# **Development and validation of the Work Style Reform Scale**

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Received April 15, 2022 and accepted October 6, 2022 Published online in J-STAGE October 19, 2022 DOI https://doi.org/10.2486/indhealth.2022-0090

Abstract: In Japan, the "Act on the Arrangement of Related Acts to Promote Work Style Reform" was enforced in 2019 to reduce long working hours. However, work style reforms largely depend on workers' and companies' awareness and abilities. This study aimed to develop the Work Style Reform scale to assess the competencies required for work style reform and to examine its validity and reliability. This study was conducted with a diverse sample of 1,641 Japanese workers, and 17 questions across three subscales—Work Style, Personal Style, and Work Environment—were developed. After a response bias analysis, some items were discarded based on an exploratory factor analysis; the reliability coefficients were calculated; and a confirmatory factor analysis was performed. The convergent and discriminant validity were evaluated through a multi-trait multi-method analysis. Finally, nine questions remained. Construct validity, reliability and convergent validity were sufficient for all Subscales, and discriminant validity was sufficient only for Work Style. In conclusion, while Work Style was sufficient, issues remained in other subscales. To improve the accuracy of them in the future, it is necessary to examine the validation of discriminant validity using different indicates and the addition of new items to the smallest subscale; Personal Style.

Key words: Work style reform, Overtime, Japanese, Scale development, Scale validation

## Introduction

Japan is well-known for its industriousness, and its proportion of workers working long hours is higher than those in Western countries<sup>1, 2)</sup>. Meanwhile, following a young worker's suicide in 1991 due to being overworked, Japan has been employing various measures for over a quarter of a century to prevent health problems attributed to overwork<sup>3)</sup>. In 2014, the Japanese government enacted the "Act Promoting Measures to Prevent Death and Injury from Overwork"<sup>4)</sup> as a countermeasure against health problems caused by overwork. Furthermore, as a more concrete

E-mail: matsumoto.yuuki78@nihon-u.ac.jp; yuuki.matmto@gmail.com ©2023 National Institute of Occupational Safety and Health countermeasure, the "Work Style Reform Law", which mandates penalties for infractions, was effectuated in April 2019. Before this law was enacted, the limit for overtime in a month was 45 h and that for overtime in a year was 360 h. However, there was a "special clause" in this standard. Only for temporary cases, overtime hours per month were allowed to exceed 45 h for half of the year, and no upper limit was set. In many Japanese companies, this case was not a temporary situation, but the norm. Subsequently, the Work Style Reform Law established working hour limits for special clauses as well<sup>5)</sup>. The limits were set at less than 100 h for the total overtime and days off work in a month, and no more than 80 h for the average sum of overtime and days off work in two to six consecutive months. Furthermore, the upper limit for overtime hours worked in a year was set at 720 h or less. Therefore, strict

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reduction of working hours is currently required to ensure that those standards are not exceeded.

Another area of focus in the work style reform is "worklife balance", which refers to the harmony of work and life. While fulfilling work responsibilities, employees should be able to have personal time for childcare, nursing care, and self-development<sup>6)</sup>. In Japan, the dependent population index is increasing due to the low birthrate and aging population. Therefore, it is essential for women to be employed in order to secure the workforce, and the population of working women is increasing<sup>7</sup>). However, in Japan, women bear a heavy burden of housework and childcare, whereas men spend more hours at work and less for housework and childcare<sup>8)</sup>. Thus, among women, the employment rate declines in their 30s because they tend to focus on childbearing/childrearing, compared to before and after this age<sup>7</sup>). Therefore, both men and women need working conditions that allow them to balance work and family, which is one of the reasons why work-life balance is attracting attention as the goal of work style reform.

Studies on work style reform have only focused on doctors and other medical professionals, and to the best of our knowledge, no studies have been conducted on work style reform for general occupations thus far. Although Nakashima *et al.*'s study on work style reform for physicians focuses on work time management on the employer side, it does not mention time management on the employee side or work-life balance<sup>9)</sup>. A study on work time and labor productivity reported that there was no difference in labor productivity between those who worked 40–50 h and those who worked more than 50 h, after adjusting for work engagement<sup>10)</sup>. This finding suggests that time inefficiencies attributable to employees may lead to longer work hours.

The Ministry of Health, Labour and Welfare (MHLW) published "Toward the realization of work style reform", which states that both employers and workers need to act together to realize work style reform<sup>11</sup>). They also suggest the need for greater awareness among workers to improve not only their working style but also their resting period<sup>12</sup>). In other words, the realization of work style reform largely depends on the abilities and awareness of both workers and employers. An imbalance between the two would inevitably make it difficult to achieve a work style reform.

