Relationship Between Teams' Leader–Member Exchange Characteristics and Psychological Outcomes for Nurses and Nurse Managers: A Cross-Sectional Study in Japan

Saeka Kawaguchi, MSc, RN[1], Yukie Takemura, PhD, RN, PHN, CNA[1] 🔟,
Kimie Takehara, PhD, RN, PHN[2], Keiko Kunie, PhD, RN, PHN[3],
Naoko Ichikawa, PhD, RN, PHN[1], Kazunori Komagata, MSc, RN, PHN[4],
Koji Kobayashi, PhD, RN, PHN[5], Mitsuyo Soma, RN[4] and
Chieko Komiyama, MNS, RN[4]

Abstract

Introduction: The Leader–Member Exchange (LMX) theory, based on the social exchange theory, relates to positive psychological states among nurses. However, the influence of various LMX qualities coexisting within a team on nurses or nurse managers is still uncleared.

Objective: This study examines the relationship of nurses and nurse managers' psychological states with the average LMX and LMX dispersion among nurses in their units.

Methods: The study was conducted at two university hospitals in March 2017 using anonymous questionnaires. Nurses completed the LMX-7 scale and the subscales of job satisfaction, achievement, and growth from the Checklist on Commitments Related to Work. Nurse managers completed the subscales of management satisfaction, effectiveness, and extracting extra effort from the Multifactor Leadership Questionnaire. Both nurses and managers completed the Intention to Continue Working scale. The nurses' data were analyzed using a multilevel analysis to clarify associations between nurses' psychological states and LMX, average LMX, and LMX dispersion. Hierarchical multiple regression analysis tested to test the correlations of the psychological states of nurse managers with average LMX and LMX dispersion.

Results: Data from 586 nurses and 28 managers were analyzed. The LMX and average LMX of nurses were positively related to positive psychological states. Nurse managers displayed significant associations between high LMX dispersion and good psychological states. When average LMX was low, management effectiveness increased as LMX dispersion increased; when average LMX was high, management effectiveness was almost constant.

Conclusion: The unit's LMX characteristics appear to be related to the psychological states of both nurses and nurse managers. Increasing the LMX of each nurse may lead to positive psychological states for not only that nurse but all nurses in the unit. When LMX with subordinates is low, increasing LMX with a portion of nurse managers should be a priority to improve their psychological states.

Keywords

leadership, Leader–Member Exchange, multilevel analysis, nurse, psychological state

---

[1]Department of Nursing Administration, Division of Health Sciences and Nursing, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan
[2]Department of Integrated Health Sciences, Graduate School of Medicine, Nagoya University, Nagoya, Japan
[3]Department of Nursing Administration, School of Nursing, Tokyo Women's Medical University, Tokyo, Japan
[4]Department of Nursing, The University of Tokyo Hospital, Tokyo, Japan

[5]Department of Labor Policy, Japanese Nursing Association, Tokyo, Japan

Corresponding Author:
Yukie Takemura, Department of Nursing Administration, Division of Health Sciences and Nursing, Graduate School of Medicine, The University of Tokyo, 7-3-1 Hongo Bunkyo-ku, Tokyo 113-0033, Japan.
Email: yukitake-tky@umin.ac.jp

Background

Leader–Member Exchange (LMX) theory is based on social exchange theory and has been demonstrated to relate positively to job satisfaction and negatively to intention to leave among nurses (Han & Jekel, 2011). The psychological states linked to LMX in previous studies are important indicators for nursing management and are connected to quality of care and intention to leave (Aiken et al., 2002).

In nursing, as in other fields, few studies have considered the influence of various LMX qualities coexisting within a team, and no studies have investigated the influence of average LMX or LMX dispersion on nurses' psychological states. Furthermore, there are currently no reports on the relationship between a team's LMX characteristics and the outcomes for senior nursing staff. According to LMX theory, a subordinate willingly undertakes tasks beyond their work role when their LMX is high; however, research on these outcomes for senior nursing staff has not yet been conducted.

