Original

The Japanese Workplace PERMA-Profiler: A validation study among Japanese workers

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Abstract: Objectives: Although well-being at work is important for occupational health, multi-dimensional workplace well-being measures do not exist for Japanese workers. The purpose of this study was to investigate the validity of the Japanese version of the Workplace PERMA-Profiler. **Methods:** Japanese workers completed online surveys at baseline (N = 310) and 1 month later (N = 100). The Workplace PERMA-Profiler was translated according to international guidelines. Job and life satisfaction, work engagement, psychological distress, work-related psychosocial factors, and work performance were measured as comparisons for convergent validity. Cronbach's alphas, Intra-class Correlation Coefficients (ICCs), and measurement errors were calculated for the reliability, and the validity of the measure was tested by correlational analyses and confirmatory factor analysis. **Results:** A total of 310 (baseline) and 86 (follow-up) workers responded and were included in the analyses. Cronbach's alphas and ICCs of the Japanese Workplace PERMA-Profiler ranged from 0.75 to 0.96. Confirmatory factor analysis indicated that the 5-factor model demonstrated a marginally acceptable fit ($\chi2$ (80) = 351.30, CFI = 0.892, TLI = 0.858, RMSEA = 0.105, SRMR = 0.051). Overall well-being and the five PERMA domains had moderate-to-strong correlations with job satisfaction, psychological distress (inversely), and work-related factors. **Conclusions:** The Japanese version of the Workplace PERMA-Profiler demonstrated adequate reliability and validity. This measure could be useful to assess well-being at work, promote well-being research among Japanese workers, and address the problem of definition for well-being in further studies.
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Introduction

The importance of well-being has been recognized not only in academic fields but also in public policy and economics [1,2]. Multiple well-designed cohort studies and meta-analyses have reported that well-being correlates with lower mortality risk [2-4]. Within occupational settings, a positive perspective, including a focus on well-being, has also been recognized as important for fostering human capital and productivity [5,6].

The conceptualization and definition of well-being is a difficult problem and topic of active discussion among researchers, and currently focuses on a diverse array of dimensions or descriptions rather than definitions [7]. Perhaps the most well-defined trait of well-being is the separation

Table 1. The English Workplace PERMA-Profiler

Label	Question	Response Anchors
A1	How often do you feel you are making progress towards accomplishing your work-related goals?	0 = never, 10 = always
E1	At work, how often do you become absorbed in what you are doing?	
P1	At work, how often do you feel joyful?	
N1	At work, how often do you feel anxious?	
A2	How often do you achieve the important work goals you have set for yourself?	
H1	In general, how would you say your health is?	0 = terrible, 10 = excellent
M1	To what extent is your work purposeful and meaningful?	0 =not at all, 10 = completely
R1	To what extent do you receive help and support from coworkers when you need it?	
M2	In general, to what extent do you feel that what you do at work is valuable and worthwhile?	
E2	To what extent do you feel excited and interested in your work?	
Lon	How lonely do you feel at work?	
H2	How satisfied are you with your current physical health?	
P2	At work, how often do you feel positive?	0 = never, 10 = always
N2	At work, how often do you feel angry?	
A3	How often are you able to handle your work-related responsibilities?	
N3	At work, how often do you feel sad?	
E3	At work, how often do you lose track of time while doing something you enjoy?	
H3	Compared to others of your same age and sex, how is your health?	0 = terrible, 10 = excellent
R2	To what extent do you feel appreciated by your coworkers?	0 =not at all, 10 = completely
M3	To what extent do you generally feel that you have a sense of direction in your work?	
R3	How satisfied are you with your professional relationships?	
P3	At work, to what extent do you feel contented?	
Hap	Taking all things together, how happy would you say you are with your work?	0 =not at all, 10 = completely

The PERMA domains, negative emotion (N), and physical health (H) are computed as the average across the three items. Overall happiness is the average of the 15 PERMA items and the overall happiness (Hap) item. Loneliness (Lon) is a single item. Copyright Kern (2014), used by permission from the author.

of positive and negative dimensions. A systematic review indicates that effects of well-being are independent of negative affect[8]. Well-being can thus be critically distinguished from the absence of negative factors (e.g., negative affect, depression, anxiety, and distress). The other distinction that has been made is between hedonic (emotion, pursuing pleasure, avoiding pain) and eudaimonic (the good life) dimensions[9]. A cognitive evaluation of one's life (satisfaction with life) provides a third dimension. Most of the proposed well-being models utilize a combination of hedonic, eudaimonic, positive, negative, and evaluative dimensions[2].

