link Between Work-Related and Non-Work-Related Supervisor–Subordinate Relationships and Affective Commitment: The Mediating and Moderating Roles of Psychological Safety. *Psychol. Res. Behav. Manag.* **2022**, *15*, 1649–1663. [\[CrossRef\]](#)
10. Lin, P.T.; Vu, T.T.; Nguyen, V.P.; Wu, Q. Self-Determination Theory and Accountant Employees' Psychological Wellbeing: The Roles of Positive Affectivity and Psychological Safety. *Front. Psychol.* **2022**, *13*, 870771. [\[CrossRef\]](#)
11. Hebles, M.; Trincado-Munoz, F.; Ortega, K. Stress and Turnover Intentions Within Healthcare Teams: The Mediating Role of Psychological Safety, and the Moderating Effect of COVID-19 Worry and Supervisor Support. *Front. Psychol.* **2021**, *12*, 758438. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Ochiai, Y.; Otsuka, Y. Reliability and validity of the Japanese version of the psychological safety scale for workers. *Ind. Health* **2021**. [\[CrossRef\]](#) [\[PubMed\]](#)
13. May, D.R.; Gilson, R.L.; Harter, L.M. The psychological conditions of meaningfulness, safety and availability and the engagement of the human spirit at work. *J. Occup. Organ. Psychol.* **2004**, *77*, 11–37. [\[CrossRef\]](#)
14. Brown, S.P.; Leigh, T.W. A new look at psychological climate and its relationship to job involvement, effort, and performance. *J. Appl. Psychol.* **1996**, *81*, 358–368. [\[CrossRef\]](#) [\[PubMed\]](#)
15. Liang, J.; Farh, C.I.C.; Farh, J.-L. Psychological Antecedents of Promotive and Prohibitive Voice: A Two-Wave Examination. *Acad. Manag. J.* **2012**, *55*, 71–92. [\[CrossRef\]](#)

16. O'Donovan, R.; Van Dun, D.; McAuliffe, E. Measuring psychological safety in healthcare teams: Developing an observational measure to complement survey methods. *BMC Med. Res. Methodol.* **2020**, *20*, 203. [\[CrossRef\]](#)
17. O'Donovan, R.; McAuliffe, E. A systematic review exploring the content and outcomes of interventions to improve psychological safety, speaking up and voice behaviour. *BMC Health Serv. Res.* **2020**, *20*, 101. [\[CrossRef\]](#)
18. Ulusoy, N.; Mölders, C.; Fischer, S. A Matter of Psychological Safety. *J. Cross-Cult. Psychol.* **2016**, *47*, 626–645. [\[CrossRef\]](#)
19. Swendiman, R.A.; Edmondson, A.C.; Mahmoud, N.N. Burnout in Surgery Viewed Through the Lens of Psychological Safety. *Ann. Surg.* **2019**, *269*, 234–235. [\[CrossRef\]](#)
20. Wild, D.; Grove, A.; Martin, M.; Eremenco, S.; McElroy, S.; Verjee-Lorenz, A.; Erikson, P.; ISPOR Task Force for Translation and Cultural Adaptation. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value Health* **2005**, *8*, 94–104. [\[CrossRef\]](#)
21. Gagnier, J.J.; Lai, J.; Mokkink, L.B.; Terwee, C.B. COSMIN reporting guideline for studies on measurement properties of patient-reported outcome measures. *Qual. Life Res.* **2021**, *30*, 2197–2218. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Kahn, W.A. Psychological conditions of personal engagement and disengagement at work. *Acad. Manag. J.* **1990**, *33*, 692–724.
23. Shimomitsu, T.; Ohno, H.; Maruta, T.; Tanigawa, T. *Investigation Research Report Concerning Prevention of Disease Related to Work in 1997 the Ministry of Labor: III Stress Measurement Research Group Report*; Tokyo Medical University: Tokyo, Japan, 2000; pp. 101–169.
24. Kobayashi, Y.; Watanabe, K.; Otsuka, Y.; Eguchi, H.; Kawakami, N.; Imamura, K.; Van Dierendonck, D. Servant Leadership in Japan: A Validation Study of the Japanese Version of the Servant Leadership Survey (SLS-J). *Front. Psychol.* **2020**, *11*, 1711. [\[CrossRef\]](#) [\[PubMed\]](#)
25. Matsuda, Y.; Pierce, J.L.; Ishikawa, R. Development and Validation of the Japanese Version of Organization-Based Self-Esteem Scale. *J. Occup. Health* **2011**, *53*, 188–196. [\[CrossRef\]](#) [\[PubMed\]](#)
26. Inoue, A.; Kawakami, N.; Tsutsumi, A.; Shimazu, A.; Tsuchiya, M.; Ishizaki, M.; Tabata, M.; Akiyama, M.; Kitazume, A.; Kuroda, M.; et al. Reliability and validity of the Japanese version of the Organizational Justice Questionnaire. *J. Occup. Health* **2009**, *51*, 74–83. [\[CrossRef\]](#)
27. Kessler, R.C.; Barker, P.R.; Colpe, L.J.; Epstein, J.F.; Gfroerer, J.C.; Hiripi, E.; Howes, M.J.; Normand, S.-L.T.; Manderscheid, R.W.; Walters, E.E.; et al. Screening for Serious Mental Illness in the General Population. *Arch. Gen. Psychiatry* **2003**, *60*, 184–189. [\[CrossRef\]](#)
28. Sakurai, K.; Nishi, A.; Kondo, K.; Yanagida, K.; Kawakami, N. Screening performance of K6/K10 and other screening instruments for mood and anxiety disorders in Japan. *Psychiatry Clin. Neurosci.* **2011**, *65*, 434–441. [\[CrossRef\]](#)
29. Schaufeli, W.B.; Salanova, M.; González-Romá, V.; Bakker, A.B. The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. *J. Happiness Stud.* **2002**, *3*, 71–92. [\[CrossRef\]](#)
30. Kawakami, N.; Inoue, A.; Tsuchiya, M.; Watanabe, K.; Imamura, K.; Iida, M.; Nishi, D. Construct validity and test-retest reliability of the World Mental Health Japan version of the World Health Organization Health and Work Performance Questionnaire Short Version: A preliminary study. *Ind. Health* **2020**, *58*, 375–387. [\[CrossRef\]](#)
31. Halbesleben, J.R.B.; Rathert, C. The role of continuous quality improvement and psychological safety in predicting work-arounds. *Health Care Manag. Rev.* **2008**, *33*, 134–144. [\[CrossRef\]](#)
32. Anyaegbunam, E.N.; Ndukaihe, I.L.G.; Nwankwo, O.A.; Ugwu, F.O. The interplay between interpersonal relationships and organisational learning behaviour: Influences of psychological safety. *J. Psychol. Afr.* **2021**, *31*, 549–554. [\[CrossRef\]](#)
33. Aiken, L.S.; West, S.G.; Reno, R.R. *Multiple Regression: Testing and Interpreting Interactions*; Sage: Thousand Oaks, CA, USA, 1991.
34. Uyanık, G.K.; Güler, N. A Study on Multiple Linear Regression Analysis. *Procedia Soc. Behav. Sci.* **2013**, *106*, 234–240. [\[CrossRef\]](#)
35. Henson, R.K. Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Meas. Eval. Couns. Dev.* **2001**, *34*, 177–189. [\[CrossRef\]](#)
36. Leroy, H.; Dierynck, B.; Anseel, F.; Simons, T.; Halbesleben, J.; McCaughey, D.; Savage, G.T.; Sels, L. Behavioral integrity for safety, priority of safety, psychological safety, and patient safety: A team-level study. *J. Appl. Psychol.* **2012**, *97*, 1273–1281. [\[CrossRef\]](#)
37. Ono, H. Why do the Japanese work long hours. *Jpn. Labor Issues* **2018**, *2*, 35–49.
38. Poormirzaei, M.; Rahmati, A. Predicting nurses' Psychological safety based on the forgiveness skill. *Iran. J. Nurs. Midwifery Res.* **2018**, *23*, 40–44. [\[CrossRef\]](#)

RESEARCH ARTICLE

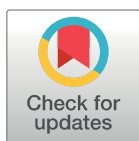
# Victimization and witnessing of workplace bullying and physician-diagnosed physical and mental health and organizational outcomes: A cross-sectional study

Kanami Tsuno<sup>1,2\*</sup>, Norito Kawakami<sup>2</sup>, Akizumi Tsutsumi<sup>3</sup>, Akihito Shimazu<sup>4</sup>, Akiomi Inoue<sup>5</sup>, Yuko Odagiri<sup>6</sup>, Teruichi Shimomitsu<sup>7</sup>

**1** School of Health Innovation, Kanagawa University of Human Services, Kawasaki, Japan, **2** Department of Mental Health, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan, **3** Department of Public Health, Kitasato University School of Medicine, Sagami, Japan, **4** Faculty of Policy Management, Keio University, Fujisawa, Japan, **5** Institutional Research Center, University of Occupational and Environmental Health, Japan, Kitakyushu, Japan, **6** Department of Preventive Medicine and Public Health, Tokyo Medical University, Tokyo, Japan, **7** Tokyo Medical University, Tokyo, Japan

\* These authors contributed equally to this work.

\* [tsuno-ky@umin.ac.jp](mailto:tsuno-ky@umin.ac.jp)



## OPEN ACCESS

**Citation:** Tsuno K, Kawakami N, Tsutsumi A, Shimazu A, Inoue A, Odagiri Y, et al. (2022) Victimization and witnessing of workplace bullying and physician-diagnosed physical and mental health and organizational outcomes: A cross-sectional study. PLoS ONE 17(10): e0265863. <https://doi.org/10.1371/journal.pone.0265863>

**Editor:** Soham Bandyopadhyay, University of Oxford, UNITED KINGDOM

**Received:** March 8, 2022

**Accepted:** September 14, 2022

**Published:** October 26, 2022

**Copyright:** © 2022 Tsuno et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**Data Availability Statement:** The data underlying the results presented in the study are available from the first author (Kanami Tsuno, [k.tsuno-wm4@kuhs.ac.jp](mailto:k.tsuno-wm4@kuhs.ac.jp)) or the School of Health Innovation Research Ethics Committee ([health-innovation@kuhs.ac.jp](mailto:health-innovation@kuhs.ac.jp)).

**Funding:** This study was supported by the Ministry of Health, Labour and Welfare, Japan (#H21-Rodo-Ippan-001) and the Japan Society for the Promotion of Science (#19K19439). The funders

## Abstract

### Background

Compared to the numerous reports on mental health outcomes of workplace bullying victims, research on organizational outcomes of witnesses and physical health outcomes of victims and witnesses is scarce. Therefore, the purpose of this study was to investigate the relationship between bullying victimization and witnessing and various physical and mental health outcomes and organizational outcomes such as sickness absence, work performance, and job satisfaction.

### Methods

This study used cross-sectional data from a nationally representative, community-based sample of 5,000 Japanese residents aged 20–60. We analyzed data from 1,496 respondents after excluding those not working at the time of the survey and those with missing values. Workplace bullying, psychological distress, physical complaints, and job satisfaction were assessed with the New Brief Job Stress Questionnaire and work performance with the World Health Organization's Health and Work Performance Questionnaire. In addition, subjective health status, physician-diagnosed mental or physical illness, and sickness absence were asked as one item. Hierarchical multiple regression analysis or Poisson regression analysis was conducted to assess the association between victimization/witnessing workplace bullying and health and organizational outcomes.

### Results

Both victimization and witnessing workplace bullying were significantly associated with psychological distress, physical complaints, subjective poor health, physician-diagnosed

had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing interests:** The authors have declared that no competing interests exist.

mental disorders, and job dissatisfaction. Victimization of workplace bullying was further associated with physician-diagnosed respiratory diseases, sickness absence ( $\geq 7$  days), and poor work performance. Victims were absent from work for 4.5 more sick days and had 11.2% lower work performance than non-victims.

## Conclusions

The results showed that both victimization and witnessing workplace bullying were significantly associated with physical and mental outcomes and various organizational outcomes. Organizations should implement further measures to prevent personal and organizational losses due to workplace bullying.

## Introduction

Workplace bullying is one of the most severe psychosocial stressors at work. Several meta-analyses and systematic reviews have already been conducted to confirm the association between exposure to workplace bullying and various mental health outcomes, such as depression or anxiety [1, 2], post-traumatic stress disorder (PTSD) [3], sleep [4], and suicidal ideation [5]. These studies clearly show that workplace bullying has unquestionably harmed the mental health of the victims.

Compared to the numerous reports on mental health outcomes of workplace bullying, few studies have focused on physical health outcomes [6]. Disease-level physical health outcomes of workplace bullying have been reported, including cardiovascular disease [7, 8], type 2 diabetes [9], and fibromyalgia [10]. By contrast, an association between workplace bullying and other chronic diseases, such as respiratory and gastrointestinal diseases, has not been thoroughly investigated to the best of our knowledge. For instance, Kivimaki, Elovainio [11] reported that a higher proportion of victims had chronic diseases among Finnish hospital employees ( $n = 5,655$ ). However, they did not report which chronic diseases they had more than non-victims. To date, only one cross-sectional study has reported that bullying was a predictor of asthma, a respiratory disease, in the Peruvian sample of cleaners ( $n = 199$ ) [12]. Although a recent study reported that workplace bullying was associated with increased doctor visits, the diagnosis is unknown [13]. On the other hand, several qualitative studies have reported that victims of workplace bullying had symptoms of asthma or gastric ulcers [14, 15]. Therefore, more quantitative study is needed to investigate the association between workplace bullying and various physical diseases, including respiratory diseases or digestive diseases.