Japanese culture has traditionally placed value on collectivism and hierarchical order, and recently, it has even been found that Japanese nurses communicate according to their position in a hierarchy ladder (Omura et al., 2018b). The nature of nurses' relationships with nurse managers may affect their work performance, and, in fact, 90.5% of nurses responded that the support of their nurse managers was important to their work environment (The Japanese Nursing Association, 2018). Thus, while LMX is an essential concept in nursing management in other countries, the relationship between nurses and nurse managers is even more critical in Japan. Furthermore, Japan has a culture that values harmony, and it has been revealed that this is a characteristic that Japanese nurses pay attention to in the workplace (Konishi et al., 2009; Omura et al., 2018a). This suggests that not in addition to the LMX of a nurse and a nurse manager, the LMX of a nurse's colleagues and nurse managers may affect the nurse's psychological state.

This study aimed to examine the influence of a team's LMX characteristics on the outcomes of both nursing managers and their subordinates in Japan as well as to obtain suggestions for further utilization of LMX theory in nursing management.

Literature Review

LMX theory focuses on the relationship between leaders and followers, in contrast to traditional leadership theories that focus exclusively on leaders' behavior or characteristics. It assumes that a leader does not establish the same type of relationship with each follower, and effective leadership is demonstrated by leaders' development of good exchange relationships with subordinates, characterized by mutual trust (Dulebohn et al., 2012). Despite the lack of a unified definition of LMX, a common view among many scholars is that LMX reflects the quality of social exchange between leaders and their followers (Dansereau et al., 1973).

Research on LMX started in the 1970s and has been organized into four historical stages (Graen & Uhl-Bien, 1995). The first confirmed the non-uniformity of the leader–follower relationship. Within a given group, some followers, called the "in-group," have high-quality exchanges characterized by high trust, respect, and obligation; other followers, called the "out-group," have low-quality exchanges characterized by low trust, respect, and obligation. The second stage confirmed the effect of the leader–follower relationship on organizational outcomes, with high LMX linked to positive effects. The third stage confirmed the development of the leader–follower relationship from the early phases of the relationship, during which the social exchange is based on monetary compensation alone and both leader and follower perform only their own organizational work roles. As the relationship develops and matures, the individuals can count on each other for loyalty and support, and both leader and follower come to mutually respect and trust each other, publicly and privately. This superior–subordinate relationship is considered to have high social exchange and, as a result, LMX is also considered to be high. In such relationships, the follower willingly undertakes tasks beyond their work role (Graen & Uhl-Bien, 1995).

The fourth, and current, stage involves assembling dyads into larger collectives. Until now, most studies have focused on LMX relationships as dyads within workgroups and independent dyads. In complex organizations, however, this narrow focus does not represent the true nature of leadership situations, which are often characterized by a leader and multiple members working together, with each relationship playing a unique role. This stage of research has adopted a unit-level perspective, examining how differentiated dyadic relationships combine to form larger systems of network assemblies (Uhl-Bien & Graen, 1992).

The fourth stage has included only a few studies on the influence of various LMX qualities coexisting within a team while viewing the team as a collection of bilateral relations between leader and followers. Here, average LMX and dispersion of LMX within the team are often used as indicators of team LMX characteristics. In a previous study conducted with Dutch secondary school teachers, for example, when average LMX within the team was high, dispersion of LMX and subordinates' affective team commitment were not correlated; alternatively, when it was low they were correlated (Le Blanc & González-Romá, 2012). However, there is

no consistent view regarding the nature of the relationships of the average and dispersion of LMX with work-related outcomes. To draw conclusions on the relationship between teams' LMX characteristics and subordinates' outcomes, it is necessary to explore different industries (Erdogan & Bauer, 2010), cultural backgrounds (Harris et al., 2014), and social structures (Chen et al., 2014) and to investigate the relationships not only between LMX dispersion and outcomes but also among average LMX, LMX dispersion, and outcomes (Erdogan & Liden, 2002). Most fourth-stage research has considered only subordinates' outcomes; few have explored the relationship between LMX characteristics and superiors' outcomes.

This study aimed to clarify how the outcomes of both superiors and subordinates relate to the mixed LMX within a team of Japanese nurses and to obtain suggestions for further utilization of LMX theory in nursing. The specific aims were:

1. to examine how nurses' psychological states are related to their own perceived LMX and to the average LMX and LMX dispersion as perceived by all nurses in their unit; and
2. to examine how nurse managers' psychological states are related to average LMX and LMX dispersion as perceived by their subordinate nurses.

