

Original Research

Associations among nurse manager leadership, work engagement, and work-related stress in Japanese nursing staff: a cross-sectional multigroup study

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ABSTRACT

Objective: To examine associations between nurse manager leadership and staff nurses' work engagement (WE) with work-related stress in Japanese nursing staff, and to assess variation by staff nurses' experience.

Methods: This cross-sectional questionnaire study was conducted in 16 hospitals in Japan (February–March 2020). Anonymous questionnaires were distributed to 1,213 nursing staff (331 valid responses (27.3%)). WE was assessed using the Japanese version of the Utrecht Work Engagement Scale, stress using the Brief Job Stress Questionnaire, and leadership using a PM-theory-based scale. Multigroup structural equation modeling (SEM) with measurement invariance testing was conducted for nurses with 1–3 ($n = 61$), 4–9 ($n = 57$), and ≥ 10 ($n = 208$) years of experience.

Results: Staff nurses' stress responses were higher in the 4–9 years group than in the ≥ 10 years group (median: 69 vs. 63; $p < .05$). Metric measurement invariance was supported across groups. The final constrained multigroup SEM showed acceptable fit ($\chi^2(399) = 615.24$, $p < .001$; comparative fit index = .959; Tucker–Lewis index = .953; root mean square error of approximation = .041; standardized root mean squared residual = .122). Across groups, higher job stressors were associated with lower WE ($\beta = -.50$ to $-.52$, $p < .001$) and higher stress responses ($\beta = .37$, $p < .001$). Relationship-oriented leadership (M-function) was associated with lower stress responses ($\beta = -.11$, $p < .05$), with no direct association with WE. WE was associated with lower stress responses ($\beta = -.26$ to $-.27$, $p < .001$).

Conclusions: Structural associations were consistent across staff nurses' career stages. Relationship-oriented leadership may be associated with lower stress responses and function as a contextual resource in nursing settings. Mid-career nurses showed higher stress. Findings should be interpreted cautiously given the cross-sectional design, modest response rate, and pre-pandemic data.

Keywords: leadership, nurse managers, structural equation modeling, work engagement, work-related stress

INTRODUCTION

Nurse manager leadership is considered an important determinant of nursing staff well-being and occupational health. Nursing work is characterized by high job demands, including heavy workloads, emotional labor, and role ambiguity, which are associated with psychological distress and burnout.¹ Within the Job Demands–Resources (JD–R) model,^{2,3} job resources are aspects of work that help achieve

goals, reduce demands, or stimulate growth, with nurse manager leadership behaviors serving as key resources. Work engagement (WE), defined as a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption, is consistently associated with lower burnout, better patient outcomes, and reduced turnover intention among nurses.^{4–10}

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However, the structural relationships among nurse manager leadership, job stressors, staff nurses' WE and their stress responses across career stages remain insufficiently understood.

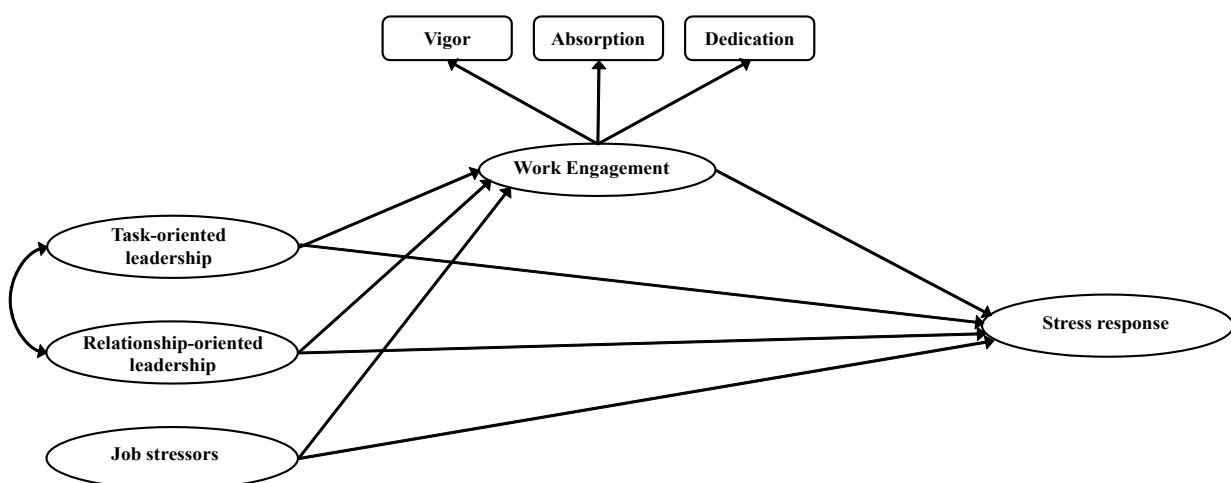
PM theory¹¹⁻¹⁵ provides a framework particularly suited to Japanese organizational settings by distinguishing task-oriented leadership (P-function) from relationship-oriented leadership (M-function). In the present study, nurse manager leadership was conceptualized as a workplace resource within a JD-R-informed framework.¹⁶ Relationship-oriented leadership may be especially relevant to nurses because supportive communication, mutual trust, and interpersonal sensitivity may help staff remain psychologically engaged in demanding clinical environments.¹⁷⁻¹⁹