The primary organizational outcomes of workplace bullying are absenteeism, turnover, and work performance. Meta-analytic studies have found significant associations between workplace bullying and sickness absence and poor work performance [16, 17]. However, most of the studies that have examined the work performance of bullying victims have only calculated the correlation coefficient between bullying and work performance without using standardized measures [17, 18]. For example, although Kivimaki, Elovainio [11] reported that victims had a 26% higher risk of taking sickness absence, they did not report how many more days the victims took off for sickness absence than non-victims. To calculate workplace bullying costs [19, 20], clarifying the difference between victims and non-victims is essential. Thus, this study investigates the relationship between bullying and other organizational outcomes, such as job satisfaction, and examines how many more days victims take off as sickness absence and how many percent less they work than non-victims.



Few studies have examined witnesses' health and organizational outcomes after adjusting for exposure to bullying. Most studies have included some victims among the witnesses, contributing to overestimating the health effects of witnessing workplace bullying [21]. Therefore, when investigating witness health outcomes, researchers have to exclude bullied people from witnesses or control for the experience of being bullied to see a "pure" effect of witnessing bullying. Although a multilevel study has reported that department-level bullying can affect subsequent psychological distress and intention to leave, even when controlling for individual exposure to bullying [22], no studies have examined the association between witnessing bullying and organizational outcomes such as sickness absence and work performance, to the best of our knowledge.

To sum up, previous research has focused primarily on mental health outcomes of bullying victimization. Furthermore, most bullying studies used specific workers, such as health care workers, and cannot be generalized to the general working population. To overcome this gap, we conducted a cross-sectional study for a nationally representative sample in Japan. We then investigated the association between bullying victimization and witnessing and various physical and mental health outcomes, such as physician-diagnosed physical and mental disorders, subjective health, and physical complaints, as well as organizational outcomes such as sickness absence, work performance, and job satisfaction.

## Methods

### Participants

This cross-sectional study was conducted in 2010 for a nationally representative community-based sample of 5,000 Japanese residents between the ages of 20 and 60. The details of the random sampling were described elsewhere [23]. A total of 2,384 agreed to participate and completed the questionnaire (response rate: 47.7%). After excluding 751 respondents who were not working at the time of the survey and 137 respondents who had missing responses on sex, age, education, occupation, employment, workplace bullying, subjective health status, sickness absence, job satisfaction, the data from 1,496 respondents were analyzed in this study.

**Ethics statement.** The Ethical Committee of the Graduate School of Medicine/Faculty of Medicine, The University of Tokyo, reviewed and approved this study's aims and procedures before conducting the survey (#2953). The questionnaire was directly sent to each participant's home via the survey company. We informed the participants that their participation in this study was voluntary, and they agreed to participate in the research by filling out an anonymous questionnaire. Thus, implied informed consent was obtained in this study.

### Measures

**Workplace bullying.** Workplace bullying was assessed using a self-labeling method without a definition, using the New Brief Job Stress Questionnaire (New BJSQ) [24, 25]. First, respondents were asked whether they experienced bullying at the survey time. The respondents who answered "1 = very much so" or "2 = moderately so" were defined as "victims" [23]. Respondents were also asked whether there are people who are bullied or harassed in their workplace, and those who answered "1 = very much so" or "2 = moderately so" were defined as "witnesses." Three categories were created from these two questions: "not bullied nor witnessed," "not bullied but witnessed," and "bullied" since both experiencing and witnessing bullying have been reported as risk factors for adverse health outcomes [22].

**Mental health.** Five aspects measured psychological distress: vigor (three items), anger-irritability (three items), fatigue (three items), anxiety (three items), depression (six items) using an 18-item scale of the New BJSQ [24]. Each item sample is "I have been full of energy

(reverse item)" (vigor), "I have felt angry" (anger-irritability), "I have felt extremely tired" (fatigue), "I have felt worried or insecure" (anxiety), and "I have felt sad" (depression). A four-point Likert-style response option was used: "almost never = 1" to "almost always = 4." Average scores of 18 items were calculated for analysis. Higher scores mean having greater psychological distress.

Physician-diagnosed mental disorders were measured by asking whether the individual has received treatment for a mental disorder, including depression. Those who answered "yes" were determined to have a mental disorder. In Japan, "treatment" refers to a medical treatment based on a physician's diagnosis and is performed only by the physician. The Medical Practitioners Law strictly prohibits other medical personnel from performing medical treatment, including medication prescription. Therefore, in this study, "physician-diagnosed mental disorders" refer to mental disorders that a physician is currently treating.

**Physical health.** For physician-diagnosed physical diseases, respondents were asked, "Are you currently receiving treatment for any of the following diseases or symptoms?" and answered "yes" or "no" to chronic diseases such as cardiovascular diseases (i.e., hypertension, heart disease, stroke), diabetes, respiratory diseases (i.e., asthma, chronic bronchitis), digestive diseases (i.e., stomach ulcer, liver disease), and orthopedic diseases (i.e., back pain). In this survey, physician-diagnosed physical diseases refer to diseases currently being treated by a physician. In the analyses, "no" was set as a reference group.

Physical complaints were measured by an 11-item of the New BJSQ [24]. The item samples are "I have experienced headaches" and "I have felt dizzy." Response options were the same as for the psychological distress scale of the BJSQ. The higher the score, the greater the physical complaints.

Subjective health status was measured with a single item, "Overall, how was your health during the past month?" Response options ranged from "not good at all = 1" to "perfect = 6" and those who answered "perfect," "very good," or "good" classified as "good," and those who answered "not so good," "not good," or "not good at all" classified as "poor." In the analyses, "good" was set as a reference group.

**Sickness absence.** To measure sickness absence, we asked, "In the past year, how many days in total did you take off from work due to health problems?" Two categories were created from this question: sickness absence ( $\geq 1$  day) and sickness absence ( $\geq 7$  days). In the analysis, no sick leave and less than 7 days of sick leave were established as the reference groups, respectively.

**Work performance.** A single item measured work performance (relative presenteeism) from the World Health Organization's Health and Work Performance Questionnaire (WHO-HPQ) [25, 26]. The respondents were asked, "On a scale from 0 to 10 where 0 is the worst work performance anyone could have at your job and 10 is the performance of a top worker, how would you rate your overall work performance on the days you worked during the past four weeks (28 days)?" Again, response options were 0 to 10, and a higher score means having more excellent work performance.

## Job satisfaction

Job satisfaction was measured by one item of the New BJSQ [24]. Response options ranged from "dissatisfied = 1" to "satisfied = 4," with those who answered "satisfied" or "somewhat satisfied" classified as "satisfied" and those who answered "somewhat dissatisfied" or "dissatisfied" classified as "dissatisfied." In the analyses, "satisfied" was set as a reference group.

**Other covariates.** As individual and socioeconomic status (SES) characteristics, sex, age, education, household income during the past year, occupation, and employment were asked to the respondents. Then, dummy variables were created for analyses: sex (male = 1,

female = 0), age (under 29 = 1, over 30 = 0), education (high school graduates or below = 1, college graduates or above = 0), household income (less than 2.5 million yen [equivalent to < US\$22,000, if 1\$ = ¥115] = 1, over 250 million yen = 0), occupation (manager = 1, others = 0), and employment (permanent = 1, others = 0).

### Statistical analysis

First, Spearman's correlation coefficients were calculated between all variables. Second, mean values of continuous variables including psychological distress, physical complaints, sickness absence, and work performance were compared among victims, witnesses, and non-victims/non-witnesses by analysis of variance (ANOVA). Then, hierarchical multiple regression analyses were conducted to examine the relationship between experienced or witnessed bullying at work and psychological distress, physical complaints, and work performance. Finally, we conducted Poisson regression analyses to examine the relationship between workplace bullying and categorical health outcomes, including physician-diagnosed diseases and subjective health and organizational outcomes, including sickness absence ( $\geq 1$  or  $\geq 7$ ) and job satisfaction. Prevalence ratios (PRs) and 95% Confidence Intervals (CIs) were calculated, adjusting for individual characteristics (sex and age) and SES variables (education, household income, occupation, and employment status). The 2-tailed *p*-value for statistical significance to see the differences among each social indicator was set at 0.05. All analyses were conducted using SPSS 27.0 for Windows.

## Results

### Characteristics of the respondents

[Table 1](#) shows the characteristics of the respondents of this study. Most of the respondents were males, 40–49 years old, graduated high school or below, had a household income between ¥2.50 million and ¥4.99 million, had professional or technical jobs, and were permanent (full-time) employees. Six percent of the respondent had experienced workplace bullying, and ten percent had not been bullied but witnessed bullying at the workplace. Approximately 60% of the respondents rated their health as "good," had at least one day of sickness absence during the past year, and rated their job satisfaction as "satisfied."

### Correlations between variables

[Table 2](#) shows Spearman's correlation coefficients between all variables in this study. Experiencing workplace bullying was significantly and positively associated with younger age, low household income, psychological distress, physician-diagnosed mental disorders, physician-diagnosed respiratory diseases, physical complaints, subjective poor health, sickness absence, and job dissatisfaction, while significantly and negatively associated with work performance. Witnessing bullying at the workplace was also significantly and positively associated with psychological distress, physician-diagnosed mental disorders, physical complaints, subjective poor health, sickness absence, and job dissatisfaction.

### Comparison of the mean scores of psychological distress, physical complaints, sickness absence, and work performance

[Table 3](#) shows the comparison of the mean values of continuous outcome variables among victims (*n* = 91), witnesses (*n* = 151), and non-bullied/non-witnessed respondents (*n* = 1,254) by ANOVA. The highest scores in victims and second-highest scores in witnesses were observed in psychological distress and physical complaints. Victims reported significantly lower work performance than non-bullied/non-witnessed respondents; the difference of the scores was

Table 1. Characteristics of respondents in this study (N = 1,496).

	n	%		n	%
<b>Individual and socioeconomic characteristics</b>			<b>Health outcomes</b>		
Sex			Physician-diagnosed mental disorders		
Male	781	52.2	Yes	32	2.1
Female	715	47.8	No	1464	97.9
Age			Physician-diagnosed cardiovascular diseases		
< 30	234	15.6	Yes	143	9.6
30–39	422	28.2	No	1353	90.4
40–49	428	28.6	Physician-diagnosed diabetes		
> = 50	412	27.5	Yes	63	4.2
Education			No	1433	95.8
High school graduate or below	679	45.4	Physician-diagnosed respiratory diseases		
Vocational school/college graduate	401	26.8	Yes	36	2.4
University/graduate school graduate	416	27.8	No	1460	97.6
Household income (million yen)			Physician-diagnosed digestive diseases		
< 2.50	125	8.4	Yes	98	6.6
2.50–4.99	453	30.3	No	1398	93.4
5.00–7.49	395	26.4	Physician-diagnosed orthopedic diseases		
7.50–9.99	240	16.0	Yes	191	12.8
≥10.00	152	10.2	No	1305	87.2
Unknown	131	8.8	Physician-diagnosed other chronic diseases		
Occupation			Yes	201	13.4
Managers	144	9.6	No	1295	86.6
Professionals or technicians	338	22.6	Subjective health status		
Clerks	281	18.8	Good	929	62.1
Sales workers	160	10.7	Poor	567	37.9
Service workers	151	10.1			
Production workers and laborers	225	15.0	<b>Organizational outcomes</b>		
Others	197	13.2	Sickness absence ( $\geq 1$ )		
Employment contract			Yes	895	59.8
Permanent	969	64.8	No	601	40.2
Temporary/contract/part-time	477	31.9	Sickness absence ( $\geq 7$ )		
Others	50	3.3	Yes	417	27.9
<b>Workplace bullying</b>			No	1079	72.1
Not bullied nor witnessed	1254	83.8	Job satisfaction		
Not bullied but witnessed	151	10.1	Satisfied	918	61.4
Bullied	91	6.1	Dissatisfied	578	38.6

<https://doi.org/10.1371/journal.pone.0265863.t001>

0.75, which means an 11.2% difference between victims and non-victims ( $0.75/6.72 \times 100$ ). Witnesses also reported significantly lower work performance than non-bullied/witnessed respondents. In contrast, the mean days of sickness absence were not significantly different among victims, witnessed, and non-bullied/non-witnessed respondents, although the difference was 4.5 days between victims and non-victims.

### Relationship between workplace bullying and psychological distress, physical complaints, and work performance

Table 4 shows the results of hierarchical regression analyses of bullying and continuous outcome variables. In Step 2 where sex, age, education, household income, occupation, and



Table 2. Spearman's correlations between variables.