Methods

Design

This study was designed as a cross-sectional survey of nurses and nurse managers.

Participants

The survey was conducted among nurses and nurse managers in 38 units of two university hospitals in Tokyo, Japan, in March 2017. Each of the units had one manager. Nurses and managers from all 38 units were invited to complete the questionnaire. Nurse managers concurrently serving multiple departments were excluded. We distributed 1082 questionnaires for nurses and 38 for nurse managers. Participants placed completed questionnaires in individual envelopes, which were submitted to collection boxes placed in each nursing unit.

Measures

Leader–Member Exchange. Nurses completed the Japanese version of LMX-7 scale; the original scale was developed by Graen and Uhl-Bien (1995). Since a Japanese version of LMX-7 had not been developed, we translated the scale into Japanese after obtaining permission from the original authors. Translation was performed by our researchers, who are familiar with LMX, together with an expert who is bilingual in English and Japanese. The translation was checked by cognitive debriefing and independently back-translated by a professional translator. The original author evaluated whether the back-translation was equivalent to the original, whose reliability and validity had previously been verified in another study. The centroid item is "How effective is your working relationship with your leader?" (Graen & Uhl-Bien, 1995), and a sample item is "Do you know where you stand with your leader...[and] do you usually know how satisfied your leader is with what you do?" The questionnaire comprises seven items rated on a five-point Likert scale (1 = *rarely*; 5 = *very often*).

Three values were calculated:

- LMX: LMX between each nurse manager–nurse dyad; total raw score for seven items on LMX-7. Cronbach's alpha was .94.
- Average LMX: average LMX value of each dyad within a unit; calculated by taking an average within a unit.
- LMX dispersion: LMX dispersion value of each dyad within a unit; calculated by the sum of the squared difference from the mean of the unit divided by the number of respondents, that is, the mean of the squared differences.

We used average LMX and dispersion of LMX as an index of the team's LMX characteristics. To verify the influence of group characteristics, the average and dispersion of relevant variables should be in tandem (Cole et al., 2010). In a previous study, the average LMX indicated to what extent group members felt rewarded by their leaders in general and how much they reciprocated through preforming actions useful to the leaders (Bernerth & Hirschfeld, 2016). Another study suggested that LMX dispersion represents the extent of differences in the nature of the social exchange relationship of members with their leader, which is considered an important element of LMX theory (Henderson et al., 2009).

Work-Related Psychological Status. Nurses were asked to measure job satisfaction, intention to continue working, feeling of achievement, and feeling of growth, and nurse managers were asked to measure intention to continue working, management satisfaction, management effectiveness, and feeling of extracting extra effort. These psychological states were examined in our survey because active incentives for work, including "approval from others", "feeling of achievement", "feeling of growth", and "responsibility to work" (Herzberg, 1965), are powerful determinants of job satisfaction. The first three are promoted through effective superior–subordinate relationships.

Both nurses and managers completed the "Intention to Continue Working" scale, measured using a 10-point Likert scale (1 = "*I strongly want to quit my current workplace*"; 10 = "*I strongly want to continue working at my current workplace*").

To measure job satisfaction, nurses completed the "Job Satisfaction" scale using a six-item subscale from the "Checklist on Commitments Related to Work" (The Japan Institute for Labour Policy and Training, 2003). A sample item is "I like my current job." Each item is scored on a five-point Likert-type scale ranging from 1 (*Not at all*) to 5 (*Extremely*). The total score for the six items was calculated. Cronbach's alpha was .94.

To measure feeling of achievement, nurses completed the "Achievement" scale, measured using a four-item subscale of the "Work Situation" scale (The Japan Institute for Labour Policy and Training, 2003). A sample item is "My current job makes me feel a sense of accomplishment," and each item is scored on a five-point Likert scale (1 = *No*; 2 = *If anything, No*; 3 = *Neither No nor Yes*; 4 = *If anything, Yes*; 5 = *Yes*). The total score for the four items was calculated, and Cronbach's alpha was .82.

For feeling of growth, nurses completed the "Growth" scale using a four-item subscale of the "Work Situation" scale (The Japan Institute for Labour Policy and Training, 2003). A sample item is "I felt that I grew myself through work"; each item is scored on a five-point Likert scale (1 = *No*; 5 = *Yes*). The total score for the four items was calculated, and Cronbach's alpha was .86.