Moreover, within the JD-R perspective, leadership has been discussed as an important contextual job resource relevant to employee motivation and well-being. This aligns with the concept of engaging leadership, which positions leadership within the JD-R perspective as a key source relevant to work engagement, and employee well-being.¹⁶ In the present study, nurse manager leadership was conceptualized as a contextual job resource potentially associated with staff nurses' WE and stress-related outcomes. However, the present analytical model did not test a direct path from leadership to job stressors.

Career development theory²⁰ and clinical expertise frameworks²¹ suggest that nurses' needs, role

demands, and responses to leadership may differ by experience level. Prior research also indicates that work engagement, job stressors, and coping-related characteristics vary across career stages.²²⁻²⁶ We therefore used a pragmatic three-group classification (1-3, 4-9, and ≥ 10 years) to approximate early-, mid-, and later-career phases. Because these cutoffs are analytic rather than fixed developmental boundaries, they should be interpreted cautiously.

Drawing on the JD-R model, the present study examined whether nurse manager leadership and job stressors were associated with staff nurses' WE and stress responses, and whether these associations differed by years of nursing experience. Figure 1 presents the analytical model tested in the present study. The model includes nurse manager leadership, job stressors, WE, and stress responses as the focal variables. Specifically, we hypothesized that: (H1) both P-function and M-function leadership would be positively associated with WE; (H2) job stressors would be negatively associated with WE and positively associated with stress responses; (H3) WE would be negatively associated with stress responses and would function as an intervening work-related state in the analytical model; and (H4) the magnitude or pattern of these associations might vary by career stage. H3 was created because higher WE is associated with better occupational well-being and lower burnout-related strain in nursing, suggesting that more engaged nurses experience comparable demands as more manageable and report fewer stress-



Note. Work engagement was specified as a latent construct indicated by vigor, dedication, and absorption. Figure 1 presents a parsimonious empirical model restricted to constructs directly measured in this study. Direct paths to stress responses were included to examine partial mediation. Residuals are omitted for clarity.

Figure 1. Hypothesized Analytical Model for the Multigroup Structural Equation Model

related symptoms than less engaged nurses.^{4,5,8,10,27}

METHODS

Study Design and Setting. A cross-sectional, self-administered questionnaire survey was conducted from February to March 2020 in 16 hospitals across a metropolitan region of Japan.

Available administrative variables in the anonymized dataset indicated substantial heterogeneity in facility size, with bed sizes ranging from 55 to 660.

Participants. The researcher's affiliated institution had cooperative agreements regarding education, research, and personnel exchange with 21 of 67 hospitals in the same prefecture. The survey was conducted in 16 of the 21 hospitals that agreed to participate. Facility sizes were as follows: 3 hospitals with fewer than 100 beds, 11 hospitals with 100–499 beds, and 2 hospitals with 500 beds or more. To minimize weighting effects due to institutional size, the maximum number of target departments per hospital was limited to four. As the survey included questions about nurse manager leadership, only departments with assigned unit nurse managers were included. The target population comprised staff nurses and other non-unit-manager nursing personnel working in departments with assigned unit nurse managers. Unit nurse managers were excluded because the study focused on subordinates' perceptions of nurse manager leadership. Assistant nurse managers, chief-level nurses, and equivalent mid-level personnel were retained if they remained organizationally positioned as recipients of the unit nurse manager leadership. Accordingly, the analytic sample included staff nurses and mid-level personnel with limited supervisory responsibilities. Questionnaires were distributed to 1,213 eligible nursing staff members. Participants aged ≥ 61 years were excluded to reduce heterogeneity related to retirement transition and late-career employment patterns. A total of 349 questionnaires were returned (28.8%), of which 331 contained sufficient data for analysis (27.3%). Of these, 326 had complete data for the experience-group variable and were included in the multigroup SEM.