Variables †	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1 Age (under 29 = 1)	1																			
2 Sex (male = 1)	-.07**	1																		
3 Education (high school = 1)	-.10**	-.03	1																	
4 Household income (< 250 = 1)	.04	-.09**	.06*	1																
5 Occupation (manager = 1)	-.13**	.25**	-.04	-.07**	1															
6 Employment (permanent = 1)	.07**	.46**	-.13**	-.18**	.12**	1														
7 Psychological distress	.08**	.08**	-.03	.05*	-.04	.13**	1													
8 Mental disorders (yes = 1)	-.03	.04	.02	.06*	.03	.04	.08**	1												
9 Cardiovascular diseases (yes = 1)	-.13**	.08**	.07*	.03	.14**	-.00	-.02	-.00	1											
10 Diabetes (yes = 1)	-.06*	.11**	.00	-.02	.08**	.02	-.01	.04	.22**	1										
11 Respiratory diseases (yes = 1)	-.01	.00	-.01	.00	-.01	-.02	.05	.01	.04	-.01	1									
12 Digestive diseases (yes = 1)	-.07**	.02	.03	-.01	.02	-.03	.02	.05*	.10**	.08**	.08**	1								
13 Orthopedic diseases (yes = 1)	-.04	-.02	.06*	.00	.01	-.00	.08**	-.04	.05	.06*	.02	.03	1							
14 Other chronic diseases (yes = 1)	-.03	-.07*	-.02	.00	-.04	-.05*	.06*	.01	-.04	-.02	.00	-.03	.03	1						
15 Physical complaints	.03	-.08**	.03	.06*	-.03	.02	.61**	.07**	.01	.05*	.08**	.15**	.17**	.12**	1					
16 Poor subjective health (poor = 1)	.04	-.03	.03	.06*	-.03	.02	.44**	.14**	.08**	.10**	.08**	.14**	.16**	.15**	.46**	1				
17 Sickness absence	.03	-.02	.02	.02	-.04	.02	.10**	.08**	.05*	.04	.07**	.12**	.09**	.13**	.13**	1				
18 Work performance	-.18**	.02	.07**	-.02	.01	-.08**	-.21**	-.04	.03	.02	-.02	.03	.03	-.04	-.08**	-.10**	-.07**	1		
19 Job dissatisfaction (dissatisfied = 1)	.10**	.05*	.01	.01	-.05*	.09**	.49**	.03	-.02	-.01	.06*	.03	.06*	.07**	.28**	.26**	.08**	-.20**	1	
20 Bullied at work (yes = 1)	.06*	.00	-.03	.10**	-.03	-.01	.21**	.08**	-.02	.02	.07**	.00	.03	.04	.16**	.16**	.07**	-.08**	.17**	1
21 Witnessed bullying at work (yes = 1)	-.03	.01	-.03	.01	-.05	-.00	.18**	.06*	-.01	-.04	.02	.03	-.00	.04	.10**	.10**	.05	-.01	.12**	-.09**

SD: Standard deviation.

\*  $p < .05$ \*\*  $p < .01$ .<https://doi.org/10.1371/journal.pone.0265863.t002>

**Table 3. Mean values of psychological distress, physical complaints, sickness absence, and work performance of bullied respondents (n = 91) and witnesses (n = 151) compared with non-bullied/witnessed respondents (n = 1,254): ANOVA.**

Variables:	Mean	SD	p value
Psychological distress			< 0.001
Not bullied nor witnessed	2.07 *ab	0.57	
Not bullied but witnessed	2.47 *ac	0.56	
Bullied	2.73 *bc	0.68	
Physical complaints			< 0.001
Not bullied nor witnessed	1.73 *ab	0.51	
Not bullied but witnessed	1.91 *ac	0.52	
Bullied	2.16 *bc	0.64	
Sickness absence (days)			0.230
Not bullied nor witnessed	8.42	23.87	
Not bullied but witnessed	8.84	21.63	
Bullied	12.93	31.98	
Work performance			< 0.001
Not bullied nor witnessed	6.72 *a	1.70	
Not bullied but witnessed	6.61 *b	1.77	
Bullied	5.97 *ab	2.23	

\*  $p < .05$ , by Bonferroni.

<https://doi.org/10.1371/journal.pone.0265863.t003>

employment were entered, both experiencing and witnessing workplace bullying were significantly and positively associated with psychological distress ( $b = 0.64$ ;  $0.40$ ,  $p < 0.001$ ), physical complaints ( $b = 0.43$ ;  $0.19$ ,  $p < 0.001$ ); significantly and negatively associated with work performance ( $b = -0.68$ ;  $-0.14$ ,  $p < 0.001$ ). However, the regression coefficients were larger in the association between bullying victimization and outcomes than witness and outcomes.

### Relationship between workplace bullying and physician-diagnosed psychical and mental disorders under treatment, subjective health, sickness absence, and job satisfaction

Table 5 shows the results of Poisson regressions of bullying and categorical health and organizational outcome variables. Both an exposure to workplace bullying and witnessing bullying at the workplace were significantly associated with subjective poor health (PR: 2.00 [95%CI: 1.53 to 2.61]; 1.52 [1.19 to 1.94]), physician-diagnosed mental disorders (PR: 3.93 [1.55 to 10.00]; 2.91 [1.22 to 6.92]), and job dissatisfaction (PR: 1.99 [1.53 to 2.60]; 1.61 [1.27 to 2.04]), after adjusting for individual characteristics and SES variables. In addition, exposure to workplace bullying was significantly associated with sickness absence ( $\geq 7$ ) (PR: 1.56 [1.10 to 2.19]) and physician-diagnosed respiratory diseases (PR: 3.33 [1.35 to 8.23]) in the adjusted model.

## Discussion

The current study aimed to investigate the association between experiencing and witnessing bullying at work and various health and organizational outcomes in a nationally representative sample in Japan. The study results revealed victimization of workplace bullying was significantly associated with psychological distress, physician-diagnosed mental disorders, physician-diagnosed respiratory diseases, physical complaints, subjective poor health, sickness absence ( $\geq 7$ ), lower work performance, and job dissatisfaction, after adjusting for potential

**Table 4. Hierarchical multiple regression of bullying and psychological distress, physical complaints, and work performance.**

	Psychological distress				Physical complaints				Work performance			
	b	SE	$\beta$	p	b	SE	$\beta$	p	b	SE	$\beta$	p
<i>Step 1</i>												
Bullied (yes = 1)	0.67	0.06	0.26	**	0.43	0.06	0.19	**	-0.76	0.19	-0.10	**
Not bullied but witnessed bullying (yes = 1)	0.40	0.05	0.20	**	0.19	0.04	0.11	**	-0.11	0.15	-0.02	
<i>Step 2</i>												
Bullied (yes = 1)	0.64	0.06	0.25	**	0.43	0.06	0.19	**	-0.68	0.19	-0.09	**
Not bullied but witnessed bullying (yes = 1)	0.40	0.05	0.20	**	0.19	0.04	0.11	**	-0.14	0.15	-0.02	
Sex (male = 1)	0.03	0.03	0.03		-0.11	0.03	-0.10	**	0.14	0.10	0.04	
Age (under 29 = 1)	0.11	0.04	0.06	*	0.02	0.04	0.02		-0.82	0.12	-0.17	**
Education (high school = 1)	0.00	0.03	0.00		0.03	0.03	0.03		0.06	0.09	0.02	
Household income (<250 = 1)	0.12	0.05	0.06	*	0.09	0.05	0.05		-0.14	0.16	-0.02	
Occupation (manager = 1)	-0.07	0.05	-0.03		0.01	0.05	0.00		-0.14	0.16	-0.02	
Employment (permanent = 1)	0.17	0.04	0.14	**	0.09	0.03	0.08	*	-0.31	0.11	-0.08	**
<i>Step 1</i>												
R <sup>2</sup>	0.099	**			0.045	**			0.011	**		
$\Delta R^2$	0.099				0.045				0.011			
F change	82.172	**			35.564	**			8.191	**		
<i>Step 2</i>												
R <sup>2</sup>	0.127	**			0.058	**			0.049	**		
$\Delta R^2$	0.028				0.012				0.038			
F change	7.975	**			3.216	*			9.893	**		

b: Partial regression coefficient,  $\beta$ : Standard partial regression coefficient, and R<sup>2</sup>: Coefficient of determination.

\*  $p < .05$

\*\*  $p < .01$ .

<https://doi.org/10.1371/journal.pone.0265863.t004>

confounders. Witnessing bullying was also associated with psychological distress, physician-diagnosed mental disorders, physical complaints, subjective poor health, and job dissatisfaction. In addition, victims had 4.5 more days of sickness absence than non-victims, although it was not statistically significant. In contrast, victims had 11.2% significantly lower work performance than non-victims. Overall, our study results suggest that experiencing and witnessing bullying is associated with various health and organizational outcomes. In addition, this study added to the literature that bullying experience was associated with physician-diagnosed diseases, including mental disorders and respiratory diseases.

Workplace bullying was associated with having physician-diagnosed mental disorders under treatment, in addition to the association with psychological distress and physical complaints that were measured by a scale. Additionally, witnessing bullying was also associated with physician-diagnosed mental disorders under treatment. Although a meta-analysis study reported workplace bullying was related to depressive symptoms, anxiety symptoms, PTSD symptoms, and psychological complaints, few studies have focused on physician-diagnosed mental disorders [2, 7]. People who sought psychiatric treatments could have more deterioration in their social functioning than people with non-clinical psychological distress. Thus, physician-diagnosed mental disorders may be a more relevant outcome to assess the health and social impact of workplace bullying. Thus, although causality cannot be determined since

**Table 5. Workplace bullying and physician-diagnosed physical and mental disorders, subjective health, sickness absence, and job satisfaction: Poisson regression analysis.**

Outcome variables:	Crude		Adjusted †	
	Not bullied but witnessed	Bullied	Not bullied but witnessed	Bullied
	PRs (95% CI)	PRs (95% CI)	PRs (95% CI)	PRs (95% CI)
Mental disorders	<b>2.91 (1.22 to 6.92)</b>	<b>3.93 (1.55 to 10.00)</b>	<b>2.91 (1.22 to 6.92)</b>	<b>3.93 (1.55 to 10.00)</b>
Cardiovascular diseases	0.87 (0.49 to 1.54)	0.78 (0.37 to 1.67)	0.90 (0.51 to 1.60)	0.84 (0.39 to 1.82)
Diabetes	0.45 (0.14 to 1.45)	1.26 (0.50 to 3.14)	0.47 (0.15 to 1.49)	1.33 (0.53 to 3.34)
Respiratory diseases	<b>2.90 (1.23 to 6.86)</b>	<b>4.15 (1.67 to 10.34)</b>	1.62 (0.62 to 4.24)	<b>3.33 (1.35 to 8.23)</b>
Digestive diseases	1.36 (0.76 to 2.45)	1.05 (0.46 to 2.41)	1.36 (0.75 to 2.44)	1.14 (0.50 to 2.64)
Orthopedic diseases	1.00 (0.62 to 1.60)	1.31 (0.77 to 2.23)	1.01 (0.63 to 1.62)	1.39 (0.82 to 2.37)
Other chronic diseases	1.36 (0.91 to 2.07)	1.49 (0.90 to 2.46)	1.33 (0.87 to 2.01)	1.51 (0.91 to 2.51)
Poor subjective health	<b>1.51 (1.19 to 1.93)</b>	<b>2.04 (1.56 to 2.66)</b>	<b>1.52 (1.19 to 1.94)</b>	<b>2.00 (1.53 to 2.61)</b>
Sickness absence ( $\geq 1$ )	1.11 (0.90 to 1.36)	1.21 (0.93 to 1.56)	1.11 (0.90 to 1.37)	1.19 (0.92 to 1.54)
Sickness absence ( $\geq 7$ )	1.14 (0.84 to 1.55)	<b>1.53 (1.09 to 2.15)</b>	1.14 (0.83 to 1.55)	<b>1.56 (1.10 to 2.19)</b>
Job dissatisfaction	<b>1.60 (1.27 to 2.03)</b>	<b>2.04 (1.57 to 2.65)</b>	<b>1.61 (1.27 to 2.04)</b>	<b>1.99 (1.53 to 2.60)</b>

† Individual characteristics (sex and age) and SES (education, household income, occupation, and employment status) adjusted in the model.

Reference group: Not exposed nor witnessed workplace bullying.

Bold figures refer to significant results.

<https://doi.org/10.1371/journal.pone.0265863.t005>

having mental disorders was also reported as a predictor of workplace bullying [2, 27], our study results added the literature that exposure to workplace bullying is associated with clinical mental illness in a representative working sample in Japan.

Our finding that exposure to workplace bullying was significantly associated with physician-diagnosed respiratory diseases under treatment was relatively “new” to this field. However, this coincides with an empirical study that reported the association between workplace bullying and asthma among Peruvian cleaners [12] or a qualitative study that reported victims had symptoms of asthma [14]. This is not surprising because stress triggers clinically significant bronchoconstriction or exacerbation of asthma [28, 29]. Moreover, since long-term exposure to stress (life events and appraisals of threat and manageability) can increase susceptibility to respiratory diseases [30], workplace bullying may also trigger or exacerbate such illnesses.