Management satisfaction among managers was measured with the "Satisfaction" scale, a two-item subscale of the "Multifactor Leadership Questionnaire (MLQ) Leader form (5x-short)," developed by Bass and Avolio (1995) and used with their permission. A sample item is "I use methods of leadership that are satisfying." Each item is scored on a five-point Likert scale ranging from 1 (*not at all*) to 5 (*frequently, if not always*). The average score of the two items was calculated. Cronbach's alpha was .60.

Nurse managers completed the "Effectiveness" scale to measure management effectiveness – a four-item subscale of the "MLQ Leader Form." A sample item is "I lead a group that is effective." Each item is scored on a five-point Likert scale (1 = *not at all*; 5 = *frequently, if not always*). The average score of the four items was calculated, and Cronbach's alpha was .83.

To assess their feeling regarding extracting extra effort, managers completed the "Extra Effort" scale, a three-item subscale of the "MLQ Leader Form." A sample item is "I get others to do more than they are expected to do." Each item is scored on a five-point Likert scale ranging from 1 (*not at all*) to 5 (*frequently,*

if not always). The average score of the three items was calculated. Cronbach's alpha coefficient was .79.

Demographic Characteristics. Nurses were asked about their age, sex, number of years as a nurse, organizational tenure, and education. Nurse managers were asked about their age, number of years as a manager, and organizational tenure. All participants were asked to indicate their age category as follows: under 30; 30–34; 35–39; 40–44; 45–49; 50–54; 55–60.

Ethical Considerations

The survey was anonymous and voluntary, and a written explanation of the study was provided to participants; responding was considered as consent to participate. Since this survey related to managers' evaluation by their subordinates, concerns around participant anonymity and the confidentiality of their responses were addressed at the outset: ages were asked in five-year categories to reduce participants' psychological resistance to being identified; unit ID, assigned for correspondence between nurses and managers, was converted twice and kept confidential; and answer sheets were taped shut. This study was approved by the relevant university ethics committees following the requirements of the Declaration of Helsinki.

Data Analysis

Following descriptive analysis, the nurses' data were analyzed using a multilevel analysis to clarify associations between nurses' psychological states and LMX, average LMX, and LMX dispersion. Unit was designated as a random effect in the multilevel analysis because nurses were based in different units, and their LMX might be dependent on their unit. As Table 1 shows, nine models were used to clarify the influences of each variable at individual (participants' characteristics and LMX) and unit levels (average LMX, dispersion of LMX, interaction term of average LMX and dispersion), as well as the cross-level interaction terms (interaction of LMX and average LMX, and interaction of LMX and dispersion of LMX). First, a null model was calculated. Second, participants' characteristics were entered into the multilevel model (Model 1). Third, LMX was entered (Model 2). Next, average LMX was entered (Model 3), followed by the interaction term of LMX and average LMX (Model 4); then, this interaction term was excluded and LMX dispersion was entered (Model 5), followed by the interaction term of LMX and average LMX (Model 6). Next, the interaction term of LMX and average LMX was excluded and the interaction term of average LMX and LMX dispersion was entered (Model 7), the interaction of LMX and average

Table 1. Variables Entered Into Each Model for Nurses' Psychological States Tested in This Study.

	Model no.								
	1	2	3	4	5	6	7	8	9
Level 1 Individual variables									
Participants' characteristics	x	x	x	x	x	x	x	x	x
Leader-Member Exchange		x	x	x	x	x	x	x	x
Level 2 Unit variables									
Average Leader-Member Exchange			x	x	x	x	x	x	x
Leader-Member Exchange dispersion					x	x	x	x	x
Interaction term									
Leader-Member Exchange × average Leader-Member Exchange					x		x		x	x
Leader-Member Exchange × Leader-Member Exchange dispersion									x
Average Leader-Member Exchange × Leader-Member Exchange dispersion							x	x	x

Note. "x" means the variable was entered into the model.
Leader-Member-Exchange dispersion is the sum of the squared difference from the mean of the unit divided by the number of respondents, i.e., the mean of the squared differences from the mean of the unit.