Participants were classified into three groups by years of nursing experience: early-career (1–3 years; $n = 61$), mid-career (4–9 years; $n = 57$), and experienced (≥ 10 years; $n = 208$). Unequal group sizes, particularly the smaller mid-career group, may have limited statistical power.

Standard protocol approvals, registrations, and patient consents. Ethical approval was obtained from the Ethics Committee of Yamagata Prefectural University of Health Sciences (Approval No. 1809-20), and written informed consent was obtained from all participants.

Measures. Work engagement (WE) was assessed using the Japanese version of the Utrecht Work Engagement Scale (UWES-J)²⁸, a 9-item instrument with three subscales: vigor, dedication, and absorption. Items are rated on a 7-point frequency scale (0 [never] to 6 [always]). In this sample, Cronbach's α values were .86 (vigor), .88 (dedication), .80 (absorption), and .92 (total).

Nurse manager leadership was assessed using a 20-item PM Leadership Survey comprising P-function (task-oriented; 10 items) and M-function (relationship-oriented; 10 items). Items are rated on a 5-point scale (0 [not at all] to 4 [very much so]). Cronbach's α values were .92 (P-function) and .96 (M-function).

Job stressors and stress responses were assessed using the Brief Job Stress Questionnaire (BJSQ).^{29,30} The job stressor subscale comprises 17 items across domains such as workload, skill underutilization, interpersonal conflict, and physical environment. The stress response subscale comprises 29 items measuring psychological and somatic symptoms. Higher scores indicated greater stressor exposure or more severe stress responses. Cronbach's α values were .79 for job stressors and .92 for stress responses.

Statistical Analysis. Descriptive statistics were calculated for all variables, and group differences among nurses with 1–3 years, 4–9 years, and ≥ 10 years of experience were examined using appropriate comparative tests. To ensure estimation stability with relatively small group sizes, item parceling was applied.³¹ WE indicators were defined as the three UWES-J subscale mean scores (vigor, dedication, and absorption). For P-function, M-function, job stressors, and stress responses, items were assigned to parcels using a loading-balanced approach based on single-factor confirmatory factor analysis loadings from the total sample, yielding three parcels for P-function and M-function, four for job stressors, and five for stress responses.

Multigroup confirmatory factor analysis was conducted to assess measurement invariance across the three experience groups. Configural and metric

invariance models were evaluated, followed by models constraining structural regression coefficients and covariances to equality across groups, using changes in fit indices. Measurement invariance was considered to be supported when the absolute change in the comparative fit index (CFI) was $\leq .010$ and the absolute change in the root mean square error of approximation (RMSEA) was $\leq .015$.^{32,33} After establishing invariance, a multigroup structural equation model was estimated to examine associations among nurse manager leadership, job stressors, WE, and stress responses. For descriptive clarity, a model constraining structural regression coefficients to equality across groups was also evaluated, and the fit of this final constrained model is reported.

Missingness on individual analysis items ranged from 0.0% to 7.7%. Missing data were handled using full information maximum likelihood under a missing-at-random-compatible assumption. All models were estimated using robust maximum likelihood, and standardized path coefficients (β) are

reported as effect-size indices. Analyses were conducted using IBM SPSS Statistics Version 28.0 and IBM Amos Version 28.0 (IBM, Armonk, NY, USA). The significance threshold was $p < .05$ (two-tailed).

RESULTS

Participant Characteristics. The sample comprised 331 nursing staff members, of whom 91.5% were women. The mean age was 38.6 (standard deviation [SD], 11.0) years, and mean duration of nursing experience was 15.6 (SD, 11.0) years. Experience-group sizes were 61 (1–3 years), 57 (4–9 years), and 208 (≥ 10 years), with 5 respondents unclassified because of missing data on years of experience. Registered nurses accounted for 95.8% of the sample. Participant characteristics are summarized in Table 1. The response rate was modest, and the sample was drawn from hospitals that agreed to participate; therefore, the findings should be interpreted with attention to possible non-response and selection bias.