Based on the above, we have developed a conceptual diagram for work style reform, as shown in Fig. 1. To further promote the realization of work style reform, it is necessary to develop indicators that assess the degree to the realization of work style reform and highlight the problems. We therefore developed the "Work Style Reform



Fig. 1. Conceptual diagram of Work Style Reform Scale.

Scale" (WSRS) for evaluating work time management and work-life balance, which are necessary for the realization of work style reform. This study aimed to verify the reliability and validity of the WSRS.

## **Subjects and Methods**

#### Study design and participants

This cross-sectional study included workers at five companies in Tokyo, Osaka, Shizuoka, and Kagoshima, where the co-authors are employed as a contracted industrial physician. The companies belonged to production-, information technology-, medical equipment-, and precision equipment-related industries. We explained the research objectives to the participants prior to the study and obtained consent from their companies' health and safety committees. Participation in this study was voluntary. Questionnaires were administered to workers in 2020 by representatives of each company. The workers were instructed to fill out the questionnaires, and completed questionnaires were collected by the representatives at a later date.

#### Participants' characteristics

Of the 1,991 workers, 1,714 workers responded to the survey. First, we excluded participants with missing data on sex or age (n=8). After calculating the deficiency rate, we excluded participants (n=65) with missing data on the WSRS. Finally, 1,641 workers (1,268 men and 373 women;  $M_{age}$  [SD]=41.9 [11.8], age range; 18–71) were included in the analyses. The valid response rate was 82.4% (breakdown for five companies; 92.0, 74.7, 57.9,

86.6, and 88.3). Appendix 1 shows characteristics; industries, occupations, work schedule, and employment status of participants by gender.

#### Development of the WSRS

Definitions of the concepts of work style, personal style, and work environment

To establish the scale constructs, experienced scale developers familiar with the COSMIN checklist, researchers who had worked for the Ministry of Health, Labour and Welfare, and industrial physicians who have experience interviewing long workers were included in the research members. In addition, we received advice from psychometricians experienced in questionnaire development and experts on work style reform laws.

The WSRS consists of three subscales, which are deemed necessary for work style reform: Work Style, Personal Style, and Work Environment. Work Style evaluates an individual's ability to avoid overtime work by completing their tasks within the prescribed working hours or in a planned manner. Personal Style, in contrast, evaluates one's ability to maintain a good work-life balance, such as by not working on days off, getting sufficient rest to alleviate accumulated fatigue, and enjoying leisure time. Therefore, although weekdays and days off differ, both require planning to spend time efficiently. Imura et al. developed a 19-item Japanese scale to evaluate time management skills based on a systematic review of previously developed time management scales in English<sup>13)</sup>. They then performed a factor analysis and derived three subscales: Time Estimation, Time Utilization, and Taking each moment as it comes. While creating the questions for the WSRS, we referred to and modified their questions to reflect time management in work style reform. Finally, the subscale Work Environment evaluates the work environment. The MHLW has been promoting diverse and flexible work styles and work interval systems among businesses to realize work style reforms. However, the impact of the work environment differs greatly with employees' departments or project groups, even within the same office. Therefore, for this subscale, we developed items for employees to evaluate their work environment in terms of discretion, workload, allocation, and securing of human resources.

## Development of items and response options

*Work Style.* To work efficiently and complete tasks on time, workers must have time management skills. Claessens *et al.* define time management as "the behavior of

using time effectively to achieve goals"<sup>14</sup>). For Macan *et al.*, the specific time management techniques include priorities, planning, goal setting, attitude toward time, and ingenuity<sup>15</sup>). Therefore, the following items under Work Style regarding work prioritization, planning, and goal setting were developed: "I prioritize and plan my work" (w-2); "I adjust the amount of work I am responsible for" (w-3); "I try to work with a fixed deadline" (w-5); "I prepare for everything as early as possible" (w-6). In addition, the following items were created to assess attitude toward and ingenuity about time: "I try to finish my work within working hours" (w-1); "I try to reduce my working hours" (w-4); and "I do not interrupt my work to do something unrelated to my work" (w-7).

*Personal Style.* Some of the items developed by Imura *et al.* include "I try to go to bed early and get up early on weekends," "I make plans for weekends," and "I try not to be lazy on weekends"<sup>13)</sup>. Referring to these items, five items on time management during days off were developed: "I spend my leisure time in a meaningful way" (p-1); "I practice stress reduction methods" (p-2); "I try not to bring work home" (p-3); "I try not to be lazy on my days off" (p-4); and "I try to wake up at the same time on weekdays as on weekends" (p-5).