The study results show that both victimization and witness to workplace bullying were associated with subjective poor health and job dissatisfaction. This is in line with the studies that reported exposure to workplace bullying influences job satisfaction in Belgian, Norwegian, Italian, and Spanish samples [31–33]. Although little study investigated the effect of witnessing workplace bullying on individual and organizational outcomes [34, 35], a recent study confirmed the adverse effects of witnessing bullying on job satisfaction, organizational commitments, and turnover intentions after controlling for witnesses’ own experiences of being bullied [36]. Our study results also confirmed this association after excluding those who were bullied from witnesses, indicating the existence of workplace bullying influences witnesses’

motivation and organizational commitment. As previously reported in the longitudinal study, the existence of bullying at the department level increases employees' subsequent psychological distress and intention to leave [22]. Our study also showed that witnesses (those who were not bullied but witnessed) had higher psychological distress and physical complaints scores than those not bullied nor witnessed, while the highest scores were observed among those who were bullied. In contrast, no significant difference was found in sickness absence and work performance between those who did not experience or witness bullying. Thus, further studies are needed to clarify this association.

The study found that victims had 4.5 more days of absenteeism and 11.2% lower work performance in the previous year than non-victims, consistent with studies that reported an association between exposure to bullying and absenteeism and work performance. [11, 16, 17]. Interestingly, this difference in productivity or sickness absence was comparable to a nationwide survey in the UK [20]. They reported that bullying victims were 7% less productive and 7 days more off work during the previous year than employees who were neither bullied nor witnessed [20]. This indicates that workplace bullying affects the productivity of the organization itself and increases organizational costs to replace those who are on sick leave. To prevent individual and organizational losses due to workplace bullying, organizations need to implement further anti-bullying measures.

Several limitations need to be noted. First, the nature of the cross-sectional design precludes determining causality. As reported in several studies, mental health status also predicts bullying victimization [2, 27]. This nature of the association between workplace bullying and mental health may have contributed to the overestimation of the association between bullying and mental disorders in the current cross-sectional study. It is unclear whether physical health status also predicts workplace bullying victimization, but this possibility cannot be ruled out. Longitudinal studies are needed to clarify workplace bullying and various health outcomes and organizational outcomes. Second, this study did not ask for the name of the diagnosis for which the respondent was receiving treatment. Since the disease severity varies, future research should focus on the name of the diagnosis and the severity of the disease. Third, we used a self-labeling method to measure workplace bullying, which has been previously reported to underestimate the prevalence of workplace bullying [37]. Fourth, the possible measurement error may have contributed to underestimating (or overestimating) the association between bullying and sickness absence since sickness absence days were obtained by self-report in this study. If possible, the use of the organizations' official sick leave data would allow for a more objective investigation of the victims' sick leave. Finally, the moderate response rate may also have influenced results unexpectedly. For example, there is a possibility that persons who suffered from serious bullying at work or had a severe mental illness were not willing to answer the questionnaire. Thus, some selection bias may have occurred in this study.

Despite some limitations, the strength of this study is the use of a representative Japanese sample, and the results of this study can be generalized to the general Japanese workforce population. Another strength is that we investigated various physician-diagnosed clinical-level diseases. As mentioned in the introduction, quantitative studies on workplace bullying and physical diseases are still scarce [6]. The authors believe that this study will encourage future research in this field, as it showed a link between workplace bullying and physician-diagnosed diseases such as mental disorders and respiratory diseases. Finally, another strength of this study is that it focuses on both victims and witnesses of workplace bullying. As previous studies have suggested, witnesses of bullying also suffer from mental illness [22], but this is often neglected in research. Future research should focus on the various health problems of both victims and witnesses of bullying in order to understand the adverse effects of workplace bullying as a whole.



## Conclusions

The study found that victimization and witnessing workplace bullying were significantly associated with psychological distress, physician-diagnosed mental disorders, physical complaints, subjective poor health, and job dissatisfaction. Furthermore, workplace bullying victimization was associated with physician-diagnosed respiratory disorders, sickness absence ( $\geq 7$ ), and poor work performance. To prevent individual and organizational losses due to workplace bullying, organizations need to implement further anti-bullying measures.

## Acknowledgments

The authors thank Dr. Toru Yoshikawa (Department of Research, The Institute for Science of Labour, Kawasaki, Japan) for his support in conducting this study.

## Author Contributions

**Conceptualization:** Kanami Tsuno.

**Data curation:** Kanami Tsuno.

**Formal analysis:** Kanami Tsuno.

**Funding acquisition:** Kanami Tsuno, Norito Kawakami.

**Investigation:** Kanami Tsuno, Norito Kawakami, Akizumi Tsutsumi, Akihito Shimazu, Akiomi Inoue, Yuko Odagiri, Teruichi Shimomitsu.

**Methodology:** Kanami Tsuno.

**Project administration:** Kanami Tsuno.

**Resources:** Kanami Tsuno.

**Supervision:** Norito Kawakami.

**Writing – original draft:** Kanami Tsuno.

**Writing – review & editing:** Kanami Tsuno, Norito Kawakami, Akizumi Tsutsumi, Akihito Shimazu, Akiomi Inoue, Yuko Odagiri, Teruichi Shimomitsu.

## References

1. Nielsen MB, Einarsen S. Outcomes of exposure to workplace bullying: A meta-analytic review. *Work & Stress*. 2012; 26(4):309–32.
2. Verkuil B, Atasayi S, Molendijk ML. Workplace Bullying and Mental Health: A Meta-Analysis on Cross-Sectional and Longitudinal Data. *PLoS One*. 2015; 10(8):e0135225. <https://doi.org/10.1371/journal.pone.0135225> PMID: 26305785
3. Nielsen MB, Tangen T, Idsoe T, Matthiesen SB, Magerøy N. Post-traumatic stress disorder as a consequence of bullying at work and at school. A literature review and meta-analysis. *Aggression and Violent Behavior*. 2015; 21:17–24.
4. Nielsen MB, Harris A, Pallesen S, Einarsen SV. Workplace bullying and sleep—A systematic review and meta-analysis of the research literature. *Sleep Med Rev*. 2020; 51:101289. <https://doi.org/10.1016/j.smrv.2020.101289> PMID: 32179375
5. Leach LS, Poyser C, Butterworth P. Workplace bullying and the association with suicidal ideation/ thoughts and behaviour: a systematic review. *Occup Environ Med*. 2017; 74(1):72–9. <https://doi.org/10.1136/oemed-2016-103726> PMID: 27663985
6. Mikkelsen EG, Hansen ÅM, Persson R, Byrgesen MF, Høgh A. Individual consequences of being exposed to workplace bullying. *Bullying and Harassment in the Workplace*. 2020:163–208.

7. Kivimäki M, Virtanen M, Vartiainen M, Elovainio M, Vahtera J, Keltikangas-Järvinen L. Workplace bullying and the risk of cardiovascular disease and depression. *Occup Environ Med*. 2003; 60(10):779–83. <https://doi.org/10.1136/oem.60.10.779> PMID: 14504368
8. Xu T, Magnusson Hanson LL, Lange T, Starkopf L, Westerlund H, Madsen IEH, et al. Workplace bullying and workplace violence as risk factors for cardiovascular disease: a multi-cohort study. *Eur Heart J*. 2019; 40(14):1124–34. <https://doi.org/10.1093/eurheartj/ehy683> PMID: 30452614
9. Xu T, Magnusson Hanson LL, Lange T, Starkopf L, Westerlund H, Madsen IEH, et al. Workplace bullying and violence as risk factors for type 2 diabetes: a multicohort study and meta-analysis. *Diabetologia*. 2018; 61(1):75–83. <https://doi.org/10.1007/s00125-017-4480-3> PMID: 29130114
10. Kivimäki M, Leino-Arjas P, Virtanen M, Elovainio M, Keltikangas-Järvinen L, Puttunen S, et al. Work stress and incidence of newly diagnosed fibromyalgia: prospective cohort study. *J Psychosom Res*. 2004; 57(5):417–22. <https://doi.org/10.1016/j.jpsychores.2003.10.013> PMID: 15581643
11. Kivimäki M, Elovainio M, Vahtera J. Workplace bullying and sickness absence in hospital staff. *Occup Environ Med*. 2000; 57(10):656–60. <https://doi.org/10.1136/oem.57.10.656> PMID: 10984336
12. Radon K, Llanqui U, Arce A, Herrera R, Herbig B, Nowak D, et al. Job strain, bullying and violence at work and asthma in Peruvian cleaners—a cross-sectional analysis. *J Asthma*. 2016; 53(10):1018–25. <https://doi.org/10.1080/02770903.2016.1180698> PMID: 27437609
13. Hajek A, König HH. Are perceived bad working conditions and perceived workplace bullying associated with doctor visits? Results of the nationally representative German General Social Survey. *BMC Health Serv Res*. 2019; 19(1):697. <https://doi.org/10.1186/s12913-019-4570-7> PMID: 31615523
14. Hallberg LR, Strandmark MK. Health consequences of workplace bullying: experiences from the perspective of employees in the public service sector. *International Journal of Qualitative Studies on Health and Well-being*. 2006; 1(2):109–19.
15. MacIntosh J. Workplace Bullying Influences Women's Engagement in the Workforce. *Issues Ment Health Nurs*. 2012; 33(11):762–8. <https://doi.org/10.3109/01612840.2012.708701> PMID: 23146010
16. Nielsen MB, Indregard AM, Overland S. Workplace bullying and sickness absence: a systematic review and meta-analysis of the research literature. *Scand J Work Environ Health*. 2016; 42(5):359–70. <https://doi.org/10.5271/sjweh.3579> PMID: 27310716
17. Bowling NA, Beehr TA. Workplace harassment from the victim's perspective: a theoretical model and meta-analysis. *J Appl Psychol*. 2006; 91(5):998–1012. <https://doi.org/10.1037/0021-9010.91.5.998> PMID: 16953764
18. Ekici D, Beder A. The effects of workplace bullying on physicians and nurses. *Australian Journal of Advanced Nursing, The*. 2014; 31(4):24–33.
19. Giga SI, Hoel H, Lewis D. The costs of workplace bullying: Department for Business, Enterprise and Regulatory Reform; 2008.
20. Hoel H, Sparks K, Cooper CL. The cost of violence/stress at work and the benefits of a violence/stress-free working environment. Geneva: International Labour Organization. 2001.
21. Nielsen MB, Einarsen S. Can observations of workplace bullying really make you depressed? A response to Emdad et al. *Int Arch Occup Environ Health*. 2013; 86(6):717–21.
22. Tsuno K, Kawachi I, Kawakami N, Miyashita K. Workplace Bullying and Psychological Distress: A Longitudinal Multilevel Analysis Among Japanese Employees. *J Occup Environ Med*. 2018; 60(12):1067–72. <https://doi.org/10.1097/JOM.0000000000001433> PMID: 30124499
23. Tsuno K, Kawakami N, Tsutsumi A, Shimazu A, Inoue A, Odagiri Y, et al. Socioeconomic determinants of bullying in the workplace: a national representative sample in Japan. *PLoS One*. 2015; 10(3):e0119435. <https://doi.org/10.1371/journal.pone.0119435> PMID: 25751252
24. Inoue A, Kawakami N, Shimomitsu T, Tsutsumi A, Haratani T, Yoshikawa T, et al. Development of a Short Questionnaire to Measure an Extended Set of Job Demands, Job Resources, and Positive Health Outcomes: The New Brief Job Stress Questionnaire. *Ind Health*. 2014; 52(3):175–89. <https://doi.org/10.2486/indhealth.2013-0185> PMID: 24492763
25. Kawakami N, Inoue A, Tsuchiya M, Watanabe K, Imamura K, Iida M, et al. Construct validity and test-retest reliability of the World Mental Health Japan version of the World Health Organization Health and Work Performance Questionnaire Short Version: a preliminary study. *Ind Health*. 2020; 58(4):375–87. <https://doi.org/10.2486/indhealth.2019-0090> PMID: 32173661
26. Kessler RC, Barber C, Beck A, Berglund P, Cleary PD, McKeen D, et al. The world health organization health and work performance questionnaire (HPQ). *J Occup Environ Med*. 2003; 45(2):156–74. <https://doi.org/10.1097/01.jom.0000052967.43131.51> PMID: 12625231
27. Kostev K, Rex J, Waehlert L, Hog D, Heilmaier C. Risk of psychiatric and neurological diseases in patients with workplace mobbing experience in Germany: a retrospective database analysis. *German*