Table 1. Participant Characteristics and Scale Scores

		Total Sample <i>N</i> =331	1–3 years <i>n</i> =61	4–9 years <i>n</i> =57	≥ 10 years <i>n</i> =208	
		<i>n</i> (%) / <i>M</i> (SD)	<i>n</i> (%) / <i>M</i> (SD)	<i>n</i> (%) / <i>M</i> (SD)	<i>n</i> (%) / <i>M</i> (SD)	<i>p</i>
Gender						
	Female	303 (91.5)	52 (85.2)	51 (89.5)	195 (93.8)	
	Male	26 (7.9)	8 (13.1)	6 (10.5)	12 (5.8)	
	No response	2 (0.6)	1 (1.6)	0 (0.0)	1 (0.5)	
Age		38.6 (11.0)	24.5 (4.2)	29.4 (4.8)	45.0 (7.5)	
Basic Nursing Education						
	High school nursing course	18 (5.4)	0 (0.0)	1 (1.8)	17 (8.2)	
	Vocational school for LPNs	12 (3.6)	1 (1.6)	0 (0.0)	10 (4.8)	
	High school advanced nursing course	23 (6.9)	0 (0.0)	3 (5.3)	19 (9.1)	
	Five-year integrated high school nursing program	16 (4.8)	6 (9.8)	4 (7.0)	6 (2.9)	
	Vocational nursing college	227 (68.6)	43 (70.5)	38 (66.7)	143 (68.8)	
	Junior nursing college	7 (2.1)	0 (0.0)	0 (0.0)	7 (3.4)	
	University	25 (7.6)	11 (18.0)	11 (19.3)	3 (1.4)	
	No response	3 (0.9)	0 (0.0)	0 (0.0)	3 (1.4)	
Years of Nursing Experience		15.6 (11.0)	1.4 (1.2)	6.3 (1.7)	22.4 (7.7)	
Nursing Licensure						
	Registered Nurse	317 (95.8)	60 (98.4)	57 (100.0)	196 (94.2)	
	Licensed Practical Nurse	13 (3.9)	0 (0.0)	0 (0.0)	12 (5.8)	
	No response	1 (0.3)	1 (1.6)	0 (0.0)	0 (0.0)	
Current Department / Unit						
() indicates nursing care system	Ward (7:1)	181 (54.7)	46 (75.4)	40 (70.2)	94 (44.5)	
	Ward (10:1)	43 (13.0)	4 (6.6)	11 (19.3)	27 (12.8)	
	Ward (13:1)	40 (12.1)	6 (9.8)	3 (5.3)	31 (14.7)	
	Ward (15:1)	20 (6.0)	1 (1.6)	2 (3.5)	17 (8.1)	
	Ward (20:1)	13 (3.9)	3 (4.9)	0 (0.0)	10 (4.7)	
Non-ward units		34 (10.3)	1 (1.6)	1 (1.8)	32 (15.2)	
UWES-J		2.5 (1.0) [0.3, 1.2]	2.3 (1.2) [0.1, 1.0]	2.2 (1.1) [0.3, 0.8]	2.6 (1.0) [0.5, 1.4]	<i>n.s.</i>
Nurse Manager Leadership						
	Performance (P) function	3.4 (1.3) [0.0, 0.1]	3.7 (1.5) [-0., 0.4]	3.3 (1.3) [0.4, -0.5]	3.4 (1.0) [-0.1, 0.3]	<i>n.s.</i>
	Maintenance (M) function	3.6 (1.6) [-0.3, -0.2]	4 (1.7) [-0.6, 0.6]	3.5 (2.0) [-0.2, -0.5]	3.6 (1.5) [-0.3, -0.2]	<i>n.s.</i>
Work-related Stress						
	Job stressors	46 (7.0) [0.2, 0.2]	46 (5.0) [0.1, 0.6]	48 (7.0) [0.2, 0.0]	46 (5.5) [0.2, 0.3]	<i>n.s.</i>
	Stress responses	64 (19.0) [0.4, 0.0]	63 (14.0) [0.2, 1.0]	69 ^a (20.0) [0.3, -0.5]	63 ^b (15.0) [0.4, 0.0]	* <i>a</i> > <i>b</i>

Note. *N* = 331. Due to missing data from five participants regarding years of nursing experience, the total for the three experience groups is *n* = 326. Values for scale scores represent median (interquartile range) and [skewness, kurtosis]. Comparisons among experience groups were performed using one-way ANOVA and post-hoc tests. Superscripts a and b indicate significant differences between groups ($p < .05$).