For instance, Diener's subjective well-being theory (SWB)[10] suggested three dimensions of well-being: pleasant affect, unpleasant affect, and life satisfaction. Ryff's psychological well-being (PWB)[11], focuses on six eudaimonic dimensions: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance. Well-being at work has been discussed primarily in emotional (e.g., positive affect at work) and cognitive (e.g., job satisfaction) dimensions[12]. Alternatively, well-being has been conceptualized more

holistically as flourishing, which combines multiple hedonic and eudaimonic dimensions. For example, Seligman's PERMA model[13] consists of five domains: positive emotion (P), engagement (E), relationships (R), meaning (M), and accomplishment (A).

The problem of defining these concepts of well-being should be addressed through operationalization, using established measures[7]. Most of the well-being and flourishing models have corresponding measures. For instance, the PERMA-Profiler developed by Butler and Kern[14] allows individuals to monitor their well-being. This tool can also be useful for integrating the dimensions of well-being, compared with other previously developed measures[15,16]. Kern developed a workplace version of the measure (the Workplace PERMA-Profiler)[17], which adjusted the questions to the workplace context to measure well-being at work (Table 1). Mirroring the general version of the PERMA-Profiler, the workplace measure consists of five factors (positive emotion, engagement, relationships, meaning, and accomplishment) across 15 items, along with 8 additional items to measure happiness (1 item), negative emotion (3 items), health (3 items), and loneli-

ness (1 item). The measure is freely available for individual use (www.permahsurvey.com).

However, no multi-dimensional measurements for well-being at work have been developed in Japan. In addition, the reliability and validity of the original Workplace PERMA-Profiler has not been confirmed in published papers. Although well-being at work can cover the same dimensions as overall well-being, work-related well-being might operate in different contexts and might be associated with different outcomes (e.g., productivity) than overall well-being[5,6]. In addition, specification and stratification of well-being will address further questions such as a spill-over effect of well-being between work and life[12]. In practice, because the Workplace PERMA-Profiler is easy to complete in a short time (23 items, or 15 items using only the PERMA domains), it could be useful as an indicator of positive aspects for prevention and health promotion approaches in the workplace.

The current study aimed to investigate the reliability and validity of the Japanese version of the Workplace PERMA-Profiler among Japanese workers. The internal consistency, test-retest reliability, structural validity, and convergent validity of a translated version of the measure were tested. We hypothesized that the Japanese version of the Workplace PERMA-Profiler would have good internal consistency, test-retest reliability, and five-factor structural validity. Based on correlations for the original PERMA-Profiler[14], we also hypothesized that well-being measured by the Workplace PERMA-Profiler would have a moderate-to-strong positive correlation with job satisfaction ($r \geq 0.50$) and a moderate negative correlation with psychological distress ($r \leq -0.30$). We expected that well-being at work would overlap with job satisfaction and work-related factors, and would be negatively associated with adverse health outcomes. Because work engagement[18] could be a similar concept with engagement (E) in the PERMA model for the workplace, we expected that this measure would have weak-to-moderate correlations with work-related psychosocial factors and work performance ($r \geq 0.20$)[19].

Subjects and Methods

Design

This was a validation study consisting of baseline (November 2016) and one-month follow-up (December 2016) online surveys in Japan. The internal consistency, structural validity, and convergent validity of the Japanese version of the Workplace PERMA-Profiler were investigated using the cross-sectional data. Test-retest reliability was investigated using the longitudinal data one month after follow-up. Because Seligman suggests that the PERMA domains are more stable reflections of well-being[13], we conducted the follow-up study after one month, expecting scores to remain fairly stable over that period. This manuscript was written according to the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) reporting guidelines[20]. Each characteristic of the measure was reported according to the COSMIN checklist.

Participants

Participants were drawn from workers registered as respondents of an Internet survey company, Macromill, Inc[21]. Of the available respondents, 310 workers completed a web-based questionnaire in order of arrival. Macromill had access to over 2,000,000 potential participants representing all prefectures in Japan, and recruited participants based on their demographic attributes to obtain a relatively representative sample. These registered members have diverse characteristics in terms of gender and age. Participant inclusion criteria were (a) Japanese workers who lived in a prefecture of Japan and (b) age 18 or older. There were no exclusion criteria. Based on these criteria, the Internet survey company recruited workers from their potential pool of participants, until the targeted number was reached. If the eligible workers agreed with the terms and conditions of the online survey, they could access the self-report questionnaire. After one month, the company randomly sampled 100 participants from the workers who completed the baseline survey again. Participating workers were awarded approximately 100 'Macromill points' as a reward for each survey, which could be used for cashing out and shopping (one point was equivalent to 1 Japanese yen). Informed consent was obtained from all participants via instructions on the survey. The instructions assured protection of personal information and explained that any identifying information would be removed from the data. The study protocol was approved by the research ethics committee of the Graduate School of Medicine and the Faculty of Medicine, The University of Tokyo, Japan (No. 11242).