*Work Environment*. We developed the following item statements regarding various work styles and staffing; "My office assigns work to employees according to their abilities". (e-1); "I am given appropriate discretionary authority in my office" (e-2); "I am given an appropriate workload in my office" (e-3); "My office is well-staffed" (e-4); and "It's easy to get paid leave at my office" (e-5).

Appendix 2 shows the list of questions on the WSRS. Respondents were given the following instruction: "Please select the most appropriate options for the following questions". All items are endorsed on a 5-point Likert scale: (1) always, (2) often, (3) sometimes, (4) rarely, and (5) never. The items are reverse-scored from 4 (always) to 0 (never), and higher scores indicate better ability to work efficiently.

## *Verifying the reliability and validity of the WSRS* Response bias, reliability, and construct validity

We analyzed the ceiling effect, floor effect, skewness, and kurtosis to check for response bias. The reliability of the three subscales was verified using McDonald's  $\omega$  coefficient<sup>16</sup>). If only two items remained within one subscale, Spearman-Brown's coefficient was used instead of it<sup>17</sup>). Exploratory factor analysis (maximum likelihood method) and confirmatory factor analysis were performed to investigate and verify construct validity. Hypotheses for convergent and discriminant validity

We used the "Planning" and "Active Coping" subscales of the Brief Coping Orientation to Problems Experienced (Brief-COPE) to compare the Work Style subscale with. The Brief-COPE, developed by Carver et al., can measure a wide range of stress-coping mechanisms<sup>18, 19)</sup>. Although the Japanese version of the Brief-COPE developed by Otsuka et al. has some limitations<sup>20</sup>, it is one of the most commonly used coping scales and is also used when surveying workers<sup>21, 22)</sup>. Coping is defined as the process of cognitive and behavioral efforts to deal with a request that is rated as beyond an individual's resources<sup>23)</sup>. Therefore, we considered that it could be approximated work time management as a behavioral effort to handle a request such as overwork, in particular, the Brief-COPE's "Planning" and "Active Coping" subscales to be suitable comparison subscales for the WSRS's Work Style subscale which includes items on work planning and innovations related to coping with and coordinating work.

The Athens Insomnia Scale (AIS) and Mental Component Summary (MCS), calculated from the Short Form-8 (SF-8), were used as comparison scales for Personal Style. Sleep accounts for most of the resting time and is strongly associated with mental health<sup>24)</sup>. The AIS was developed based on the diagnostic criteria for insomnia established by the International Statistical Classification of Diseases and Related Health Problems-10 (ICD-10). It is one of the most widely used insomnia scales<sup>25, 26)</sup>. The SF-8 is a comprehensive scale that measures health-related quality of life. The MCS is the SD score of mental functioning calculated from the SF-8, which is comparable to the national norm<sup>27)</sup>. Therefore, to assess whether employees are getting adequate rest, the AIS and MCS were considered suitable comparison scales for the Personal Style subscale.

The Perceived Stress Scale (PSS) and the Work-Family Negative Spillover Scale (WFNS), a subscale of the Japanese version of the Work-Life Balance Scale (SWING-J), were used as comparison scales for the Work Environment subscale. The PSS is comprehensive and one of the most useful measures of stress<sup>28, 29)</sup>. The items express the state in which an individual feels that the demands of the environment exceed their coping capacity. The SWING-J scale was developed by Shimada *et al*<sup>30)</sup>. Shimada *et al*.<sup>30)</sup> has developed many psychological scales for Japanese workers. The WFNS subscale of the SWING-J assesses the negative impact of work on family. It is positively correlated with job demands and negatively correlated with workplace support. Therefore, the PSS and WFNS were considered suitable comparative measures for the Work Environment subscale.

To evaluate the convergent validity of the WSRS, we hypothesized that there is a moderate correlation between each comparison scale. We predicted the correlation coefficients (r) between Work Style and Planning, Work Style and Active Coping, Personal Style and AIS, Work Environment and PSS, and Work Environment and WFNS to be -0.5 < r < -0.3 and between Personal Style and MCS to be 0.3 < r < 0.5. For discriminant validity, we hypothesized that all correlation coefficients (r) between the scales except for the comparison scales to be -0.3 < r < 0.3.