- medical science: GMS e-journal. 2014;12:Doc10–Doc. <https://doi.org/10.3205/000195> PMID: [24872810](https://pubmed.ncbi.nlm.nih.gov/24872810/)
28. Chen E, Miller GE. Stress and inflammation in exacerbations of asthma. *Brain Behav Immun*. 2007; 21(8):993–9. <https://doi.org/10.1016/j.bbi.2007.03.009> PMID: [17493786](https://pubmed.ncbi.nlm.nih.gov/17493786/)
  29. Lehrer P, Feldman J, Giardino N, Song HS, Schmaling K. Psychological aspects of asthma. *J Consult Clin Psychol*. 2002; 70(3):691–711. <https://doi.org/10.1037//0022-006x.70.3.691> PMID: [12090377](https://pubmed.ncbi.nlm.nih.gov/12090377/)
  30. Cohen S, Tyrrell DAJ, Smith AP. Psychological Stress and Susceptibility to the Common Cold. *N Engl J Med*. 1991; 325(9):606–12. <https://doi.org/10.1056/NEJM199108293250903> PMID: [1713648](https://pubmed.ncbi.nlm.nih.gov/1713648/)
  31. Arenas A, Giorgi G, Montani F, Mancuso S, Perez JF, Mucci N, et al. Workplace Bullying in a Sample of Italian and Spanish Employees and Its Relationship with Job Satisfaction, and Psychological Well-Being. *Front Psychol*. 2015; 6:1912. <https://doi.org/10.3389/fpsyg.2015.01912> PMID: [26696948](https://pubmed.ncbi.nlm.nih.gov/26696948/)
  32. Rodríguez-Muñoz A, Baillien E, De Witte H, Moreno-Jiménez B, Pastor JC. Cross-lagged relationships between workplace bullying, job satisfaction and engagement: Two longitudinal studies. *Work & Stress*. 2009; 23(3):225–43.
  33. Olsen E, Bjaalid G, Mikkelsen A. Work climate and the mediating role of workplace bullying related to job performance, job satisfaction, and work ability: A study among hospital nurses. *J Adv Nurs*. 2017; 73(11):2709–19. <https://doi.org/10.1111/jan.13337> PMID: [28512986](https://pubmed.ncbi.nlm.nih.gov/28512986/)
  34. Cooper-Thomas H, Bentley T, Catley B, Gardner D, O'Driscoll M, Trenberth L. The impact of bullying on observers and targets. *New Zealand Journal of Human Resource Management*. 2014; 14(2):82–95.
  35. Sims RL, Sun P. Witnessing workplace bullying and the Chinese manufacturing employee. *Journal of Managerial Psychology*. 2012; 27(1):9–26.
  36. Salin D, Notelaers G. The effects of workplace bullying on witnesses: violation of the psychological contract as an explanatory mechanism? *The International Journal of Human Resource Management*. 2020; 31(18):2319–39.
  37. Tsuno K, Kawakami N, Inoue A, Abe K. Measuring workplace bullying: reliability and validity of the Japanese version of the negative acts questionnaire. *J Occup Health*. 2010; 52(4):216–26. <https://doi.org/10.1539/joh.110036> PMID: [20571253](https://pubmed.ncbi.nlm.nih.gov/20571253/)

# Workplace Social Support and Reduced Psychological Distress

## A 1-Year Occupational Cohort Study

Reiko Inoue, MD, Hiroyuki Hikichi, PhD, Akiomi Inoue, PhD, Yuko Kachi, PhD, Hisashi Eguchi, PhD, Kazuhiro Watanabe, PhD, Yumi Arai, MSN, Noboru Iwata, PhD, and Akizumi Tsutsumi, MD

**Objective:** There is little evidence that workplace social support can relieve workers' mental health problems. Therefore, we examined whether social support from coworkers and supervisors was associated with reduced serious psychological distress among employees. **Methods:** We used two-wave panel data from 13 Japanese companies. The baseline survey was conducted in 2011, and the follow-up survey 1 year later. From 9889 respondents, we selected 759 who had psychological distress at baseline, defined as  $\geq 13$  on the Kessler Psychological Distress Scale (K6). **Results:** Increased coworker support was significantly associated with employees' reduced psychological distress (odds ratio, 3.51; 95% confidence interval, 2.17 to 5.68). The association between increased supervisor support and reduced psychological distress was nonsignificant (odds ratio, 1.32, 95% confidence interval, 0.85 to 2.04). **Conclusion:** Encouraging coworker support may contribute to the secondary prevention of mental health problems among employees.

**Keywords:** epidemiology, occupational health, psychological distress, longitudinal study, social support

Workers' psychological distress is associated with persistent presenteeism.<sup>1</sup> The World Health Organization reported in 2019 that symptoms of depression and anxiety negatively impact workers' productivity, a situation that costs the global economy US \$1 trillion annually.<sup>2</sup> Arguably, early detection of and reductions in mental health problems are required to prevent the onset of chronic mental illnesses and to avoid lowered productivity among workers.

Indeed, occupational health studies have demonstrated that social support in workplaces may contribute to primary prevention of mental health problems.<sup>3,4</sup> Emotional and instrumental support from coworkers and supervisors can reduce workers' negative emotions and help them resolve workplace issues that cause psychological distress.<sup>5</sup> Workplace support can buffer the effects of stress at work on health problems.<sup>6</sup>

From the Department of Public Health, Kitasato University School of Medicine, Sagami-hara (Drs Inoue, Hikichi, Kachi, Watanabe, and Tsutsumi and Ms Arai); Institutional Research Center, University of Occupational and Environmental Health (Dr Inoue); and Department of Mental Health, Institute of Industrial Ecological Sciences, University of Occupational and Environmental Health (Dr Eguchi), Kitakyushu; and Department of Nursing, Faculty of Healthcare, Kiryu University, Midori (Dr Iwata), Japan.

The present study was supported by grant 20K19671 from the Grant-in-Aid for Scientific Research of the Japan Society for the Promotion of Science. The funder had no role in the study design, in the collection, analysis, or interpretation of data; in the writing of the report; or in the decision to submit the article for publication.

Conflicts of interest: none declared.

This research was conducted in full accordance with the Helsinki Declaration. Written consent was obtained from participants. This study was approved by the Research Ethics Committee of the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo (no. 2772), Kitasato University Medical Ethics Organization (B12-103), and Ethics Committee of Medical Research, University of Occupational and Environmental Health, Japan (10-004).

Supplemental digital contents are available for this article. Direct URL citation appears in the printed text and is provided in the HTML and PDF versions of this article on the journal's Web site ([www.joem.org](http://www.joem.org)).

Address correspondence to: Reiko Inoue, MD, 1-15-1 Kitasato, Minami-ku, Sagami-hara, Kanagawa 252-0374, Japan ([dm18003@st.kitasato-u.ac.jp](mailto:dm18003@st.kitasato-u.ac.jp)).

Copyright © 2022 American College of Occupational and Environmental Medicine  
DOI: 10.1097/JOM.0000000000000265

It is likely then that secondary prevention of mental health problems may also be achieved by promoting workplace social support. Several population-based surveys have suggested that informational and emotional support can improve depressive symptoms in dementia patients and their caregivers.<sup>7-9</sup> However, few studies have focused on the secondary prevention of mental health problems via support in the workplace and targeted only workers who report deteriorated mental health.

In the present study, therefore, using two-wave panel data consisting of 13 Japanese companies, we prospectively examined whether workplace social support was associated with reduced psychological distress among employees.

## METHODS

### Participants

We analyzed data obtained from a Japanese occupational cohort study—J-HOPE (the Japanese study of Health, Occupation and Psychosocial factors related Equity)—which was conducted for 4 consecutive years beginning in 2009 to ask employers about health and social connectedness in their workplaces.<sup>10</sup> A detailed flowchart illustrating the sampling process is presented in Figure 1. To maximize the number of participants in the sample who were at high risk of mental health problems, we selected two-wave panel data derived from the 2011 and 2012 surveys (participation rates were 80.2% and 77.4%, respectively), which comprised 9889 employees from 13 companies (eg, manufacturing, transportation, service industries, information technology, and hospitals/medical facilities) in Japan. In this study, we defined serious psychological distress as a score of 13 or more on the K6 scale (the Kessler Psychological Distress Scale<sup>11</sup>); after excluding 9056 employees who did not qualify as having serious psychological distress at baseline and 74 employees who had missing responses for relevant variables, the data from 759 employees were analyzed.

This research was conducted in full accordance with the Helsinki Declaration. Written consent was obtained from participants. This study was approved by the Research Ethics Committee of the Graduate School of Medicine and Faculty of Medicine, The University of Tokyo (no. 2772); Kitasato University Medical Ethics Organization (B12-103); and Ethics Committee of Medical Research, University of Occupational and Environmental Health, Japan (10-004).

### Outcome Variables

Our outcome variable was reduced serious psychological distress. We measured serious psychological distress using the Japanese version of the K6.<sup>11-13</sup> The scale consists of six items that measure the frequency of the following indicators of psychological distress during the previous 30 days: (1) nervous, (2) hopeless, (3) restless or fidgety, (4) depression, (5) that everything was an effort, and (6) worthlessness. Responses ranged from 0 (none of the time) to 4 (all of the time). Reduced psychological distress was defined as a score of 12 points or less on the K6 in the follow-up survey (ie, 1: reduced psychological distress vs 0: persistent psychological distress).

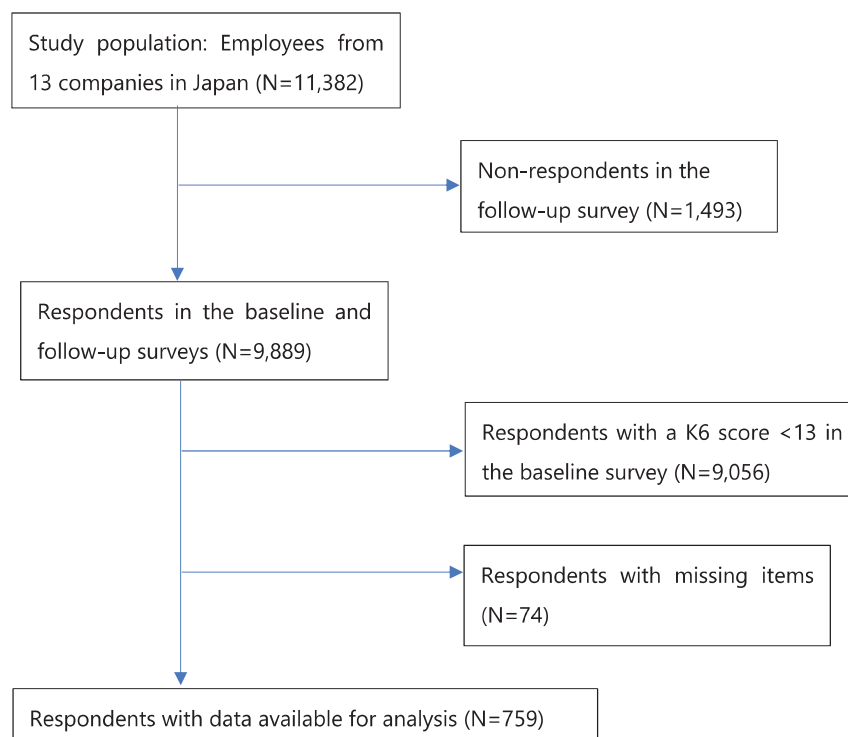


FIGURE 1. Recruitment process for the study sample.

### Explanatory Variables

We measured coworker support and supervisor support using the Japanese version of the Job Content Questionnaire.<sup>13</sup> Coworker support was measured using four items: “My coworkers are competent in doing their jobs,” “My coworkers take a personal interest in me,” “My coworkers are friendly,” and “My coworkers are helpful in getting the job done.” The supervisor support scale also contained four items: “My supervisor is concerned about the welfare of those under him/her,” “My supervisor pays attention to what I say,” “My supervisor is helpful in getting the job done,” and “My supervisor is good at getting people to work together.” Respondents answered all eight questions on a 4-point scale: 1 = “strongly disagree” to 4 = “strongly agree.” In accordance with the Job Content Questionnaire Users’ Guide, we calculated the total score of the four questions about coworkers and the total score of the four questions about supervisors for each participant (Cronbach  $\alpha$ s were 0.84 and 0.92, respectively, in 2011).<sup>14</sup>

We hypothesized that increased social support from coworkers and supervisors during the period between baseline (T1) and follow-up (T2) would reduce employees’ psychological distress, whereas decreased workplace social support during that period would have the opposite effect. To examine our hypothesis, we split the social support scores from each survey at the median value (11 points) to create four categories that represented four different patterns of transition in workplace social support for each participant: (1) 2011 low scores and 2012 low scores (reference group); (2) 2011 low and 2012 high; (3) 2011 high and 2012 low; and (4) 2011 high and 2012 high.

### Covariates

We selected the following potential confounding variables: age, sex, working hours per week ( $\leq 30$ , 31 to 40, 41 to 50, 51 to 60, and  $\geq 61$ ),<sup>15</sup> educational attainment (junior high school, high school, junior college, college, and graduate school),<sup>16</sup> number of family members with whom the participant shares a living,<sup>17</sup> job category (manager, nonmanual, manual, and other), and household income.<sup>16</sup>

### Statistical Analysis

We implemented a multivariable logistic regression model to examine the association between four patterns of workplace social support transition over time and reduced psychological distress. The effects of coworker and supervisor support were separately analyzed because of their strong correlation ( $r = 0.485$ ). We calculated the population attributable fraction to estimate the effect size of the low-high group among all populations reducing psychological distress. We calculated the values as  $(IP_1 - IP_0) / IP_1$ , in which  $IP_1$  is the cumulative proportion of the total population getting reduced psychological distress and  $IP_0$  is the cumulative proportion of participants in the low-low, high-low, and high-high groups who reduced psychological distress.<sup>18</sup> In a sensitivity analysis, we used a continuous change variable in social support (T2 – T1) as an explanatory variable in the same model. Furthermore, taking into consideration time-dependent confounding, we repeated the analysis using a continuous variable for change in working hours (T2 – T1) as a covariate instead of baseline working hours. All statistical tests were two-sided with a significance level of 5%. Data were analyzed with IBM SPSS Statistics version 26 for Windows (IBM Corp, Armonk, NY).