LMX was entered (Model 8), and finally the interaction term of LMX and LMX dispersion was entered (Model 9). To clarify the models, goodness of fit was compared among them.

Hierarchical multiple regression analysis was performed to test the correlations of nurse managers' psychological states with average LMX and LMX dispersion. In Model 1, participants' characteristics were entered, followed in Model 2 by average LMX, LMX dispersion (Model 3), and the interaction term of average LMX and LMX dispersion (Model 4).

The significance level was set at $p < .05$ (two-tailed). IBM SPSS Statistics ver. 24.0 for Microsoft Windows was used for the analyses. As calculated by G-Power 3.19, with an effect size of 0.15, power of .95, and an alpha of .05 with 10 predictors, a sample size of 172 nurses was required to achieve statistically appropriate power; 36 nurse managers were required, using five predictors, with an effect size of 0.35 and power of .70.

Results

Questionnaires were collected from 840 nurses and 35 nurse managers from 38 units. More than half of nurses were under 30 years of age (range: 20–60) and female (Table 2); 89 nurses and two managers were excluded because they returned blank questionnaires, and a further 155 nurses and two managers were excluded because more than one item on the characteristics or LMX scales was left incomplete. Ten nurses and three managers were excluded because the number of responses within each unit was less than five. Ultimately, data from 586 nurses (33 units; 54.2% of the number distributed) and 28 managers (28 units; 73.7% of the number distributed) were analyzed.

Table 2. Nurses' Demographics and Descriptive Statistics.

	$N = 586$ (33 units)	
	n or mean ± *SD*	(%) or [range]
Age, years		
<30	338	(57.7)
≥30	248	(42.3)
Sex		
Female	555	(94.7)
Male	31	(5.3)
Education		
Vocational school or junior college	183	(31.2)
University or graduate school	403	(68.8)
Number of years as nurse	7.8 ± 7.8	–
Organizational tenure	2.7 ± 2.5	–
Leader-Member Exchange	22.0 ± 6.4	[7–35]

The number of nurses who had graduated from university or graduate school was higher than that of those who had graduated from vocational school or junior college. Just half of the managers were over 50 years old (range: 40–60), and more than half of the managers had completed more than three years as nurse manager (Table 3).

Relationship Between LMX and Psychological States

Regarding the analysis of nurses' data, Spearman's correlations between age and number of years as a nurse and between age and education were over .5; considering multiple collinearity, age was excluded from the subsequent analysis. Regarding all nurse outcomes, judging from Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC), Model 3, with

Table 3. Nurse Managers' Demographics and Descriptive Statistics.

	$N = 28$ (28 units)	
	n or mean ± SD	(%) or [range]
Age, years		
Under 40	0	(0.0)
40–50	14	(50.0)
Over 50	14	(50.0)
Number of years as nurse manager		
<3 years	5	(17.9)
≥3 years	23	(82.1)
Organizational tenure	2.4 ± 1.5	–
Average subordinates' Leader-Member Exchange	22.2 ± 3.3	[17.4–29.1]
Subordinates' Leader-Member Exchange dispersion	32.5 ± 15.8	[10.6–82.2]

Note. Leader-Member-Exchange dispersion is the sum of the squared difference from the mean of the unit divided by the number of respondents, i.e., the mean of the squared differences from the mean of the unit.

only average LMX at the group level, fit better than the other models. In Model 3 (Table 4), LMX and average LMX were significantly related to job satisfaction, intention to continue working, feeling of achievement, and feeling of growth.

Regarding the analysis of managers' data, Spearman's correlation between age and number of years as a manager was over .5; considering multiple collinearity, age was excluded from the subsequent analysis. For all manager outcomes, average LMX was not significant, while LMX dispersion was significantly related to intention to continue working, management satisfaction, and management effectiveness in Model 3 (Table 5). In Model 4, for management effectiveness, the relation with average LMX and LMX dispersion was non-significant, but the interaction of average LMX and LMX dispersion was significant. When average LMX was low, management effectiveness increased as LMX dispersion increased; when average LMX was high, management effectiveness was almost constant even if LMX dispersion increased (Figure 1A). This interaction cannot be denied in terms of management satisfaction since the significance probability of the interaction was $p = .05$. There was a similar trend in the relation among average LMX, LMX dispersion, and management satisfaction (Figure 1B).