#### Statistical analysis

We employed the maximum likelihood method with Promax rotation for the exploratory factor analysis. The cutoff value for the factor loadings was 0.4 or higher, based on Pett's recommendation<sup>31)</sup>. In confirmatory factor analysis, Goodness of Fit Index; GFI, Adjusted Goodness of Fit Index; AGFI, Comparative Fit Index; CFI, Root Mean Square Error of Approximation; RMSEA, Akaike's Information Criterion; AIC and Consistent Akaike's Information Criterion; CAIC were used as indices for comparing model fit. For the RMSEA, we also referred to the cutoff values;  $\leq 0.05$ , recommended by Browne and Cudeck<sup>32)</sup>. Pearson's correlation coefficient was used for the correlation analysis, and an unpaired *t*-test was performed for the Good-Poor analysis. The scale's reliability was assessed using McDonald's omega coefficient. In case that the number of question items comprising the scale was only two, Spearman-Brown's coefficient was used instead of it<sup>17)</sup>. For the reliability value, 0.7 or higher was considered acceptable, based on the report of Fabrigar  $et al^{33}$ .

All analyses were performed using IBM SPSS Version 22 and 28, and IBM SPSS Amos Version 22 (IBM Corp., Armonk, NY, USA) for Windows. A two-sided *p*-value <0.05, was considered statistically significant.

## Results

#### Missing rate and response bias

Table 1 shows the missing rate, M, SD, ceiling effect (M+1 SD, upper limit 4), floor effect (M-1 SD, lower limit 0), kurtosis, and skewness for each item. As all missing rates were approximately 1%, there were no items with significantly high missing rates. The ceiling and floor effects were assessed for each item, and ceiling effects were observed for w-1 (4.17) and p-3 (4.08). Since the effects were mild, the decision to exclude the two items was based on the overall results.

Table 1. Characteristics of missing and score distribution for each item

	w-1	w-2	w-3	w-4	w-5	w-6	w-7	p-1	p-2	p-3	p-4	p-5	e-1	e-2	e-3	e-4	e-5
Ν	1,691	1,690	1,689	1,685	1,686	1,684	1,684	1,687	1,682	1,683	1,686	1,687	1,685	1,684	1,683	1,681	1,689
Missing (n)	15	16	17	21	20	22	22	19	24	23	20	19	21	22	23	25	17
Missing (%)	0.89	0.95	1.01	1.25	1.19	1.31	1.31	1.13	1.43	1.37	1.19	1.13	1.25	1.31	1.37	1.49	1.01
Mean	3.36	3.21	2.38	2.89	2.80	2.76	2.76	2.60	2.29	2.86	2.01	2.04	2.27	2.35	2.24	1.69	2.60
SD	0.81	0.73	1.01	0.80	0.86	0.90	0.99	1.02	1.08	1.22	1.10	1.26	0.89	0.92	0.94	1.09	1.13
Ceiling effect	4.17	3.94	3.39	3.69	3.66	3.66	3.75	3.62	3.37	4.08	3.11	3.30	3.16	3.27	3.18	2.78	3.73
Floor effect	2.55	2.48	1.37	2.09	1.94	1.86	1.78	1.58	1.21	1.64	0.91	0.78	1.38	1.43	1.30	0.60	1.47
Skewness	-1.51	-0.93	-0.37	-0.64	-0.59	-0.60	-0.46	-0.48	-0.30	-0.85	-0.01	-0.12	-0.36	-0.42	-0.38	0.14	-0.63
Kurtosis	2.73	1.56	-0.22	0.67	0.47	0.15	-0.41	-0.27	-0.49	-0.31	-0.63	-1.06	0.20	0.26	-0.12	-0.77	-0.33

SD: standard deviation.

#### Exploratory factor analysis

An exploratory factor analysis was performed on 17 items. Referring scree plot and the construct of the scale, the number of factors was set to three. The results of the first-factor analysis are presented in Table 2. The Kaiser-Meyer-Olkin measure of sampling was 0.837; Bartlett's sphericity test was significant (p < 0.001); and the cumulative contribution rate was 38.0%. Items with factor loadings less than 0.4 were w-3, w-7, p-3, p-4, and p-5. Of these, w-7, p-3, p-4, and p-5, which had communalities <0.2, were excluded, and a second-factor analysis was performed on the remaining 13 items. The Kaiser-Meyer–Olkin measure of sampling was 0.837; Bartlett's sphericity test was significant (p < 0.001); and the cumulative contribution rate was 47.0%. As the factor loading for w-3 was less than 0.4 (0.380), it was excluded. The thirdfactor analysis was performed on the remaining 12 items. The Kaiser–Meyer–Olkin measure of sampling was 0.818; Bartlett's sphericity test was significant (p < 0.001); and the cumulative contribution rate was 48.5%. As all questionnaire items had factor loadings  $\geq 0.4$  for one factor, the exploratory factor analysis was completed. However, since the communalities of e-4 and e-5 were <0.3, we determine the exclusions by performing a confirmatory factor analysis.