Table 2. Goodness-of-Fit Indices for Individual Experience Groups and the Total Sample

Experience Group	χ^2	<i>df</i>	CFI	TLI	RMSEA	SRMR	AIC	BIC
1–3 years (<i>n</i> =61)	177.45	117	.937	.918	.093	.098	321.449	388.181
4–9 years (<i>n</i> =57)	177.00	117	.934	.913	.096	.133	321.002	394.949
≥10 years (<i>n</i> =208)	180.54	117	.981	.975	.051	.099	324.543	339.096
Total Sample (<i>N</i> =331)	249.00	117	.975	.966	.058	.096	393.003	401.800

Note. *N* = 331. AIC = Akaike information criterion; BIC = Bayesian information criterion; CFI = comparative fit index; *df* = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; TLI = Tucker-Lewis index.

All models were estimated using the robust maximum likelihood (MLR) method.

Measurement invariance was evaluated using changes in approximate fit indices across nested models. Invariance was considered supported when $|\Delta\text{CFI}| \leq .010$ and $|\Delta\text{RMSEA}| \leq .015$.^{32,33}

Table 3. Parcel-Based Multi-Group SEM Fit Indices and Invariance Testing

Model	χ^2	<i>df</i>	CFI	TLI	RMSEA	SRMR	AIC	BIC	ΔCFI	ΔRMSEA
Configural invariance	537.00	351	.965	.954	.041	.097	860.998	979.439	-	
Metric invariance	578.54	377	.962	.953	.041	.102	850.540	949.972	-.003	.000
Equal structural regressions	596.20	391	.961	.954	.040	.119	840.199	929.396	-.001	-.001
Equal structural covariances (comparison model)	615.24	399	.959	.953	.041	.122	843.417	926.764	-.002	.001

Note. Configural, metric, and structural invariance were evaluated using parcel indicators (3 UWES parcels; 3 P-function parcels; 3 M-function parcels; 4 stressor parcels; and 5 stress-response parcels).

Scale Scores and Group Comparisons. Table 1 summarizes the scale scores. Median staff nurses' WE scores were 2.3 in the 1–3 years group, 2.2 in the 4–9 years group, and 2.6 in the ≥10 years group, with no statistically significant between-group difference. Median leadership scores were also similar across groups. By contrast, physical and mental stress responses differed significantly: the median score was higher in the 4–9 years group than in the ≥10 years group (69 vs. 63; $p < .05$). Job stressor scores did not differ significantly by experience group.

Model Fit Across Experience Groups. Prior to the multi-group analysis, the goodness-of-fit of the hypothesized model was evaluated independently for each experience group and the total sample (Table 2). The experienced group (≥10 years; $n = 208$) and the total sample demonstrated excellent fit (e.g., total sample: CFI = .975, Tucker–Lewis index [TLI] = .966, RMSEA = .058, standardized root mean squared residual [SRMR] = .096). Models for the early-career (1–3 years) and mid-career (4–9 years) groups showed higher RMSEA values (.093 and .096, respectively) and SRMR values (.098 and .133, respectively); however, CFI and TLI remained within or near acceptable ranges (all $> .910$). These results provided a sufficient empirical basis to proceed with the formal multi-group structural equation modeling and metric measurement invariance testing.

Metric measurement invariance and Model Fit. Descriptive and structural results are presented in