Discussion

In this study, not only LMX as perceived by staff nurses but also average LMX within the unit had significant positive relationships with nurses' psychological states.

However, LMX dispersion within the unit was not significantly related, and there was no interaction. LMX has previously been linked to nurses' job satisfaction and intention to continue working (Han & Jekel, 2011; Laschinger et al., 2007, 2011; Trybou et al., 2014), consistent with the results of the present study. Therefore, it is certain that LMX between nurse managers and nurses, as perceived by nurses, is related to subordinate nurses' psychological state, as average LMX is also suggested to be in this study, although this has not yet been verified. LMX dispersion was not significant, and it may be that only average LMX is related to nurses' psychological states. This result indicates that nurses are more likely to have a good psychological state not just when their relationship with their nursing manager is good but also when many of their colleagues have a good relationship with the nursing manager, whether or not they are part of the team. A study conducted with non-professional workers at a Chinese beverage company (Hu & Liden, 2013), in contrast to the results of the present study, revealed that a higher average LMX of colleagues was associated with a lower job satisfaction. This may indicate that in general companies, employees are in competition with each other and feel that a situation is not advantageous when their colleagues have a good relationship with their supervisors. However, Japanese nurses place a high value on harmony in the workplace (Konishi et al., 2009; Omura et al., 2018a), so their psychological state may be better when each of their colleagues has a good relationship with their nurse managers. In addition, it has recently been shown that, for high LMX with the nurse manager to be associated with a high performance, a centrality in friendship network with colleagues is also necessary (Regts et al., 2019); future research will need to consider the interaction of the dyadic relationship between the nurse and the nurse manager and the relationship between colleagues.

On the other hand, there was no relationship between managers' psychological states and average LMX, but a significant ($p < .05$) relationship or trend ($.05 < p < .1$) was observed with LMX dispersion. Regarding management effectiveness and management satisfaction, there was a significant interaction or trend of interaction between average LMX and LMX dispersion. Although management effectiveness and management satisfaction were relatively constantly high in the unit with high average LMX, in the unit with low average LMX, there was a tendency for high dispersion of LMX to be positively related to high management effectiveness and management satisfaction. In units with high average LMX, there are some subordinate nurses with high LMX within the unit, regardless of whether LMX dispersion is high or low, while units with low average LMX also have a fixed number of subordinate nurses with high LMX when LMX dispersion is high. Each scenario means that

Table 4. Relationships Between Leader-Member Exchange and Psychological States Among Nurses: Hierarchical Linear Model $N = 542$.

	Job satisfaction			Intention to continue working		
	19.2 ± 5.4 [6–30]			5.2 ± 2.6 [1–10]		
Mean ± SD [range]	N. Model Estimate	Model 3 Estimate	Model 5 Estimate	N. Model Estimate	Model 3 Estimate	Model 5 Estimate
Intercept	19.25**	18.67**	18.65**	5.29**	5.32**	5.32**
Level 1 Individual variables						
Number of years as nurse		0.09*	0.09*		0.04*	0.04*
Organizational tenure		0.02	0.03		−0.05	−0.05
Education		1.15*	1.17*		0.13	0.14
Sex		−1.01	−1.00		−0.35	−0.35
Leader-Member Exchange		0.34**	0.34**		0.18**	0.18**
Level 2 Unit variables						
Average Leader-Member Exchange		0.35**	0.35**		0.16**	0.16**
Leader-Member Exchange dispersion			0.01			0.00
VC within unit	28.03**	24.11**	24.12**	6.13**	5.09**	5.10**
VC between units	1.21*	0.29	0.32	0.35*	0.08	0.08
Interclass correlation	0.04	0.01	0.01	0.05	0.02	0.02
AIC	3631.45	3540.54	3546.63	2561.21	2464.36	2471.90
BIC	3640.19	3549.26	3555.35	2569.81	2472.93	2480.47