#### Item-total correlation analysis and reliability coefficients

The item-total correlation and reliability coefficients for each subscale are presented in Table 3. The McDonald's  $\omega$  coefficient for Work Style and Work Environment were 0.771 and 0.782, respectively, and the Spearman– Brown coefficient for Personal Style was 0.779. Thus, all reliability coefficients were above the cutoff value of 0.7. Although none of the correlation coefficients were below 0.3, the reliability coefficient of Work Style and Work Environment were increased after w-1 or e-5 was deleted.

 Table 2.
 Factor loadings and communality based on exploratory factor analysis; first (top) and final (bottom) factor analysis

	1st factor	2nd factor	3rd factor	Communality	
First factor analysis					
e-3	0.815	-0.032	0.010	0.652	
e-2	0.788	-0.006	-0.035	0.594	
e-1	0.760	-0.010	-0.021	0.557	
e-4	0.490	0.002	0.032	0.256	
e-5	0.445	-0.007	0.093	0.240	
w-2	-0.085	0.811	-0.044	0.584	
w-4	-0.030	0.720	-0.008	0.497	
w-5	0.095	0.622	-0.013	0.436	
w-6	-0.006	0.601	0.040	0.381	
w-1	-0.002	0.450	0.071	0.234	
w-3	0.245	0.368	0.034	0.288	
w-7	-0.038	0.335	0.052	0.120	
p-1	-0.029	0.010	0.849	0.708	
p-2	0.025	-0.020	0.741	0.554	
p-4	0.051	0.055	0.389	0.195	
p-3	0.014	0.046	0.236	0.071	
p-5	0.145	0.054	0.182	0.094	
Final (for	urth) factor ana	lysis			
w-2	0.769	-0.062	-0.019	0.551	
w-4	0.718	-0.018	0.000	0.506	
w-5	0.654	0.101	-0.003	0.483	
w-6	0.589	-0.006	0.045	0.366	
e-2	0.009	0.818	-0.019	0.663	
e-1	0.007	0.764	-0.008	0.583	
e-3	-0.023	0.750	0.048	0.580	
p-1	-0.014	-0.045	0.986	0.930	
p-2	0.037	0.080	0.618	0.447	

Furthermore, when e-5 was deleted, "Reliability coefficient when the item is excluded" of e-4 also increased to 0.822. Therefore, Table 3 also shows the results with e-4 and e-5 deleted.

 Table 3.
 Reliability coefficient and item-total correlation

 coefficient in three subscales; work style, personal style,

 and work environment (two patterns; 5 items and 3 items)

	Reliability	Item_total	Reliability coef-		
	coefficient	correlation	ficient when the		
	coefficient	conclation	item is excluded		
w-1	0.771 <sup>a</sup>	0.397	0.774		
w-2		0.645	0.701		
w-4		0.603	0.708		
w-5		0.542	0.729		
w-6		0.533	0.735		
p-1	0.779 <sup>b</sup>	0.638			
p-2		0.638			
e-1	0.782 <sup>a</sup>	0.609	0.729		
e-2		0.611	0.731		
e-3		0.688	0.693		
e-4		0.487	0.779		
e-5		0.471	0.786		
e-1	0.822ª	0.666	0.765		
e-2		0.694	0.737		
e-3		0.670	0.761		

<sup>a</sup>McDonald's @ coefficient, <sup>b</sup>Spearman-Brown coefficient.

#### Confirmatory factor analysis

Confirmatory factor analyses were performed on 12 items excluding w-3, w-7, p-3, p-4, and p-5, on 11 items excluding the aforementioned 5 items and w-1, and on 9 items excluding the aforementioned six items and e-4 and e-5. The results of the goodness of model fit are listed in Table 4. The six indices-GFI, AGFI, CFI, RMSEA, AIC, and CAIC-indicate that the best results were obtained for Model 3 (nine items). Following the RMSEA cutoff value;  $\leq 0.05$ , in particular, only Model 3 was acceptable. The results of the final exploratory factor analysis (final/ fourth factor analysis), which was conducted again for the nine-item model, are shown in Table 2. The Kaiser-Meyer-Olkin measure of sampling was 0.784; Bartlett's sphericity test was significant (p < 0.001); and the cumulative contribution rate was 56.9%. All the questions had factor loadings  $\geq 0.4$  for one factor, and none of the items had communalities <0.3. Path diagrams for each model are shown in Appendix 3.