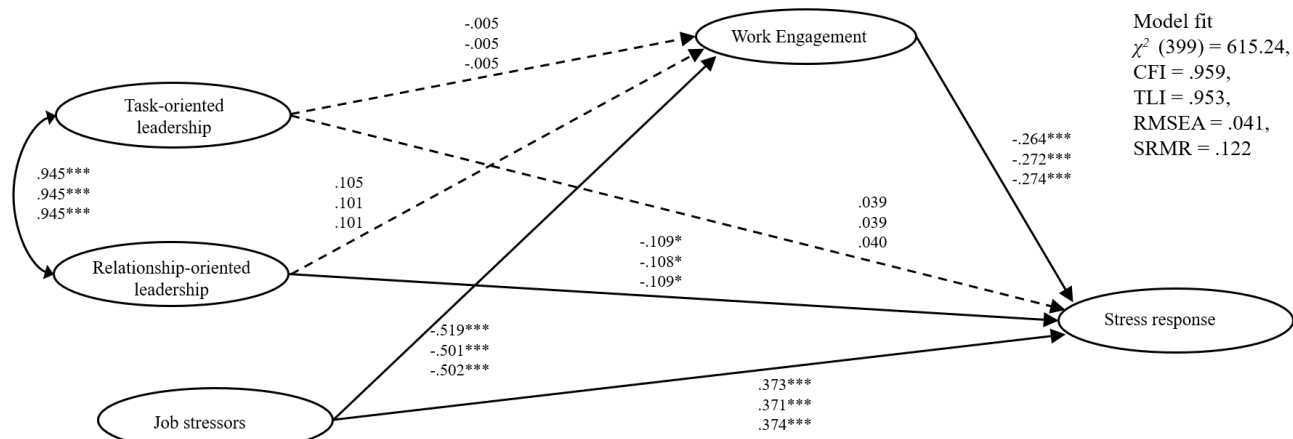
Table 2, Table 3, and Figure 2. Metric measurement invariance was supported based on changes in fit indices across nested models. Compared with the configural model, the metric model showed a reduction of .003 in CFI and no change in RMSEA ($\Delta\text{CFI} = -.003$, $\Delta\text{RMSEA} = .000$). Compared with the metric model, the equal-structural-regressions model showed a reduction of .001 in CFI as well as RMSEA ($\Delta\text{CFI} = -.001$, $\Delta\text{RMSEA} = -.001$). Finally, compared with the equal-structural-regressions model, the equal-structural-covariances model showed a reduction of .002 in CFI and an increase of .001 in RMSEA ($\Delta\text{CFI} = -.002$, $\Delta\text{RMSEA} = .001$). These findings support an acceptable level of invariance and structural equivalence across the three experience groups according to the predefined criteria. The final constrained multigroup structural equation model (equal structural covariances model) showed mixed but broadly acceptable fit: $\chi^2(399) = 615.24$, $p < .001$, CFI = .959, TLI = .953, RMSEA = .041, and SRMR = .122. Although SRMR exceeded the conventional benchmark of .08, elevated values may occur in models with large numbers of observed variables and complex latent structures; this value was therefore considered acceptable for further interpretation.^{34,35}

Across all groups, relationship-oriented leadership (M-function) was significantly and negatively associated with stress responses (1–3 years: $\beta = -.109$, $p < .05$; 4–9 years: $\beta = -.108$, $p < .05$; ≥10 years: $\beta = -.109$, $p < .05$). No significant association was observed between relationship-oriented leadership and WE in any group.

Table 4. Standardized Path Coefficients of the Structural Equation Model Across Experience Groups

Path	1–3 years (n=61)	4–9 years (n=57)	≥10 years (n=208)
Task-oriented leadership → Work engagement	$\beta = -.005, p = .934$	$\beta = -.005, p = .934$	$\beta = -.005, p = .934$
Relationship-oriented leadership → Work engagement	$\beta = .105, p = .055$	$\beta = .101, p = .055$	$\beta = .101, p = .055$
Job stressors → Work engagement	$\beta = -.519^{***}, p < .001$	$\beta = -.501^{***}, p < .001$	$\beta = -.502^{***}, p < .001$
Task-oriented leadership → Stress responses	$\beta = .039, p = .459$	$\beta = .039, p = .459$	$\beta = .040, p = .459$
Relationship-oriented leadership → Stress responses	$\beta = -.109^*, p = .038$	$\beta = -.108^*, p = .038$	$\beta = -.109^*, p = .038$
Job stressors → Stress responses	$\beta = .373^{***}, p < .001$	$\beta = .371^{***}, p < .001$	$\beta = .374^{***}, p < .001$
Work engagement → Stress responses	$\beta = -.264^{***}, p < .001$	$\beta = -.272^{***}, p < .001$	$\beta = -.274^{***}, p < .001$

Note. β values are standardized estimates and p-values are based on tests of the corresponding unstandardized coefficients. Analytic sample for the multigroup SEM. * $p < .05$, ** $p < .01$, *** $p < .001$.