Measurements

Participants completed an online self-reporting survey that included the Workplace PERMA-Profiler and questions regarding job and life satisfaction, work engagement, psychological distress, work-related psychosocial factors (job demands, job control, and social support from supervisors and colleagues)[22,23], and work performance.
The Workplace PERMA-Profiler

The Japanese version of the Workplace PERMA-Profiler was used to measure multidimensional well-being at work. The measure includes the five factors of the PERMA model (positive emotion, engagement, relationships, meaning, and accomplishment), as well as overall happiness at work, negative emotion, health, and loneliness. Each factor score of the Workplace PERMA-Profiler was calculated as an average of the item scores. An overall score of well-being at work was calculated as

an average of 15 items and happiness (1 item). All items were rated on an 11-point Likert-type scale (ranging from 0 to 10).

The Japanese version of the measure was developed according to the procedure specified in the International Society of Pharmacoeconomics and Outcomes Research (IS-POR) task force guidelines[24]. First, we obtained permission from the developer of the original Workplace PERMA-Profiler (MLK) to translate the measure into Japanese (preparation). Forward-translation was independently conducted and was followed by reconciliation, back-translation, back-translation review, harmonization, and cognitive debriefing. The back-translation was conducted by two experts in Japanese and English affiliated with the English Language Program of the Kanazawa Institute of Technology, who did not know the purpose of the study. The original developer checked the back-translated measure and made revisions at the back-translation review stage. Cognitive debriefing sessions were conducted with nine Japanese workers who were recruited using snowball sampling, and included a company president and occupational health staff members (occupational doctor, public health nurse, clinical psychologist, and human resource management workers). They were asked to complete the harmonized measure and revise the wording if they had difficulty understanding an item, and their feedback was used for further revision. Results from the different stages were combined to create the final measure. For the full version of the Japanese Workplace PERMA-Profiler, please see Appendix 1.

Job and life satisfaction

Job and life satisfaction were measured by questions from the Brief Job Stress Questionnaire (BJSQ)[25]. This scale has been widely used to assess stress responses in Japan. Job and life satisfaction measures consisted of one item each: 'I am satisfied with my job' and 'I am satisfied with my family life', respectively. The two items are rated on a four-point Likert scale (1 = Dissatisfied, 4 = Satisfied), with higher scores indicating higher satisfaction.

Work engagement

The nine-item Japanese version of the Utrecht Work Engagement Scale (UWES) was used to assess work engagement[26]. The UWES consists of three subscales: vigor (three items, e.g., 'At my job, I feel strong and vigorous'), dedication (three items, e.g., 'I am enthusiastic about my job'), and absorption (three items, e.g., 'I am immersed in my work'). All items are rated on a seven-point Likert scale (0 = Never, 6 = Always). The reliability and unidimensional validity of the Japanese version of the UWES were confirmed in a previous study[26]. The scores from each of the nine items were averaged and used for analyses (Cronbach's alpha (α) = 0.96).

Psychological distress

Two scales were used to measure non-specific and spe-cific psychological distress. Non-specific psychological distress was measured by the Japanese version of the K6 scale[27]. The scale consisted of six items (e.g., 'About how often did you feel nervous?'), asking respondents how often they had experienced symptoms of psychological distress during the last 30 days. All items were rated on a five-point Likert scale (0 = None of the time, 4 = All the time). The reliability and validity of the K6 were confirmed in a previous study[27]. In this study, the total continuous scores on the Japanese version of the K6 were used for analyses (α = 0.91).

Specific types of psychological distress were also measured by questions from the BJSQ[25]: vigor (three items, e.g., 'I have been very active'; α = 0.93), irritation (three items, e.g., 'I have felt angry'; α = 0.91), fatigue (three items, e.g., 'I have felt extremely tired'; α = 0.91), anxiety (three items, e.g., 'I have felt tense'; α = 0.82), and depression (six items, e.g., 'I have felt depressed'; α = 0.93). The BJSQ has been widely used in Japan to assess responses to stress and has demonstrated satisfactory internal consistency, test-retest reliability, convergent validity, and predictive validity for the onset of depression[28]. All items are rated on a four-point Likert scale (1 = Almost never, 4 = Almost always).

Work-related psychosocial factors

Job demands (three items, e.g., 'I have an extremely large amount of work to do'; α = 0.83), job control (three items, e.g., 'I can work at my own pace'; α = 0.83), and social support from supervisors (three items, e.g., 'How reliable are your superiors when you are troubled?' ; α = 0.84) and colleagues (three items, e.g., 'How freely can you talk with your co-workers?'; α = 0.87) were also measured by the BJSQ[25]. All items are rated on a four-point Likert scale (for job demands and job control: 1 = Not at all, 4 = Very much so; for social support: 1 = Not at all, 4 = Extremely). Higher scores mean higher job demands, job control, and social support.