### Scores distribution and good-poor analysis

The results of the factor analysis indicated that the appropriate number of items for Work Style, Personal Style, and Work Environment are 4, 2, and 3, respectively. The score ranges were 0–16, 0–8, and 0–12, respectively. In all subscales, higher scores indicate better scores. Participants' descriptive statistics for each subscale are shown

Table 4. The six indices of three model based on confirmatory factor analysis

	Model 1 (12 items)	Model 2 (11 items)	Model 3 (9 items)
GFI	0.959	0.968	0.987
AGFI	0.937	0.949	0.975
CFI	0.943	0.957	0.984
RMSEA	0.065	0.060	0.044
AIC	454.651	334.896	142.808
CAIC	627.534	494.604	277.539

GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; AIC: Akaike's Information Criterion; CAIC: Consistent Akaike's Information Criterion.

 Table 5.
 Characteristics and distribution of scores for the three subscales

	Work style	Personal style	Work environment
Number of items	4	2	3
Mean score	11.7	4.9	6.9
SD	2.6	1.9	2.4
Top quartile score	13	6	9
Median score	12	5	7
Bottom quartile score	10	4	6
Maximum score	16	8	12
Minimum score	0	0	0

SD: standard deviation.

in Table 5. The M  $\pm$  SD scores on Work Style, Personal Style, and Work Environment were  $11.7 \pm 2.6$ ,  $4.9 \pm 1.9$ , and  $6.9 \pm 2.4$ , respectively. The maximum and minimum values are consistent with the predicted score ranges.

For the Good-Poor Analysis, we performed unpaired *t*-tests for the top and bottom quartile groups of each subscale. There were significant differences (p<0.001) between the top and bottom quartile groups.

# *Hypothesis verification for convergent validity and discriminant validity*

Convergent and discriminant validity results based on multi-trait multi-method analysis are presented in Table 6. The hypotheses regarding convergent validity were supported for Work Style, Personal Style, and Work Environment. For discriminant validity, all the hypotheses were confirmed for Work Style. However, for Personal Style and Work Environment, the correlations exceeded the predicted values in measures other than Planning and Active Coping.

	Work style	Personal style	Work environment
Planning (Brief-COPE)	-0.363*	-0.164*	-0.207*
	(-0.5 to -0.3)	(-0.3 to 0.3)	(-0.3 to 0.3)
Active Coping (Brief-COPE)	-0.351*	-0.244*	-0.292*
	(-0.5 to -0.3)	(-0.3 to 0.3)	(-0.3 to 0.3)
Sleep (AIS)	-0.179*	-0.417*	-0.337*
	(-0.3 to 0.3)	(-0.5 to -0.3)	(-0.3 to 0.3)
Mental Component Summary (SF-8)	0.170*	0.353*	0.310*
	(-0.3 to 0.3)	(0.3 to 0.5)	(-0.3 to 0.3)
Perceived Stress (PSS)	-0.267*	-0.444*	-0.382*
	(-0.3 to 0.3)	(-0.3 to 0.3)	(-0.5 to -0.3)
Work-Family Negative Spillover (SWING-J)	-0.117*	-0.323*	-0.324*
	(-0.3 to 0.3)	(-0.3 to 0.3)	(-0.5 to -0.3)

 Table 6.
 Convergent validity (shaded area) and discriminant validity (unshaded area) of the Work Style

 Reform scale

The hypotheses are given in parentheses.

Brief-COPE: Brief Coping Orientation to Problems Experienced; AIS: Athens Insomnia Scale; SF-8: Short Form-8; PSS: Perceived Stress Scale; SWING-J: Work-Life Balance Scale.

\* The Pearson's correlation coefficients were significant (p < 0.05).

## Discussion

This study developed a scale to assess the competencies required for work style reform. The final scale consisted of 9 items and demonstrated acceptable internal consistency and structural validity. Three main factors were determined (Work style, Personal style and Work environment) through EFA. The scale also showed acceptable convergent validity for all subscales, and acceptable discriminant validity for Work style. To comply with Work Style Reform Law, although employers are required to increase the workforce and reduce workloads, employees should also endeavor to finish their work within the prescribed time frame. Additionally, work style reform is not realized unless employees can utilize that time for family and selfdevelopment, even if they are spared from overtime and have more free time in their daily lives. The scale developed in this study is novel as it can quantitatively evaluate work time management and work-life balance to realize work style reform. Although a scale to measure time management skills exists, no scale can evaluate it in the workplace as well as on days off. The WSRS is considered to help determine the degree to which work style reform has been realized and to identify problems hindering its realization by quantifying the time management and worklife balance necessary to achieve work style reform.