### RESULTS

Table 1 shows the characteristics of participants categorized by temporal transition in coworker support and supervisor support. Across the categories, more than 60% of respondents were men, more than half of whom were nonmanual workers; the average age ranged from 34.4 to 40.0 years. The highest proportion of educational attainment in the low-low group was high school (39.0% for coworker support and 37.3% for supervisor support), whereas most respondents in the high-high group had graduated from college (37.6% and 39.1%, respectively). In the follow-up survey, the prevalence of reduced psychological distress (a K6 score of  $\leq 12$ ) was highest in the low-high group (76.1% and 63.2%, respectively).

Table 2 shows the results of logistic regression analysis. Increased coworker support (low-high) and higher coworker support at



TABLE 1. Participants' Baseline Characteristics, Categorized Into Four Patterns of Transitioning Workplace Social Support

	Coworker Support						Supervisor Support									
	Low-Low (n = 331)		Low-High (n = 126)		High-Low (n = 96)		High-High (n = 206)		Low-Low (n = 346)		Low-High (n = 123)		High-Low (n = 99)		High-High (n = 191)	
	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)
Sex																
Men	243 (73.4)		94 (74.6)		66 (68.8)		141 (68.4)		246 (71.1)		91 (74.0)		63 (63.6)		144 (75.4)	
Women	88 (26.6)		32 (25.4)		30 (31.3)		65 (31.6)		100 (28.9)		32 (26.0)		36 (36.4)		47 (24.6)	
Age, y		40.0 (9.5)		37.3 (9.9)		37.9 (9.4)		34.4 (9.3)		38.7 (9.5)		37.8 (10.2)		36.0 (9.1)		36.9 (10.2)
Work hours per week																
≤30 h	42 (12.7)		13 (10.3)		9 (9.4)		22 (10.7)		45 (13.0)		16 (13.0)		10 (10.1)		15 (7.9)	
31–40 h	98 (29.6)		37 (29.4)		25 (26.0)		52 (25.2)		103 (29.8)		31 (25.2)		28 (28.3)		50 (26.2)	
41–50 h	142 (42.9)		58 (46.0)		44 (45.8)		90 (43.7)		141 (40.8)		59 (48.0)		41 (41.4)		93 (48.7)	
51–60 h	37 (11.2)		13 (10.3)		11 (11.5)		32 (15.5)		40 (11.6)		11 (8.9)		16 (16.2)		26 (13.6)	
≥61 h	12 (3.6)		5 (4.0)		7 (7.3)		10 (4.9)		17 (4.9)		6 (4.9)		4 (4.0)		7 (3.7)	
Education																
Junior high school	8 (2.4)		1 (0.8)		4 (4.2)		1 (0.5)		6 (1.7)		2 (1.6)		2 (2.0)		4 (2.1)	
High school	132 (39.9)		37 (29.4)		23 (24.0)		46 (22.3)		130 (37.6)		30 (24.4)		30 (30.3)		48 (25.1)	
Junior college	59 (17.8)		17 (13.5)		30 (31.3)		52 (25.2)		81 (23.4)		26 (21.1)		19 (19.2)		32 (16.8)	
College	99 (29.9)		55 (43.7)		30 (31.3)		78 (37.9)		100 (28.9)		50 (40.7)		38 (38.4)		74 (38.7)	
Graduate school	33 (10.0)		16 (12.7)		9 (9.4)		29 (14.1)		29 (8.4)		15 (12.2)		10 (10.1)		33 (17.3)	
No. of family members with whom share a living		2.9 (1.5)		2.7 (1.4)		2.5 (1.4)		2.4 (1.4)		2.8 (1.5)		2.7 (1.4)		2.6 (1.5)		2.5 (1.4)
Job category																
Manager	33 (10.0)		20 (15.9)		6 (6.3)		19 (9.2)		25 (7.2)		20 (16.3)		12 (12.1)		21 (11.0)	
Nonmanual worker	165 (49.8)		70 (55.6)		61 (63.5)		130 (63.1)		181 (52.3)		68 (55.3)		56 (56.6)		121 (63.4)	
Manual worker	90 (27.2)		18 (14.3)		19 (19.8)		34 (16.5)		95 (27.5)		19 (15.4)		17 (17.2)		30 (15.7)	
Other	43 (13.0)		18 (14.3)		10 (10.4)		23 (11.2)		45 (13.0)		16 (13.0)		14 (14.1)		19 (9.9)	
Household income, million JPY		6.17 (2.82)		5.90 (2.89)		5.63 (2.80)		5.23 (2.79)		5.84 (2.76)		6.11 (3.02)		5.58 (2.79)		5.65 (2.92)
K6 score*																
≤12 points	169 (51.1)		96 (76.2)		53 (55.2)		125 (60.7)		196 (56.6)		78 (63.4)		51 (51.5)		118 (61.8)	
*Score in the follow-up survey for the Kessler Psychological Distress Scale (K6).																

\*Score in the follow-up survey for the Kessler Psychological Distress Scale (K6).

**TABLE 2.** Adjusted Odds Ratios for the Reduced Psychological Distress by the Category of Changes in Social Support (n = 759)

	Coworker Support		Supervisor Support	
	OR	95% CI	OR	95% CI
Change in social support (reference: low-low)				
Low-high	3.51	2.17–5.68	1.32	0.85–2.04
High-low	1.31	0.81–2.11	0.83	0.52–1.31
High-high	1.85	1.26–2.70	1.33	0.91–1.94
Sex (reference: men)	1.03	0.72–1.47	1.04	0.73–1.48
Age	1.01	0.99–1.03	1.00	0.99–1.02
Income	1.00	1.00–1.00	1.00	1.00–1.00
Education				
(reference: junior high school)				
High school	0.64	0.19–2.17	0.70	0.21–2.35
Junior college	0.53	0.15–1.86	0.60	0.17–2.06
College	0.47	0.14–1.63	0.57	0.17–1.94
Graduate school	0.42	0.11–1.56	0.49	0.13–1.78
Family	0.96	0.86–1.07	0.97	0.87–1.08
Job category (reference: manual)				
Nonmanual	0.81	0.53–1.26	0.86	0.56–1.32
Manager	1.26	0.63–2.54	1.45	0.73–2.90
Other	1.42	0.82–2.48	1.55	0.89–2.67
Work hours (reference: ≤30 h)				
31–40 h	0.98	0.57–1.67	1.01	0.60–1.71
41–50 h	1.09	0.65–1.83	1.08	0.65–1.81
51–60 h	0.99	0.51–1.91	0.98	0.51–1.88
≥61 h	1.73	0.71–4.23	1.67	0.70–4.02

CI, confidence interval; OR, odds ratio.

both surveys (high-high) were significantly associated with reduced psychological distress (odds ratio [OR], 3.51; 95% confidence interval [CI], 2.17 to 5.68; and OR, 1.85; 95% CI, 1.26 to 2.70, respectively). By contrast, neither increased supervisor support (low-high) nor higher supervisor support at both surveys (high-high) was significantly linked to reduced psychological distress, although the point es-

timates suggested the expected direction (OR, 1.32; 95% CI, 0.85 to 2.04; and OR, 1.33; 95% CI, 0.91 to 1.94, respectively).

The population attributable fraction of coworker's low-high group was 6.16%, and that of supervisor's low-high group was 1.71%.

Table 3 presents the results of our sensitivity analysis. The continuous variables for differences in coworker support were significantly related to reduced psychological distress, but the continuous variables for differences in supervisor support were not associated significantly with reduced psychological distress (OR, 1.18; 95% CI, 1.05 to 1.34; and OR, 1.07; 95% CI, 0.95 to 1.20, respectively).

Analysis using differences in working hours between baseline and follow-up showed the almost same results as the main analyses. Increased coworker support and higher coworker support at both surveys were significantly related to reduced psychological distress (OR, 3.56; 95% CI, 2.20 to 5.77; and OR, 1.91; 95% CI, 1.31 to 2.81, respectively). Increased supervisor support and higher supervisor support at both surveys were not significantly associated with reduced psychological distress (OR, 1.33; 95% CI, 0.86 to 2.06; and OR, 1.32; 95% CI, 0.90 to 1.92, respectively) (see Appendix, <http://links.lww.com/JOM/B185>).

## DISCUSSION

In the present study, we prospectively investigated associations between workplace social support and reduced psychological distress among workers who reported serious psychological distress at baseline. Logistic regression analyses showed that enhanced coworker support over time (low-high) and higher coworker support at both T1 and T2 surveys (high-high) were associated with reduced psychological distress. Furthermore, each supervisor support category (low-high, high-high) was associated with reduced psychological distress, but it was not statistically significant. Those results were similar to those from our analyses in which changes in support were a continuous variable or that took into account changes in working hours between baseline and follow-up. Previous studies have suggested that social support can help prevent the incidence of mental illness among workers.<sup>3,4</sup> Our

**TABLE 3.** Adjusted Odds Ratios for the Reduced Psychological Distress by the Continuous Change in Social Support (n = 759)

	Coworker Support		Supervisor Support	
	OR	95% CI	OR	95% CI
Change in social support*	1.18	1.05–1.34	1.07	0.95–1.20
Sex (reference: men)	1.01	0.71–1.44	1.01	0.71–1.43
Age	1.01	0.99–1.03	1.00	0.99–1.02
Income	1.00	1.00–1.00	1.00	1.00–1.00
Education				
(reference: junior high school)				
High school	0.70	0.21–2.35	0.70	0.21–2.34
Junior college	0.56	0.16–1.94	0.61	0.18–2.08
College	0.55	0.16–1.89	0.58	0.17–1.96
Graduate school	0.49	0.13–1.78	0.50	0.14–1.82
Family	0.97	0.87–1.08	0.96	0.86–1.08
Job category (reference: manual)				
Nonmanual	0.86	0.56–1.31	0.87	0.57–1.33
Manager	1.46	0.74–2.89	1.47	0.74–2.91
Other	1.53	0.88–2.64	1.54	0.89–2.66
Work hours (reference: ≤30 h)				
31–40 h	1.01	0.60–1.70	1.00	0.59–1.68
41–50 h	1.09	0.65–1.81	1.08	0.65–1.79
51–60 h	0.94	0.49–1.79	0.94	0.50–1.80
≥61 h	1.63	0.67–3.93	1.66	0.69–3.99

\*The score used was the result of subtracting T1 from T2.  
CI, confidence interval; OR, odds ratio.

results provide additional evidence that coworker support contributes to secondary prevention, as well as primary prevention, of mental health problems among workers.

Our results also suggest that coworker support may be more effective in relieving severe psychological distress than supervisor support. Indeed, in a community-based study, people with mental health problems were more likely to seek informal social support in intimate relationships.<sup>19</sup> Coworkers, then, who typically interact more often and closely with one another than they do with their supervisors, can be a suitable resource for efficient social support to ameliorate mental health issues in the workplace. In addition, subordinates may not feel free to consult their supervisors, who are in a position to evaluate them and to see them as a person with whom they can discuss negative information about themselves such as psychological distress and hospital visits. However, the impact of coworker support on mitigating psychological distress may not be very large. Although the OR of the coworkers' low-high group was larger than 3, the population attributable risk was only 6.16% of the population because of the small prevalence of the low-high group.

In this study, we did not find clear evidence that supervisor support contributed to reducing serious psychological distress. Although no previous study on supervisor support has focused on its secondary prevention effect exclusively for workers with worsening mental health, some research has indicated that supervisor support may improve workers' mental health.<sup>20</sup> Further research is needed on the effects of supervisor support on the secondary prevention of mental health problems among employees.

One strength of the present study is its longitudinal design, which reduced the possibility of reverse causation in the relationship between workplace social support and psychological distress. A limitation of the study was that both exposure (social support) and outcome (psychological distress) variables were assessed simultaneously at baseline and follow-up and were both based on self-report. Although the study design was longitudinal, we cannot rule out the possibility that workers' evaluations of social support could have affected their mental health status when answering the questionnaire. For example, those with poor mental health may not be able to seek help and obtain workplace support. The second limitation was the sample configuration: although it included several companies and a wide variety of occupations, it comprised a higher percentage of employees from large-scale enterprises as well as permanent, nonmanual, and male workers compared with the general Japanese working population.<sup>21</sup> Therefore, the present findings may strongly reflect the features of these demographic groups, while underestimating or neglecting the features of their counterparts (ie, employees at medium- or small-scale enterprises; nonpermanent, manual, and female workers). Therefore, generalizations of the findings should be made with caution. A third limitation is that the mechanism that support ameliorating psychological distress is unknown in this study. We did not obtain information about the causes of psychological distress or of mediators between support and reduced psychological distress, which would allow us to examine those mechanisms. Workplace support is known to have a buffering effect in situations in which work-related stressors lead to mental distress.<sup>6</sup> Thus, when participants' psychological distress is caused by a lack of social support or workplace conflict, enhancing social support in the workplace may be more effective. Confining the study population to those who have less coworker support may provide a greater effect size.

Despite the limitations, the findings of the present study indicate that increased workplace social support, especially from coworkers, can help reduce workers' psychological distress. Encouraging coworker support may thus contribute to the secondary prevention of mental health problems for employees in the workplace.