Work performance

Work performance was assessed using an item from a validated scale, the Japanese short version of the WHO Health and Work Performance Questionnaire (WHO-HPQ)[29]. The item rated an individual's overall job performance for the past month on a scale of 0 to 10, with 0 being the worst job performance and 10 being the best. The ratings were multiplied by 10 to calculate work performance according to the WHO-HPQ scoring guidelines.

Analysis

To test reliability, some statistical values (Cronbach's alphas, Intra-class Correlation Coefficients, the Standard Error of Measurement, and the Smallest Detectable Change) of the Japanese version of the Workplace PERMA-Profiler were calculated. Confirmatory factor analysis (CFA) and correlational analysis were conducted to test validity. We used PASW statistics version 18 (IBM
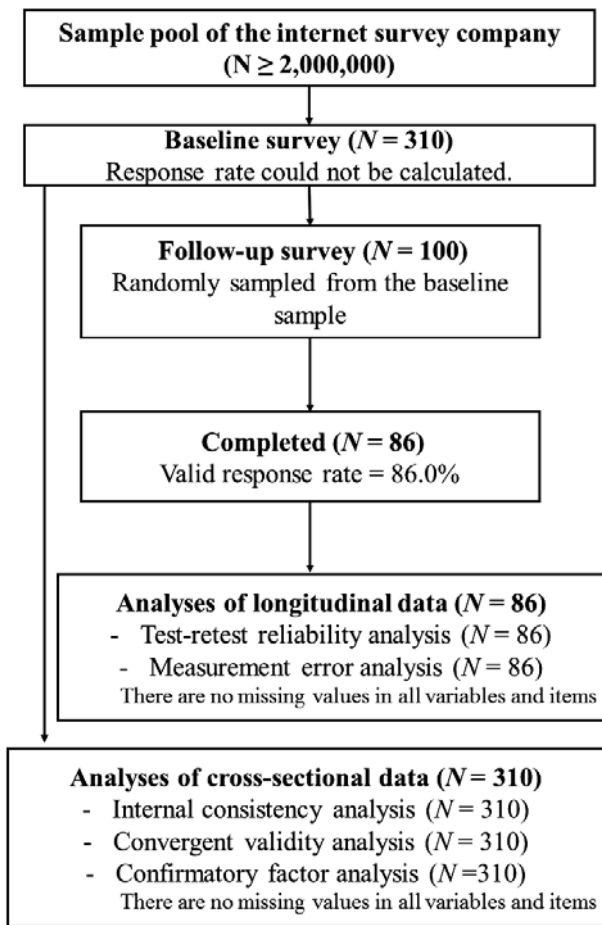
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┌─────────────────────────────────────────────┐
│  Sample pool of the internet survey company  │
│            (N ≥ 2,000,000)                    │
└─────────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────────┐
│       Baseline survey (N = 310)               │
│   Response rate could not be calculated.      │
└─────────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────────┐
│     Follow-up survey (N = 100)                │
│   Randomly sampled from the baseline          │
│   sample                                       │
└─────────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────────┐
│          Completed (N = 86)                   │
│     Valid response rate = 86.0%               │
└─────────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────────┐
│  Analyses of longitudinal data (N = 86)       │
│  - Test-retest reliability analysis (N = 86)  │
│  - Measurement error analysis (N = 86)        │
│  There are no missing values in all variables │
│  and items                                     │
└─────────────────────────────────────────────┘
                    │
┌─────────────────────────────────────────────┐
│  Analyses of cross-sectional data (N = 310)   │
│  - Internal consistency analysis (N = 310)    │
│  - Convergent validity analysis (N = 310)     │
│  - Confirmatory factor analysis (N = 310)     │
│  There are no missing values in all variables │
│  and items                                     │
└─────────────────────────────────────────────┘
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Fig. 1.

SPSS software) and Mplus version 7.4[30] for each analysis.

Internal consistency

To assess internal consistency, Cronbach's alphas were calculated for the total score and for each factor score (i.e., positive emotion, engagement, relationships, meaning, and accomplishment) of the Japanese Workplace PERMA-Profiler. Based on previous research[31], the sample size of more than 100 was considered sufficient for methodological quality for Cronbach's alpha. Because a five-factor structure of the measure was confirmed in previous studies[13,14], we did not check the dimensionality of the measure but calculated Cronbach's alphas for the total score and each factor score directly.