## Construct validity; factor loadings, and reliability

In the exploratory factor analysis, the items of Work

Style, Personal Style, and Work Environment were all extracted with no overlap. Furthermore, the final nine items all had communalities above 0.3, and their factor loadings were above 0.4 for only one factor. Thus, the nine-item, three-factor structure of the WSRS showed sufficient construct validity.

The reliability coefficients of Work Environment were more than 0.8, indicating sufficient reliability. Since the reliability coefficients of Work Style and Personal Style were also above 0.7, they are reliable enough to be included in the scale. However, since it has been pointed out that a scale consisted of only two items is undesirable, Personal Style is required to increase the number of items in order to obtain sufficient reliability<sup>17</sup>.

## Construct validity; subscale composition details

We examined the subscale composition details of the extracted factors. The item with the highest factor loadings in Work Style was w-2. Work Style assesses time management at work. The Time Management Scale developed by Imura *et al.* and the Time Management Behavior Scale and Time Management Questionnaire, which were used as references in developing the scale, both include concepts related to "planning" and "priority"<sup>13, 15, 34</sup>). Therefore, the subscale "Work Style", which is dominated by item w-2, pertains to work-related priorities and planning and is suitable for measuring the competencies needed to realize work style change.

For Personal Style, although only two items were included, the factor loadings for p-1 were remarkably high, and this item alone may represent this subscale in general. This subscale evaluates the awareness taken to enhance one's living time (days off), to realize work-life balance. Regarding living time, the Charter states that "working people can make their health maintained, and they can also spend quality time with family and friends as well as have time for self-development and participation in community activities"<sup>6</sup>). In other words, enriching work-life balance includes not only taking vacations (rest) but also engaging in self-development. Therefore, we deem the subscale Personal Style suitable for comprehensively evaluating work-life balance.

Finally, for Work Environment, while the item with the highest factor loadings was e-2, items e-1 and e-3 also showed high loadings of 0.7 or higher. The International Labor Organization (ILO) urges countries to "improve working conditions to achieve work style reform"<sup>35</sup>); these include reducing overtime and implementing flexible measures for work planning. Appropriate discretion, staffing, and workload, which are included in this subscale, are essential to improve working conditions, according to the ILO. Therefore, this subscale is also considered suitable for evaluating respondents' work environments, based on which measures for the realization of work style reforms can be employed.

Among the three models, the GFI, AGFI, and CFI were all closest to 1 in Model 3, and the AGFI was a close approximation of the GFI. Additionally, the AIC and CAIC demonstrated the lowest values. These findings suggest that Model 3 is the best fit.

#### Convergent validity and discriminant validity

As for the convergent validity based on the multitrait multi-method analysis, all the subscales showed the expected degrees and directions regarding correlations. As for the discriminant validity, while our hypothesis was confirmed for Work Style, indicating sufficient validity, some issues remained for Personal Style and Work Environment subscales. We examined the cause of the unexpected correlation between sleep and MCS, and the work environment. Previous studies have reported that poor work environments are associated with insomnia and mental health problems among workers<sup>36–38)</sup>. However, to the best of our knowledge, the health-related items on the scale have never been reported to not correlate with the work environment because the work environment is related to various physical and mental health outcomes. Therefore, paradoxically, the results of this study are unavoidable.

The unexpected correlation between Perceived Stress and WFNS and Personal Style could be explained as follows. The PSS assesses perceived stress that cannot be controlled by an individual but is distinguishable from other physical and mental symptoms<sup>39–41)</sup>. Meanwhile, PSS can also assess stress caused by the interaction between an individual and their environment<sup>42)</sup>. Therefore, Personal Style might have been more strongly correlated than expected due to a partial interaction between workers and their work environment. Further, the WFNS is a subscale of the SWING-J, which focuses specifically on stress caused by one's work environment. However, since the scale also includes items related to time spent with family and friends outside of work, the correlation with Personal Style may have been greater than expected. In either case, the factor structure and correlations that were generally expected were confirmed, and we believe that the WSRS is sufficiently reliable and valid.