## ACKNOWLEDGMENTS

The authors thank Kazuhiko Enta, Norito Kawakami, Sumiko Kurioka, Yuki Kosugi, Koichi Miyaki, Akihito Shimazu, Masaya Takahashi, and Takafumi Totsuzaki for their contribution to the J-HOPE study.

## REFERENCES

- Lerner D, Adler DA, Rogers WH, et al. Work performance of employees with depression: the impact of work stressors. *Am J Health Promot*. 2010;24:205–213.
- Kestel D. Mental health in the workplace [World Health Organization Web site]. January 2019. Volume 22. Available at: <https://www.who.int/news-room/commentaries/detail/mental-health-in-the-workplace>. Accessed January 19, 2022.
- Frese M. Social support as a moderator of the relationship between work stressors and psychological dysfunctioning: a longitudinal study with objective measures. *J Occup Health Psychol*. 1999;4:179–192.
- Peterson U, Bergström G, Samuelsson M, Åsberg M, Nygren Å. Reflecting peer-support groups in the prevention of stress and burnout: randomized controlled trial. *J Adv Nurs*. 2008;63:506–516.
- House JS, Robert LK. Measures and concepts of social support. In: Cohen S, Syme SL, eds. *Social Support and Health*. New York: Academic Press; 1985:83–108.
- Mathieu M, Eschleman KJ, Cheng D. Meta-analytic and multiwave comparison of emotional support and instrumental support in the workplace. *J Occup Health Psychol*. 2019;3:387–409.
- Weber BA, Roberts BL, Yarandi H, Mills TL, Chumbler NR, Wajzman Z. The impact of dyadic social support on self-efficacy and depression after radical prostatectomy. *J Aging Health*. 2007;19:630–645.
- Leung P, Orrell M, Orgeta V. Social support group interventions in people with dementia and mild cognitive impairment: a systematic review of the literature. *Int J Geriatr Psychiatry*. 2015;30:1–9.
- Chien LY, Chu H, Guo JL, et al. Caregiver support groups in patients with dementia: a meta-analysis. *Int J Geriatr Psychiatry*. 2011;26:1089–1098.
- J-HOPE Japanese study of Health, Occupation and Psychosocial factors related Equity [J-HOPE Web site]. Available at: <https://www.med.kitasato-u.ac.jp/lab/publichealth/eng/jhope.html>. Accessed February 23, 2022.
- Sakurai K, Nishi A, Kondo K, Yanagida K, Kawakami N. Screening performance of K6/K10 and other screening instruments for mood and anxiety disorders in Japan. *Psychiatry Clin Neurosci*. 2011;65:434–441.
- Furukawa TA, Kawakami N, Saitoh M, et al. The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int J Methods Psychiatr Res*. 2008;17:152–158.
- Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med*. 2002;32:959–976.
- Karasek RA. *Job Content Questionnaire and User's Guide*. Lowell, MA: University of Massachusetts; 1985.
- Virtanen M, Jokela M, Madsen IE, et al. Long working hours and depressive symptoms: systematic review and meta-analysis of published studies and unpublished individual participant data. *Scand J Work Environ Health*. 2018;44:239–250.
- Lorant V, Delière D, Eaton W, Robert A, Philpott P, Anseau M. Socioeconomic inequalities in depression: a meta-analysis. *Ame J Epidemiol*. 2003;157:98–112.
- National Institute for Occupational Safety and Health. National occupational research agenda. Cincinnati, OH: US Department of Health and Human Services; 1996 (NIOSH publication no. 96-115).
- Rockhill B, Newman B, Weinberg C. Use and misuse of population attributable fractions. *Am J Public Health*. 1998;88:15–19.
- Rickwood D, Deane F, Wilson C, Ciarrochi J. Young people's help-seeking for mental health problems. *AeJAMH*. 2005;4:218–251.
- Tsutsumi A. Development of an evidence-based guideline for supervisor training in promoting mental health: literature review. *J Occup Health*. 2011;53:1–9.
- Summary of Census Results of 2016 Economic Census for Business Activity. Tokyo, Japan: Ministry of Internal Affairs and Communications, Ministry of Economy, Trade and Industry; 2018. Available at: [https://www.stat.go.jp/english/data/e-census/2016/pdf/k\\_gaiyoe.pdf](https://www.stat.go.jp/english/data/e-census/2016/pdf/k_gaiyoe.pdf). Accessed February 25, 2022.



# Low Adaptation to Management Philosophy and Refraining From Seeking Medical Care in Japanese Employees

## A 1-Year Prospective Study

Akiomi Inoue, PhD, Hisashi Eguchi, MD, Yuko Kachi, PhD, and Akizumi Tsutsumi, MD

**Objective:** We examined the prospective association of low adaptation to management philosophy with refraining from seeking medical care (RSMC) among Japanese employees in a company with a management philosophy of “pursuing employees’ well-being.” **Methods:** We surveyed 2791 employees (2059 men and 732 women) from 2 factories of a Japanese manufacturing company following the management philosophy of “pursuing employees’ well-being.” Using a self-administered questionnaire, we measured adaptation to management philosophy at baseline and RSMC at a 1-year follow-up. We conducted robust Poisson regression analysis. **Results:** Low adaptation to management philosophy was significantly associated with RSMC (incidence rate ratio, 1.17; 95% confidence interval, 1.03–1.35). **Conclusions:** Adaptation to management philosophy may be an important factor associated with the decision of employees working at a company following the “pursuing employees’ well-being” management philosophy to seek medical care for their perceived health issues.

**Keywords:** access to medical care, corporate values, Japan, longitudinal studies, mission statement

Access to medical care is a fundamental human right granted to all people and an important determinant of health.<sup>1</sup> It has been reported that delayed access to medical care, often caused by refraining from seeking medical care (RSMC: reluctance to seek or avoidance of medical care),<sup>2</sup> has various adverse effects, such as reduced quality of life, prolonged hospitalization, and increased mortality.<sup>3–6</sup> Studies on RSMC have been conducted mainly with community residents, but in recent years, these studies have been expanded to include employees. Previous studies on RSMC or access to medical care among employees have reported that psychosocial factors at work (eg, low job control, organizational justice, and workplace social capital)<sup>7–9</sup> and occupational

### CME Learning Objectives

After completing this enduring educational activity, the learner will be better able to:

- Discuss the association between low adaptation to management philosophy and refraining from seeking medical care among Japanese employees
- Discuss the importance of a management philosophy that focuses not only on revenue but also employee wellness
- Explain how a positive management philosophy can direct employee behavior and adherence

characteristics (eg, small company size, self-employment, and blue-collar employment)<sup>10</sup> are key predictors of employees’ RSMC.

In such a situation, individual adaptation to management philosophy (ie, employees’ understanding and empathizing with the content of the management philosophy and including it in their actions)<sup>11</sup> of the company to which employees belong has recently been considered a predictor of each employee’s attitudinal and behavioral outcomes.<sup>12</sup> Takao and Wang<sup>11</sup> have described adaptation to management philosophy as the process of fusion of corporate identity officially asserted by management philosophy and individual identity, and the state of individual adaptation to management philosophy as “a state in which the individual not only recognizes management philosophy as the core of corporate identity, but also deeply incorporates it into their own identity, and the philosophy has become the core of both corporate and individual identities.” To date, Wang<sup>13</sup> reported that adaptation to management philosophy affected high job involvement and organizational citizenship behavior among employees. However, that study focused on employees in a company with a management philosophy of “striving to contribute to the creation of a future where the aspirations of the people can be fulfilled.” The application of these findings to employees in companies with other management philosophies, and to other attitudinal or behavioral outcomes, such as access to medical care, is limited.

The present study focused particularly on a management philosophy of “pursuing employees’ well-being.” This is because, due to the growing interest in health and productivity management in recent years, an increasing number of companies have adopted the “pursuing well-being” or “maintenance and promotion of health” of employees as their management philosophy,<sup>14</sup> and access to medical care at the time of ill-health is directly related to the right to health based on the right to the pursuit of well-being.

Scott<sup>15</sup> and Hatvany and Pucik<sup>16</sup> have argued that management philosophy provides direction for employees, sets constraints on their behavior, and enhances their motivation through the presentation of a clear picture of the organizational goals, norms, and values. As an example, Wang<sup>13</sup> has noted that a management philosophy that emphasizes “ethics” may change the thoughts of employees from pure profit seeking to a concern for business ethics issues, making them a more socially

From the Institutional Research Center, University of Occupational and Environmental Health, Japan, Kitakyushu, Fukuoka, Japan (Dr Inoue), Department of Mental Health, Institute of Industrial Ecological Sciences, University of Occupational and Environmental Health, Japan, Kitakyushu, Fukuoka, Japan (Dr Eguchi), Department of Public Health, Kitasato University School of Medicine, Sagami-hara, Kanagawa, Japan (Dr Kachi, Dr Tsutsumi).

**Funding sources:** The present study was supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT KAKENHI: grant number JP21119002), Japan Society for the Promotion of Science (JSPS KAKENHI: grant numbers JP26253042, JP17K09172, and JP20K10477), and Ministry of Health, Labour and Welfare (Industrial Disease Clinical Research Grants: grant numbers 200201-01 and 200401-01).

**Ethical Considerations and Disclosures:** Research Ethics Committee, Graduate School of Medicine and Faculty of Medicine, The University of Tokyo (no. 2772-(6)), Kitasato University Medical Ethics Organization (no. B12-103), and Ethics Committee of Medical Research, University of Occupational and Environmental Health, Japan (no. 10-004) reviewed and approved the aims and procedures of the present study.

Inoue, Eguchi, Kachi, and Tsutsumi have no relationships/conditions/circumstances that present potential conflict of interest.

The JOEM editorial board and planners have no financial interest related to this research.

Address correspondence to: Akiomi Inoue, PhD, Institutional Research Center, University of Occupational and Environmental Health, Japan, 1-1 Iseigaoka, Yahatanishi-ku, Kitakyushu, Fukuoka 807-8555, Japan (akiomi@med.uoeh-u.ac.jp).

Copyright © 2022 American College of Occupational and Environmental Medicine  
DOI: 10.1097/JOM.0000000000002671

motivated person, and that such social motivation may also change the way of individual involvement with job, other persons, and the organization. On a similar principle, a management philosophy that emphasizes “employees’ well-being” may change the thoughts of employees from pure profit seeking to an interest in management issues that focus on employee health, making them more concerned about their own health. In addition, employees who adapt to such a philosophy may view the “pursuing well-being” as a core part of their own identity as well as that of the company, and thus see the maintenance and promotion of their own health as beneficial and essential for both the company and themselves, and may not hesitate to take action to seek medical care when they feel unwell.

Therefore, while a company’s management philosophy of “pursuing employees’ well-being” may play an important role in promoting employees’ action to seek medical care when they feel unwell, simply adopting such a philosophy may not be enough. Employees are more likely to exercise their right to health and seek medical care only when they adapt to the philosophy. A recent study of employees in a company with the management philosophy of “pursuing employees’ well-being” reported that adaptation to management philosophy predicted high work engagement,<sup>17</sup> but the association with RSMC has not been reported.

The purpose of the present study is to examine the association of low adaptation to management philosophy with RSMC among Japanese employees in a company with a management philosophy of “pursuing employees’ well-being” using a 1-year prospective design. It was hypothesized that those who perceived lower adaptation to management philosophy at baseline would be more likely to refrain from seeking medical care during the 1-year follow-up.

## METHODS

### Study Design

We used data from a Japanese Study of Health, Occupation, and Psychosocial Factors Related Equity (J-HOPE). The J-HOPE is a large-scale Japanese occupational cohort study conducted over a period of 7 years and has so far reported approximately 50 findings on health among employees due to psychosocial factors at work. However, the data cleaning process is time consuming because of the large number of people surveyed and data obtained for the entire project; therefore, although the findings of the studies have been published sequentially, there has been a time lag between data acquisition and analysis in some studies. The J-HOPE was conducted in 13 companies, but only one company measured adaptation to management philosophy; therefore, we used data from that company in the present study. At that company, we obtained baseline data from April to June 2011 and 1-year follow-up data from April to June 2012.

### Participants

We surveyed employees at 2 factories of a Japanese manufacturing company following the management philosophy of “pursuing employees’ well-being.” The surveyed company was founded in the 1950s. At the time, its management philosophy was “making its technology available to the world,” with no mention of “pursuing employees’ well-being.” However, in response to employee complaints about overtime work and concerns about the future, the company adopted “pursuing employees’ well-being” as its management philosophy in the 1960s. This philosophy has been introduced and explained to employees through management’s greeting on the foundation day or through the company newsletter. An invitation to the survey was sent to all employees ( $N = 3630$ ) in February 2011. Because they were covered by the same corporate health insurance and the 2 factories were near each other, they had almost equal access to medical care. All variables used in the present study were measured using a self-administered questionnaire, except for em-

ployment status, which was obtained from the personnel records of the company surveyed. In the baseline survey, 3461 employees responded to the self-administered questionnaire (response rate, 95.3%). During the 1-year follow-up period, 336 employees transferred to other sites, took leave (ie, sick leave, maternity leave, or parental leave), resigned, or declined to participate. Overall, 3125 employees participated in the 1-year follow-up survey and responded to the follow-up questionnaire (follow-up rate, 90.3%). After excluding 334 employees who were missing at least one response on a variable relevant to the present study, we analyzed data from 2791 employees (2059 men, 732 women; Fig. 1). The analysis used the J-HOPE first wave and second wave data sets as of June 1, 2021. The study purposes and procedures were explained to the employees, and written informed consent was obtained from them before study initiation. Research ethics committee, Graduate School of Medicine and Faculty of Medicine, The University of Tokyo (no. 2772-(6)); Kitasato University Medical Ethics Organization (no. B12-103); and Ethics Committee of Medical Research, University of Occupational and Environmental Health, Japan (no. 10-004) reviewed and approved the aims and procedures of the present study.