Test-retest reliability

Intra-class Correlation Coefficients (ICCs) for the total score and each factor score were calculated to assess test-retest reliability across the 1 month period. Although the previous study reported different parameters (Pearson's r) as the standard of test-retest reliability, the sample size can be considered good to excellent when 50-100 participants are recruited in the test-retest reliability analysis[31]. In addition, the Standard Error of Measurement (SEM)

and the Smallest Detectable Change (SDC) were calculated as the standards of measurement error[32-34]. The SEM describes the standard deviation of repeated measures in one participant, and the SDC represents the minimal change that one participant must show on the measure to ensure that the observed change is real and not just measurement error[32]. The SEM was calculated as (the standard deviation of all testing scores) $\times \sqrt{(1 - ICC)}$[33,34], and the SDC was calculated as $1.96 \times \sqrt{(2 \times SEM)}$[32].

Structural validity

To confirm the five-factor structural validity, CFA was conducted among the 15 items, using a robust maximum likelihood estimation in Mplus[30]. The original five-factor model (each of three items was explained by the five factors) and a one-factor model (all 15 items were explained by one factor) were assumed and tested in several model fit indices: the chi square ($\chi 2$), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). We considered the model a good fit if the CFI and TLI exceeded 0.95 and the RMSEA and SRMR was less than 0.06[35]. Based on a previous study[31], the sample size required for factor analysis was at least five to seven times the number of items, with a minimum of 100. Given that the Japanese version of the Workplace PERMA-Profiler has 15 items, an adequate number of participants ($N \geq 105$) was recruited in the study.

Convergent validity

Pearson's correlation coefficients (r) among the PERMA factors, job and life satisfaction, work engagement, psychological distress, work-related psychosocial factors, and work performance were calculated to examine convergent validity. The minimum effect size for detection in the study was 0.20 (ρ). Based on a sample size calculation using G*Power version 3.1.9.2[36], the necessary sample size was estimated to be more than 255 in the case of α error probability of 0.05 and power (1 - β) of 0.90. Therefore, an adequate number of participants was recruited in the study.

Results

Characteristics of participants

A flow chart of the participants is shown in Fig. 1. Because the survey company ceased recruitment once the target number of respondents had been reached, the baseline response rate could not be determined. In the one month follow-up survey, 86 of 100 workers randomly sampled from the baseline participants responded to the questionnaire again (response rate = 86.0%). Because the Internet-based survey required the participants to answer all items, there were no missing values on any variables or items. The demographic characteristics of the participants at baseline and follow-up are shown in Table 2. In

Table 2. Demographic characteristics of the participants

	Baseline Survey (N = 310)		Follow-up Survey (N = 86)	
	n (%)	Mean (SD)	n (%)	Mean (SD)
Gender				
Men	155 (50.0)		40 (46.5)	
Women	155 (50.0)		46 (53.5)	
Age		44.9 (13.6)		45.8 (13.0)
Educational status				
Junior high school	4 (1.3)		0 (0.0)	
High school	86 (27.7)		30 (34.9)	
College	73 (23.5)		19 (22.1)	
University	132 (42.6)		35 (40.7)	
Graduate school	16 (5.2)		2 (2.3)	
Employment status				
Full-time	156 (50.3)		47 (54.7)	
Part-time	91 (29.4)		25 (29.1)	
Contract/Dispatched	28 (9.0)		6 (7.0)	
Freelance	28 (9.0)		7 (8.1)	
Other	7 (2.2)		1 (1.2)	
Employment shift status				
Day shift	281 (90.7)		79 (91.9)	
Rotation/night shift	29 (9.4)		7 (8.2)	
Job type				
Managerial	26 (8.4)		8 (9.3)	
Professional/Technical	56 (18.1)		13 (15.1)	
Clerical	69 (22.3)		21 (24.4)	
Sales	40 (12.9)		5 (5.8)	
Services	56 (18.1)		16 (18.6)	
Transport/Construction	12 (3.9)		2 (2.4)	
Production/Skilled	31 (10.0)		13 (15.1)	
Other	20 (6.5)		8 (9.3)	
Job category				
Services	58 (18.7)		20 (23.3)	
Manufacturing	51 (16.5)		16 (18.6)	
Medical/Welfare	33 (10.6)		7 (8.1)	
Retail	31 (10.0)		6 (7.0)	
Education	20 (6.5)		9 (10.5)	
Construction	20 (6.5)		3 (3.5)	
Transport	16 (5.2)		4 (4.7)	
Public service	15 (4.8)		3 (3.5)	
Financial/Insurance	14 (4.5)		5 (5.8)	
Information	13 (4.2)		3 (3.5)	
Other	39 (12.6)		10 (11.6)	
Size of worksite				
≤49 employees	146 (47.1)		37 (43.0)	
50-299 employees	64 (20.6)		21 (24.4)	
≥300 employees	84 (27.1)		26 (30.2)	
Unknown	16 (5.2)		2 (2.3)	

Table 3. Mean scores, internal consistency, and reliability of the Japanese version of the Workplace PERMA-Profiler (N = 310)