Note. Values on the paths indicate standardized path coefficients (β). Error terms are omitted for clarity. Analytic sample for the multigroup SEM. The coefficients are presented in three rows: the top row for the 1–3 years group ($n = 61$), the middle row for the 4–9 years group ($n = 57$), and the bottom row for the ≥ 10 years group ($n = 208$). Significant paths are indicated by solid lines, while non-significant paths are indicated by dashed lines. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 2. Final multigroup structural equation model with standardized path coefficient

Task-oriented leadership (P-function) showed no significant direct association with either WE or stress responses across career stages. Job stressors exerted the largest effect within the model. Higher job stressors were significantly associated with lower WE (1–3 years: $\beta = -.519, p < .001$; 4–9 years: $\beta = -.501, p < .001$; ≥ 10 years: $\beta = -.502, p < .001$) and higher stress responses (1–3 years: $\beta = .373, p < .001$; 4–9 years: $\beta = .371, p < .001$; ≥ 10 years: $\beta = .374, p < .001$). In addition, WE was significantly and negatively associated with stress responses across all three groups (1–3 years: $\beta = -.264, p < .001$; 4–9 years: $\beta = -.272, p < .001$; ≥ 10 years: $\beta = -.274, p < .001$).

DISCUSSION

The present study used a multigroup SEM approach to examine the associations among nurse manager leadership, job stressors, WE, and stress responses in Japanese nursing staff across three career stages. Two findings were consistent across groups. First, job stressors showed the strongest associations in the model, being related to lower WE and higher stress

responses. Second, relationship-oriented leadership (M-function) was associated with lower stress responses, whereas neither P-function nor M-function showed a significant direct association with WE. Additionally, the overall pattern of structural relationships was largely consistent across career stages.

The absence of a significant direct association between nurse manager leadership and WE should not be interpreted as evidence that leadership is unimportant for engagement. Rather, it indicates that the effects of leadership on nurses' engagement are more indirect and context-dependent. Prior studies have discussed indirect links between leadership and well-being within the JD–R perspective; however, this study did not directly test mediating pathways involving job resources.^{2,5,16} In nursing settings, supportive leadership may be related to contextual factors relevant to staff nurses' well-being and engagement, although these mechanisms were not directly examined in the present study.^{8,19} These findings suggest that nurse manager leadership may

influence engagement in a contextual and indirect manner, rather than through a direct association as observed in the present model.

Another possible explanation is that the PM leadership framework captures important aspects of managerial behavior in Japanese organizations but may not fully represent the leadership dimensions most closely tied to engagement in contemporary nursing research. Previous reviews have suggested that, although nurse managers play an important role in promoting engagement and well-being, leadership effects are often conveyed through trust in the leader, empowerment, relational social capital, and other features of the work environment rather than through a simple direct pathway to engagement.^{8,16,19} Therefore, the null direct path from leadership to WE may reflect not the absence of leadership effects per se but the fact that such effects are mediated by unmeasured job resources or more readily captured by other leadership constructs. In the present sample, this interpretation is also consistent with the relatively strong path from job stressors to WE. This finding may indicate that high job stressors reduce the detectability of any direct association between leadership and WE.^{2,3,5}

Another explanation is that contextual factors specific to the present sample may have moderated the leadership–WE relationship, reducing the detectability of a direct effect. The study was conducted in the pre-pandemic period during which nursing workloads were already high; thus, the effect of leadership on engagement may depend on the extent to which basic job demands are addressed. When job stressors are high, any direct association between leadership and WE may be less readily observable. This interpretation is consistent with the relatively large stressor–WE path coefficients observed in the present model ($\beta = -.50$ to $-.52$) and with JD–R evidence showing that high demands can weaken the beneficial effects of leadership unless sufficient resources are available.^{2,5,17}

Collectively, the null result for H1 does not imply that nurse manager leadership is unimportant for WE but rather that its influence is likely conditional and indirect. These findings underscore the need for future research using longitudinal or experimental designs to clarify the direct and mediated effects of leadership on nursing staff engagement.

The findings for job stressors, WE, and stress responses were theoretically coherent and robust across career stages. Higher job stressors were associated with lower WE and higher stress responses,

whereas higher WE was associated with lower stress responses. This pattern is broadly consistent with the JD–R perspective, in that higher job stressors were associated with lower WE.^{2,3,5} In the present study, higher job stressors were also associated with higher stress responses.

It also supports the interpretation that WE is not merely a positive affective state but a work-related condition linked to a more favorable psychological functioning.^{4,8,25} From a practical perspective, nurses with higher engagement may be better able to sustain energy, maintain focus, and interpret comparable demands as manageable, resulting in lower perceived strain. However, because the present study was cross-sectional, the direction of this association should be interpreted cautiously.