## Measures

### Exposure: Adaptation to Management Philosophy (Baseline Survey)

Adaptation to management philosophy at baseline was measured using a 3-item scale derived from a scale developed by Wang.<sup>13,18</sup> The original scale to measure adaptation to management philosophy comprises 11 items with the following 3 subscales: cognitive understanding of the content of the management philosophy (3 items: hereafter referred to as “cognitive understanding”), behavioral involvement reflecting the management philosophy (5 items: hereafter referred to as “behavioral involvement”), and emotional empathy with the management philosophy (3 items: hereafter referred to as “emotional empathy”).<sup>11</sup> When administering the survey in the workplace, it was necessary to narrow down the items to reduce the burden on the participants; therefore, one item from each subscale was selected, as follows: item #1 “I understand my company’s management philosophy” (cognitive understanding), item #2 “My company’s management philosophy has a strong effect on my attitudes towards my work” (behavioral involvement), and item #3 “My company’s management philosophy fits my sense of values” (emotional empathy).<sup>17</sup> All items were measured on a 5-point Likert-type scale (1 = disagree, 2 = moderately disagree, 3 = neither agree nor disagree [NAND], 4 = moderately agree, and 5 = agree). The total score was calculated by summing the item scores (score range, 3–15). In the present sample, Cronbach  $\alpha$  coefficient of the 3-item scale was 0.85. Participants were classified into tertiles (low, moderate, and high) based on the total score. In addition, participants were classified into 3 groups (disagree/moderately disagree [ie, those who answered 1 or 2], NAND [ie, those who answered 3], and agree/moderately agree [ie, those who answered 4 or 5]) for each item score.

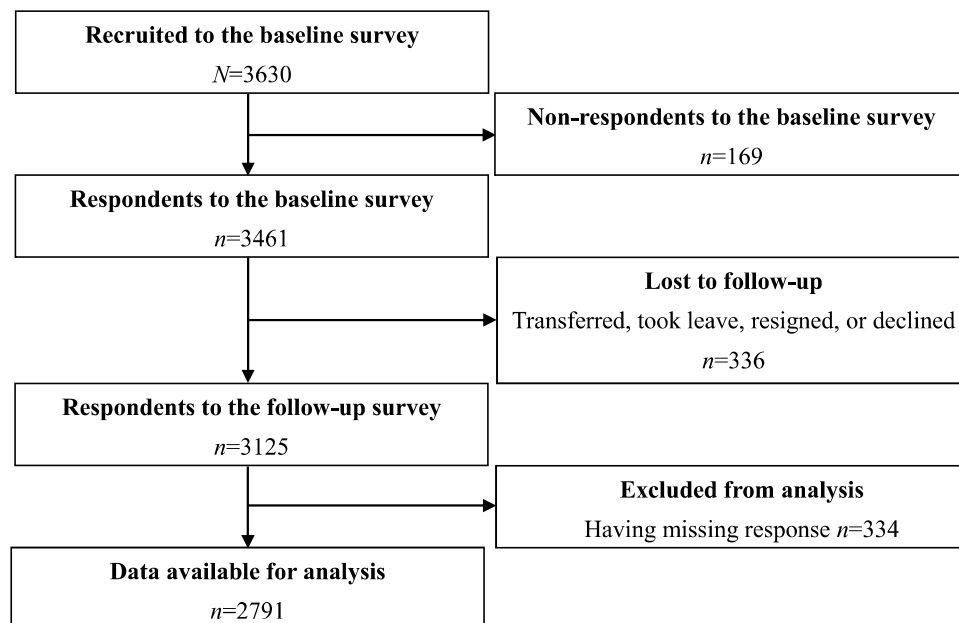
### Outcome: RSMC (1-Year Follow-up Survey)

The follow-up questionnaire included a single-item question measuring RSMC used in the Japanese General Social Survey conducted in 2008 (JGSS-2008).<sup>19</sup> Participants were asked to respond, “In the past year, have you ever refrained from visiting a hospital, clinic, acupuncturist, or dentist despite your sickness (including a slight cold or cavity) or injury?” Those who answered “Yes, I have” were classified as those who refrained from seeking medical care.

### Potential Confounders (Baseline Survey)

Based on a previous study,<sup>8</sup> demographic characteristics, socioeconomic characteristics, and health-related behaviors were potential confounders. Demographic characteristics included sex, age (29 years or younger, 30–39 years, 40–49 years, 50–59 years, and 60 years or





**FIGURE 1.** Recruitment and follow-up flow diagram.

older), medical history of stroke, myocardial infarction, hypertension, diabetes, hyperlipidemia, cancer, or mental disorders (any and none), household size (continuous variable), employee tenure (continuous variable), work shift (day shift, shift work with night duty, shift work without night duty, and night shift), and working hours per week (30 hours or less, 31–40 hours, 41–50 hours, 51–60 hours, and 61 hours or more). Socioeconomic characteristics included education (graduate school, college, junior college, and high school or junior high school), equivalent annual household income (continuous variable), occupational position (manager, nonmanual employee, manual employee, and other), and employment status (permanent employee and nonpermanent employee). Health-related behaviors included smoking habits (never smoker, ex-smoker, and current smoker), drinking habits (rarely, sometimes, and daily), and physical activity (none, light physical activity 1 or more times a week, intense physical activity once or twice a week, and intense physical activity thrice or more times a week).

### Statistical Analysis

First, Student *t* test or Fisher exact test was performed to compare those who refrained from seeking medical care with those who did not refrain on potential confounders as well as on the total and each item scores for the adaptation to management philosophy scale. Second, using the high adaptation to management philosophy group as a reference, robust (or modified) Poisson regression analysis was performed to estimate the incidence rate ratios (IRRs) and their 95% confidence intervals (CIs) of RSMC for the moderate and low adaptation to management philosophy groups. In a series of analyses, we first adjusted for demographic characteristics (ie, sex, age, medical history, household size, employee tenure, work shift, and working hours per week; Model 1). Subsequently, we incrementally adjusted for socioeconomic characteristics (ie, education, equivalent annual household income, occupational position, and employment status; Model 2) and health-related behaviors (ie, smoking habits, drinking habits, and physical activity; Model 3). A linear trend test was also performed to examine the dose-response relationship between low adaptation to management philosophy and RSMC. Furthermore, as subanalysis, a similar analysis was performed by each item of the adaptation to management philosophy scale to examine which components of adaptation to management philosophy would be more greatly associated with

RSMC. In the subanalysis, the IRRs and their 95% CIs of RSMC for the NAND and disagree/moderately disagree groups were estimated, with the agree/moderately agree group as a reference. The linear trend test was also performed. The level of significance was 0.05 (2-tailed). The statistical analyses were performed using Stata/MP 17.0 for Windows (Stata Corp, College Station, TX).

### RESULTS

Table 1 shows the detailed characteristics of the participants by those who did and did not refrain from seeking medical care. Those who refrained from seeking medical care were more likely to be male, be younger, have shorter employee tenure, work longer hours, have nonmanual or manual jobs, have permanent employment, and have no physical activity.

Table 2 shows the results of the main analysis. After adjusting for demographic characteristics (Model 1), the low adaptation to management philosophy group had a significantly higher IRR of RSMC compared with the high adaptation to management philosophy group (IRR, 1.18; 95% CI, 1.03–1.35). Furthermore, a significant dose-response relationship was observed between low adaptation to management philosophy and RSMC (*P* for linear trend = 0.012). These patterns remained unchanged after additionally adjusting for socioeconomic characteristics and health-related behaviors (Models 2 and 3).

Table 3 shows the results of the subanalysis. After adjusting for demographic characteristics (Model 1), the disagree/moderately disagree group had a significantly higher IRR of RSMC compared with the agree/moderately agree group for item #2 (behavioral involvement; IRR, 1.21; 95% CI, 1.03–1.41). Furthermore, a significant dose-response relationship was observed between disagreement with behavioral involvement and RSMC (*P* for linear trend = 0.002). On the other hand, this significant relationship was not observed for item #1 (cognitive understanding) or item #3 (emotional empathy). These patterns remained unchanged after additionally adjusting for socioeconomic characteristics and health-related behaviors (Models 2 and 3).

### DISCUSSION

The present prospective study demonstrated a significant association of low adaptation to management philosophy with RSMC among employees in a company with the management philosophy of “pursuing employees’ well-being.” In the analysis by scale items, only

**TABLE 1.** Detailed Characteristics of Employees Who Participated in the Present Study (N = 2791)

	Refrained From Seeking Medical Care (n = 1265)		Did Not Refrain From Seeking Medical Care (n = 1526)		P*
	Mean (SD)	n (%)	Mean (SD)	n (%)	
Sex					0.014
Men		962 (76.0)		1097 (71.9)	
Women		303 (24.0)		429 (28.1)	
Age	37.7 (10.6)		40.1 (11.1)		<0.001
≤29 y		351 (27.7)		339 (22.2)	
30–39 y		366 (28.9)		371 (24.3)	
40–49 y		359 (28.4)		478 (31.3)	
50–59 y		171 (13.5)		291 (19.1)	
≥60 y		18 (1.4)		47 (3.1)	
Medical history†					0.928
Any		296 (23.4)		354 (23.2)	
None		969 (76.6)		1172 (76.8)	
Household size	3.17 (1.68)		3.17 (1.61)		0.987
Employee tenure, y	13.1 (10.4)		13.9 (10.7)		0.040
Work shift					0.249
Day shift		822 (65.0)		1046 (68.5)	
Shift work with night duty		329 (26.0)		361 (23.7)	
Shift work without night duty		68 (5.4)		70 (4.6)	
Night shift		46 (3.6)		49 (3.2)	
Working hours per week					0.001
≤30 h		227 (17.9)		365 (23.9)	
31–40 h		280 (22.1)		351 (23.0)	
41–50 h		473 (37.4)		501 (32.8)	
51–60 h		222 (17.5)		233 (15.3)	
≥61 h		63 (5.0)		76 (5.0)	
Education					0.503
Graduate school		114 (9.0)		122 (8.0)	
College		153 (12.1)		207 (13.6)	
Junior college		233 (18.4)		292 (19.1)	
High school or junior high school		765 (60.5)		905 (59.3)	
Equivalent annual household income, million JPY‡	3.64 (1.76)		3.69 (1.77)		0.501
Occupational position					0.005
Manager		108 (8.5)		142 (9.3)	
Nonmanual employee		369 (29.2)		403 (26.4)	
Manual employee		621 (49.1)		709 (46.5)	
Other		167 (13.2)		272 (17.8)	
Employment status					<0.001
Permanent employee		1089 (86.1)		1236 (81.0)	
Nonpermanent employee		176 (13.9)		290 (19.0)	
Smoking habits					0.097
Never smoker		701 (55.4)		907 (59.4)	
Ex-smoker		119 (9.4)		127 (8.3)	
Current smoker		445 (35.2)		492 (32.2)	
Drinking habits					0.102
Rarely		580 (45.8)		748 (49.0)	
Sometimes		418 (33.0)		448 (29.4)	
Daily		267 (21.1)		330 (21.6)	
Physical activity (PA)					<0.001
None		939 (74.2)		1020 (66.8)	
Light PA one or more times a week		190 (15.0)		330 (21.6)	
Intense PA once or twice a week		115 (9.1)		147 (9.6)	
Intense PA thrice or more times a week		21 (1.7)		29 (1.9)	
<b>Scale Scores (Range)</b>	<b>Mean (SD)</b>	<b>Cronbach α</b>	<b>Mean (SD)</b>	<b>Cronbach α</b>	<b>P</b>
Adaptation to management philosophy (3–15)	11.0 (2.05)	0.85	11.2 (2.04)	0.86	0.010
Item #1 (cognitive understanding, 1–5)	3.73 (0.74)	—	3.76 (0.71)	—	0.263
Item #2 (behavioral involvement, 1–5)	3.65 (0.80)	—	3.76 (0.78)	—	<0.001
Item #3 (emotional empathy, 1–5)	3.58 (0.81)	—	3.65 (0.81)	—	0.030

\*Student *t* test and Fisher exact test were used for continuous and categorical variables, respectively.

†Defined as having a medical history of stroke, myocardial infarction, hypertension, diabetes, hyperlipidemia, cancer, or mental disorders.

‡If the JPY is converted into US dollar using the monthly exchange rate as of April 2011 (ie, 83 JPY per US dollar), the mean equivalent annual household incomes would be US \$43,855 and US \$44,458 for those who did and did not refrain from seeking medical care, respectively.