#### Limitations

There are some limitations in this study. First, the sample size of women was smaller than that of men. Because Japanese women bear a heavy burden of housework and childcare, work styles reform is also important for them. Second, since there is little information of job type, the representativeness of Japanese workers is unclear. Third, this was a cross-sectional study that involved a selfadministered survey. Fourth, only partial discrimination was demonstrated for Personal Style and Work Environment. Finally, other forms of validity (cross-cultural validity, other ways to assess convergent and discriminant validity etc.) and reliability (e.g., test-retest reliability, and additional number of items for subscales with fewer items) should be also examined. Therefore, in the future, the sample size should be increased, and the discriminant validity should be verified using another measure. Furthermore, the reliability coefficients need to be calculated again using the latest methods.

## Conclusions

In this study, the nine-item WSRS demonstrated sufficient construct validity and convergent validity, whereas discriminant validity for Personal Style and Work Environment were inadequate. The discriminant validity was also satisfactory for Work Style. Reliability was also satisfactory, but the number of items for Personal Style should be increased since there were only two items. In Japan, particularly, it is necessary to evaluate the effects of work style reform as it is being promoted. Although our findings suggest that the WSRS scores can be used as a basis to implement strategies that contribute to health and research activities in the industrial field in Japan, further verification of reliability and validity is required for generalizing these findings.

## Funding

No funding.

## **Ethical Considerations and Disclosure**

This study was conducted according to the tenets of the Personal Information Protection Act enforced in Japan and the Ethical Guidelines for Epidemiological Studies jointly announced by the Ministry of Health, Labour and Welfare and Ministry of Education, Culture, Sports, Science, and Technology of Japan. All workers provided written informed consent to participate in the study. This study was approved by the Ethics Committee at the Nihon University School of Medicine (No. 29-12-0).

## Acknowledgements

We thank K. Shimada, R. Ishii, and H. Ohuchi for their help with this study.

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## Appendix 1.

		T-4-1	Male		Female		
		Total	n	%	n	%	
All		1,641	1,268	77.3	373	22.7	
Industries	White-collars	573	390	68.1	183	31.9	
	Blue-collars	689	591	85.8	98	14.2	
	Unknown	379	287	75.7	92	24.3	
Occupations	Managers	204	190	93.1	14	6.9	
	Non-managers	1,295	975	75.3	320	24.7	
	Unknown	142	103	72.5	39	27.5	
Work schedule	Day work	988	718	72.7	270	27.3	
	Shift work	644	544	84.5	100	15.5	
	Unknown	9	6	66.7	3	33.3	
Employment status	Regular	762	583	76.5	179	23.5	
	Irregular	123	80	65	43	35.0	
	Unknown	756	556	73.5	125	16.5	

## Characteristics of the participants by gender

## Appendix 2.

## List of items on the Work Style Reform Scale

Work style	w-1	I try to finish my work within working hours. (勤務時間内に仕事を終わらせるよう心掛けている)				
	w-2	I prioritize and plan my work. (仕事に優先順位をつけて、計画的に進めている)				
	w-3	I adjust the amount of work I am responsible for. (担当する業務量を調整している)				
	w-4 I try to shorten my working hours. (作業時間短縮のための工夫をしている)					
	w-5 I try to work with a fixed deadline. (期限を決めて課題に取り組むようにしている)					
	w-6	I prepare for everything as early as possible. (何事も余裕を持って早めに準備をする)				
	w-7	I don't interrupt my work to do something unrelated to my work. (作業を中断して仕事に無関係なことはしない)				
Personal style	p-1	I spend my leisure time in a meaningful way. (余暇を有意義に過ごしている)				
	p-2	I practice stress reduction methods. (ストレス解消法を実践している)				
	p-3	I try not to bring work home. (自宅に仕事を持ち帰らないようにしている)				
	p-4	I try not to be lazy on my days off. (休みの日にダラダラ過ごさないようにしている)				
	p-5	I try to wake up at the same time on weekdays as I do on weekends. (休日も出来る限り平日と同じ時間に起床するようにしている)				
Work environ-	e-1	My office assigns work to employees according to their abilities. (職場では個人の能力にあった配置がされている)				
ment	e-2	I am given appropriate discretionary authority in my office. (職場では適切な裁量権が与えられている)				
	e-3	I am given an appropriate workload in my office. (職場では適切な業務量が与えられている)				
	e-4	My office is well-staffed. (職場では人手は足りている)				
	e-5	It's easy to get paid leave at my office. (職場では休暇が取得しやすい)				

## Appendix 3.

## Path diagrams of three models