Factors	Baseline Mean (SD)	Min-Max	Cronbach's alpha	Follow-up Mean (SD)[†]	Test-retest Reliability (ICC)[†]	SME[†]	SDC[†]
Positive emotion	5.46 (2.3)	0-10	0.92	5.38 (2.4)	0.86**	0.90	2.49
P1	5.32 (2.5)	0-10		5.35 (2.5)	0.79**	1.16	3.22
P2	5.76 (2.4)	0-10		5.49 (2.4)	0.82**	1.04	2.89
P3	5.29 (2.5)	0-10		5.30 (2.6)	0.77**	1.29	3.57
Engagement	5.86 (2.2)	0-10	0.85	5.99 (2.1)	0.83**	0.87	2.42
E1	6.05 (2.4)	0-10		6.20 (2.5)	0.83**	1.00	2.77
E2	5.72 (2.4)	0-10		5.85 (2.3)	0.76**	1.13	3.14
E3	5.81 (2.6)	0-10		5.92 (2.5)	0.65**	1.51	4.17
Relationships	5.59 (2.0)	0-10	0.75	5.60 (2.0)	0.83**	0.82	2.27
R1	6.03 (2.5)	0-10		5.62 (2.5)	0.69**	1.34	3.71
R2	4.87 (2.3)	0-10		5.28 (2.4)	0.70**	1.31	3.64
R3	5.88 (2.4)	0-10		5.90 (2.6)	0.77**	1.21	3.34
Meaning	6.24 (2.1)	0-10	0.88	6.21 (1.9)	0.77**	0.92	2.56
M1	6.85 (2.3)	0-10		6.77 (2.1)	0.63**	1.25	3.47
M2	5.92 (2.4)	0-10		5.91 (2.3)	0.65**	1.36	3.77
M3	5.94 (2.3)	0-10		5.95 (2.2)	0.75**	1.11	3.07
Accomplishment	6.19 (1.9)	0-10	0.84	6.29 (2.0)	0.77**	0.92	2.56
A1	5.60 (2.3)	0-10		5.56 (2.2)	0.68**	1.26	3.49
A2	6.25 (2.2)	0-10		6.49 (2.4)	0.69**	1.29	3.57
A3	6.73 (2.1)	0-10		6.84 (2.3)	0.63**	1.34	3.71
Happiness	6.01 (2.3)	0-10		6.02 (2.6)	0.83**	1.07	2.97
Overall well-being (16 items)	5.88 (1.8)	0-10	0.96	5.90 (1.9)	0.88**	0.65	1.81
Negative emotion (3 items)	4.53 (2.1)	0-10	0.78	4.48 (2.3)	0.79**	1.04	2.88
Health (3 items)	5.77 (2.2)	0-10	0.93	5.57 (2.2)	0.87**	0.80	2.23
Loneliness (1 item)	4.24 (2.9)	0-10		4.34 (2.8)	0.64**	1.71	4.73

† *N* = 86. ICC: intra-class correlation coefficient, SME: standard error of measurement, SDC: smallest detectable change. ** *p* < 0.01

the baseline survey (*N* = 310, 155 men and 155 women, mean age = 44.9 ± 13.6), the majority of the participants had graduated from university (42.6%) or had some college (23.5%). Most participants were full-time (50.3%), day-time workers (90.7%) engaged in occupations such as clerical (22.3%), service (18.1%), or professional/technical jobs (18.1%). Most workers were employed by worksites that had less than 50 workers (47.1%), which covered a wide range of job categories such as services (18.7%), manufacturing (16.5%), and medical/welfare (10.6%). Characteristics of the participants in the follow-up survey (*N* = 86, 40 men and 46 women, mean age = 45.8 ± 13.0) did not differ from those at baseline, and no significant change was observed.

Internal consistency and test-retest reliability

Table 3 shows mean scores, Cronbach's alphas (α), ICCs, SEMs, and SDCs for the PERMA factors. Cronbach's alpha coefficients ranged from 0.75 to 0.96. ICCs

ranged from 0.77 to 0.88, meaning that approximately 80% of variance in two time measurements was explained by individuals. SDCs ranged from 1.81 to 2.56.

Structural validity

The results of CFA are shown in Table 4. Of the one-factor and five-factor models, the original five-factor hypothesized model demonstrated marginally acceptable fit (χ^2 [80] = 351.30, CFI = 0.892, TLI = 0.858, RMSEA = 0.105, SRMR = 0.051). Standardized covariances among the five factors ranged from 0.73 to 0.97, indicating strong correlations. The five-factor model demonstrated the best fit between the two models compared with the one-factor model ($\Delta\chi^2$ [10] = 297.13, *p* < 0.05).