With respect to career stage, the structural pattern of associations was broadly consistent across the three groups, suggesting that the overall relationships among leadership, job stressors, WE, and stress responses were functionally similar across experience levels in the present sample. However, one descriptive finding deserves particular attention: nurses with 4–9 years of experience showed higher stress responses despite no significant between-group difference in measured job stressors. This pattern may reflect developmental characteristics of the mid-career phase, during which nurses commonly assume broader clinical responsibilities, precepting or coordination roles, and more complex interpersonal demands while still consolidating professional identity and long-term career direction.^{20,21} Such a role transition can increase psychological strain even when measured exposure to general job stressors appears similar. This interpretation is also broadly consistent with evidence that nurses with fewer than 10 years of experience report lower WE than more experienced nurses and may rely more heavily on personal and professional resources to sustain engagement.^{36,37} A second, complementary interpretation is that the stressor subscales used in this study may not have fully captured psychological burdens specific to this career phase, because recent reviews indicate that nurses' engagement and well-being are shaped by role overload, workload complexity, work-life balance, and work-environment factors that may not be fully reflected in general stress scales.³⁶ This measurement limitation, rather than any particular unmeasured process, may partly account for the pattern observed. These interpretations remain tentative and should be tested in future studies using career-stage-sensitive measures of job demands.

These findings have several practical implications. Healthcare organizations may benefit from strengthening relationship-oriented leadership behaviors among nurse managers while reducing unnecessary job stressors in the work environment. The present results suggest that leadership development alone has limited effects if demanding working conditions remain unchanged. Rather, interventions that combine supportive leadership, regular supervisory communication, role clarification, and improvements in work conditions may be more effective, especially for nurses in the 4–9-year career stage.^{16,17,19} Although the structural model did not indicate weaker leadership effects specifically in the mid-career group, the elevated stress responses suggest that nurse managers must provide more proactive and individualized support for those in this career stage.

A cautious post-pandemic interpretation is also warranted. The mid-career vulnerability observed in this study may partly persist in contemporary settings because recent evidence from the “new normal” era indicates that nurse engagement is strongly shaped by workload complexity, role overload, work-life balance, and the work environment, while burnout and stress continue to undermine engagement.³⁶ At the same time, the support needs of mid-career nurses may have shifted, with greater importance now attached to flexible staffing, healthy work environments, professional development, and leadership practices that strengthen job resources and organizational support.^{17,36} Therefore, replication in post-pandemic samples is needed before drawing conclusions about the generalizability of this pattern.

LIMITATIONS

This study had some limitations. First, the response rate was modest, and participating hospitals were recruited from institutions with existing cooperative relationships; therefore, the possibility of non-response bias and selection bias cannot be ruled out. Second, the study was cross-sectional, and temporal ordering could not be established. In particular, although higher WE was associated with lower stress responses, the direction of this association cannot be confirmed from the present data. Third, all measures were self-reported, raising the possibility of common method bias. Fourth, group sizes were unbalanced, and the smaller mid-career group may have limited statistical stability. In addition, because the sample included some nurses with limited mid-level responsibilities, such as assistant nurse managers and

chief-level nurses, role-related heterogeneity may have influenced perceptions of leadership and stress-related responses. Finally, as data collection was completed immediately before the widespread impact of the COVID-19 pandemic in Japan, the findings reflect a pre-pandemic work environment. Therefore, the generalizability of these results to current settings should be considered cautiously. Indeed, a recent systematic review highlighted that factors influencing nurse WE have significantly evolved in the post-pandemic “new normal” era,³⁶ underscoring the critical need for replication in post-pandemic samples.

CONCLUSION

This study examined the structural associations among nurse manager leadership, WE, and work-related stress across three career stages in Japanese nursing staff. Relationship-oriented (M-function) leadership was significantly and consistently associated with lower stress responses across all career stages, whereas task-oriented (P-function) leadership showed no significant direct associations. Mid-career nurses (4–9 years) showed higher stress responses despite similar measured job stressors, suggesting a comparatively vulnerable position within the observed sample. These findings support the value of career-stage-sensitive leadership strategies and indicate that targeted support for mid-career nurses may be particularly important in nurse manager education and organizational practice.

AUTHOR CONTRIBUTIONS

ST was responsible for selecting the scales, conducting the survey and analysis, and drafting the manuscript. HA provided supervision and guided the research framework and overall study process, including ethical considerations. DS and HS contributed to the analysis and interpretation of the results. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this study.

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