Convergent validity

Table 5 shows Pearson's correlation coefficients (*r*) among the PERMA factors, job and life satisfaction, work engagement, psychological distress, work-related psycho-

Table 4. Factor loadings of the 15 PERMA items, factor correlations, and model fit in confirmatory factor analyses

Items	Factor loadings — 1-factor model	Factor loadings — 5-factor model
P1	0.87*	0.88*
P2	0.83*	0.88*
P3	−0.27*	0.91*
E1	0.84*	0.77*
E2	0.76*	0.86*
E3	0.45*	0.78*
R1	0.75*	0.56*
R2	−0.21*	0.71*
R3	0.68*	0.83*
M1	−0.07	0.80*
M2	−0.22*	0.84*
M3	0.52*	0.87*
A1	0.86*	0.90*
A2	0.47*	0.70*
A3	0.68*	0.67*

Correlation coefficients in the 5-factor model

	F1 (P)	F2 (E)	F3 (R)	F4 (M)	F5 (A)
F1 (P)	1.00				
F2 (E)	0.94*	1.00			
F3 (R)	0.92*	0.78*	1.00		
F4 (M)	0.89*	0.97*	0.73*	1.00	
F5 (A)	0.90*	0.89*	0.77*	0.95*	1.00

Model fit	1-factor	5-factor
χ^2 (df)	648.43 (90) *	351.30 (80) *
CFI	0.705	0.892
TLI	0.656	0.858
RMSEA (95% CI)	0.141 (0.131, 0.152)	0.105 (0.094, 0.116)
SRMR	0.100	0.051
1-factor model vs. 5-factor model: $\Delta\chi^2$ (df)		297.13 (10) *

The robust maximum likelihood estimation method was used. $*p < 0.05$.

social factors, and work performance. The overall well-being score and five PERMA factors had strong positive correlations with job satisfaction and work engagement ($0.60 \leq r \leq 0.82$). In addition, they had small to moderate positive correlations with life satisfaction ($0.19 \leq r \leq 0.34$). Moreover, the PERMA factors were moderately negatively correlated with non-specific psychological distress ($-0.53 \leq r \leq -0.39$). With regards to specific types of psychological distress, they had comparatively strong correlations with vigor ($0.47 \leq r \leq 0.58$) and depression ($-0.53 \leq r \leq -0.38$). Among work-related psychosocial factors, job control and social support were moderately to strongly associated with PERMA factors ($0.32 \leq r \leq 0.60$). Self-reported work performance also had moderate to strong positive associations with the PERMA factors ($0.48 \leq r \leq 0.73$). Only job demands had comparatively weak associations ($0.01 \leq r \leq 0.20$).

Discussion

In this study, the Japanese version of the Workplace PERMA-Profiler demonstrated good reliability and convergent validity, with adequate structural validity. Well-being at work was associated with not only health outcomes but also work-related psychosocial factors and work performance. Indeed, the PERMA factors were more strongly related to job satisfaction than to life satisfaction, suggesting that the concepts of the original PERMA-profiler and the Workplace PERMA are critically distinct. This measure could be applicable for assessment of well-being at work among Japanese workers.

The measure demonstrated strong internal consistency, and was generally stable over a one month period. Measurement error was low. Meaningful differences in well-being at work could be detected around 2 points within the 11-point Likert scale of the scores, and may be useful for future intervention studies.

Convergent validity was also well supported. The effect sizes for health outcomes were consistent with the previous validation study[14]. In addition, work engagement indicated the strongest positive correlations with the measure, especially with the engagement (E) dimension. The associations with work-related psychosocial factors (job demands, job control, and social support) were also similar with those of work engagement[19]. Though the relationships with job demands were weak, this can be explained by the job demands-resource model[37]. In this model, job demands can cause deterioration of mental illness and do not strongly affect positive outcomes (i.e., work engagement). Well-being at work was not strongly correlated with job demands.

The PERMA domains were strongly related to job satisfaction and work performance. While the original PERMA-Profiler[14] had strong positive correlations with life satisfaction and weak positive correlations with work performance, the Workplace PERMA-Profiler had weak correlations with life satisfaction and strong correlations with job satisfaction and work performance. Indeed, the correlations were stronger here than in prior studies[19,26,38]. Future studies should investigate the extent to which the measure can predict future work performance and productivity.

Table 5. Convergent validity (r) of the Japanese version of the Workplace PERMA-profiler (N = 310)

Variables	Mean (SD)	P	E	R	M	A	Overall
Workplace PERMA-Profiler							
Positive emotion (P)	5.46 (2.3)	1.00					
Engagement (E)	5.86 (2.2)	0.83**	1.00				
Relationships (R)	5.59 (2.0)	0.74**	0.64**	1.00			
Meaning (M)	6.24 (2.1)	0.79**	0.81**	0.58**	1.00		
Accomplishment (A)	6.19 (1.9)	0.73**	0.70**	0.59**	0.75**	1.00	
Overall well-being	5.88 (1.8)	0.94**	0.91**	0.81**	0.89**	0.85**	1.00
Negative emotion	4.53 (2.1)	−0.35**	−0.21**	−0.28**	−0.17**	−0.25**	−0.30**
Health	5.77 (2.2)	0.50**	0.38**	0.47**	0.41**	0.46**	0.51**
Loneliness	4.24 (2.9)	−0.38**	−0.34**	−0.43**	−0.32**	−0.31**	−0.41**
Satisfaction							
Job satisfaction (BJSQ)	2.59 (0.9)	0.75**	0.70**	0.60**	0.64**	0.61**	0.76**
Life satisfaction (BJSQ)	2.79 (0.9)	0.32**	0.21**	0.34**	0.19**	0.30**	0.32**
Work engagement (UWES)	2.79 (1.3)	0.77**	0.79**	0.61**	0.72**	0.69**	0.82**
Psychological distress (K6)	6.52 (5.4)	−0.53**	−0.39**	−0.49**	−0.42**	−0.43**	−0.52**
Psychological distress (BJSQ)							
Vigor	6.45 (2.4)	0.58**	0.51**	0.48**	0.51**	0.47**	0.59**
Irritation	6.64 (2.5)	−0.31**	−0.22**	−0.37**	−0.15**	−0.25**	−0.31**
Fatigue	6.66 (2.6)	−0.41**	−0.27**	−0.32**	−0.26**	−0.32**	−0.37**
Anxiety	6.17 (2.4)	−0.35**	−0.19**	−0.28**	−0.21**	−0.29**	−0.31**
Depression	11.03 (4.7)	−0.53**	−0.38**	−0.45**	−0.39**	−0.42**	−0.50**
Job demands (BJSQ)	7.73 (2.3)	0.04	0.18**	0.01	0.20**	0.01	0.10
Job control (BJSQ)	7.98 (2.4)	0.42**	0.36**	0.27**	0.35**	0.36**	0.40**
Social support from supervisors (BJSQ)	7.46 (2.1)	0.41**	0.34**	0.53**	0.32**	0.33**	0.45**
Social support from colleagues (BJSQ)	7.32 (2.4)	0.45**	0.34**	0.60**	0.35**	0.32**	0.47**
Work performance (HPQ)	61.84 (19.1)	0.57**	0.54**	0.48**	0.55**	0.73**	0.65**

BJSQ: brief job stress questionnaire, UWES: Utrecht work engagement scale, HPQ: health performance questionnaire. *$p < 0.05$, **$p < 0.01$.

The CFA did not completely support the five-factor PERMA model of the measure, and the different factors are strongly correlated with one another. However, the original PERMA-profiler[14] demonstrated similar values to this study (CFI = 0.894, TLI = 0.864, RMSEA = 0.107). The lack of good model fit could occur for multiple reasons. Seligman[13] argues that the five PERMA domains are separate, measurable dimensions of well-being. First, the model itself could be wrong, such that while the theory distinguishes different factors, the everyday worker does not. Second, the measure itself could be wrong, such that the current items do not adequately distinguish the five factors. Future studies might further investigate the items, using qualitative interviews and other approaches to better understand how respondents understand each item, and whether the factors can be pulled apart psychometrically. Third, the PERMA model may not be the most appropriate model for workplaces in general, or for the

Japanese workplace in particular. Prior workplace wellbeing models have focused on affective (positive and negative emotion), evaluative (job satisfaction), and work engagement dimensions[19,26,38]. The PERMA model further breaks apart these dimensions, which may not be a helpful distinction in the workplace. Still, from a practical perspective, the PERMA domains provide specific areas to intervene (e.g., the quality of one's relationships, one's sense of competence at work), which are more tangible than the broader domains (e.g., overall job satisfaction)[39,40]. Future studies might further investigate the multidimensional structure of workplace well-being, the extent to which PERMA versus other well-being models are most appropriate for the workplace in general and within the Japanese culture, as well as possible practical applications of the model.

Several limitations exist in this study. First, because the response rate could not be calculated, selection bias might

exist. For instance, participants who were unhealthy and had low well-being may have been reluctant to participate in the survey. Second, there could be measurement errors in the assessment of the standards of convergent validity. Third, other confounders not measured in the study might distort the results of correlation analyses, such as psychological capital (e.g., self-efficacy, optimism, and intrinsic motivation). Finally, as mentioned previously, the generalizability of the results for Japanese workers could be questioned due to the use of an online survey.

In conclusion, the Japanese version of the Workplace PERMA-Profiler indicated good reliability and validity. This measure could be useful to assess well-being at work, promote well-being research among Japanese workers, and address the problem of defining well-being in further studies.

Conflicts of interest: None declared.

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