	Feeling of achievement			Feeling of growth		
	14.3 ± 2.9 [4–20]			14.5 ± 3.0 [4–20]		
Mean ± SD [range]	N. Model Estimate	Model 3 Estimate	Model 5 Estimate	N. Model Estimate	Model 3 Estimate	Model 5 Estimate
Intercept	14.34**	13.71**	13.68**	14.55**	13.91**	13.91**
Level 1 Individual variables						
Number of years as nurse	0.01		0.01	−0.01		−0.01
Organizational tenure	0.06		0.06	0.07		0.07
Education	0.53†		0.55†	0.67*		0.67*
Sex	0.00		0.03	0.08		0.08
Leader-Member Exchange	0.19**		0.19**	0.18**		0.18**
Level 2 Unit variables						
Average Leader-Member Exchange		0.17**	0.17**		0.13**	0.13**
Leader-Member Exchange dispersion			0.01			0.00
VC within unit	7.90**	6.80**	6.79**	8.49**	7.36**	7.37**
VC between units	0.45*	0.22†	0.23	0.22	0.10	0.10
Interclass correlation	0.05	0.03	0.03	0.03	0.01	0.01
AIC	2896.11	2816.25	2822.44	2918.50	2845.56	2852.90
BIC	2904.85	2824.96	2831.15	2927.24	2854.28	2861.61

Note. Random effect = unit. Leader-Member Exchange score is centered on the group mean, and average Leader-Member Exchange and Leader-Member Exchange dispersion on the ground mean. Education: dummy-coded 0 = vocational school or junior college, 1 = university or graduate school; Sex: dummy-coded 1 = male, 2 = female.

N. Model, Null Model; Estimate, Estimated intercept, and slope coefficient; VC, variance component; AIC, Akaike's Information Criterion; BIC, Bayesian Information Criterion. Lower values for AIC and BIC indicate a better fit of the model.

**p < 0.01, *p < 0.05, †p < 0.1.

superiors feel that they obtain high-quality exchange with subordinates and can perceive themselves as achieving high management effectiveness and satisfaction. However, in units with low average LMX and low LMX dispersion, superiors have low LMX with almost all subordinate nurses; therefore, it is suggested that these superiors find it difficult to feel that they obtain high-quality exchange and, thus, to feel that they have achieved management effectiveness and management satisfaction.

Table 5. Relationships Between Leader-Member Exchange and Psychological States Among Nurse Managers: Hierarchical Linear Model.

	Intention to continue working $N = 27$				Management satisfaction $N = 24$			
	6.6 ± 2.6 [1–10]				2.9 ± 0.7 [1–5]			
	Model 3		Model 4		Model 3		Model 4	
Mean $\pm$ SD [range]	β	SE	β	SE	β	SE	β	SE
Control variables								
Years as nurse manager	−0.15	0.40	−0.12	0.41	0.12	0.13	0.21	0.12
Organizational tenure	0.32	0.31	0.35†	0.32	−0.08	0.09	−0.02	0.08
Main variables								
Average Leader-Member Exchange	0.00	0.15	−0.04	0.15	0.24	0.05	0.28	0.04
Leader-Member Exchange dispersion	0.42*	0.03	0.35†	0.03	0.44*	0.01	0.24	0.01
Interaction Effect								
Average Leader-Member Exchange × Leader-Member Exchange dispersion			−0.17	0.01			−0.46†	0.00
R^2	0.32		0.34		0.22		0.37	
ΔR^2	0.16		0.02		0.18		0.15	

	Management effectiveness $N = 23$				Feeling of extracting extra effort $N = 23$			
	3.2 ± 0.6 [1–5]				3.3 ± 0.6 [1–5]			
	Model 3		Model 4		Model 3		Model 4	
Mean $\pm$ SD [range]	β	SE	β	SE	β	SE	β	SE
Control variables								
Years as nurse manager	0.16	0.10	0.23	0.09	0.18	0.12	0.22	0.12
Organizational tenure	−0.19	0.08	−0.12	0.07	−0.07	0.08	−0.04	0.08
Main variables								
Average Leader−Member Exchange	0.18	0.04	0.23	0.04	0.08	0.05	0.11	0.04
Leader-Member Exchange dispersion	0.53*	0.01	0.33	0.01	0.45†	0.01	0.33	0.01
Interaction effect								
Average Leader-Member Exchange × Leader-Member Exchange dispersion			−0.49*	0.00			−0.28	0.00
R^2	0.29		0.47		0.20		0.26	
ΔR^2	0.27		0.18		0.19		0.06	

Note. Average Leader-Member Exchange and Leader-Member Exchange dispersion scores are centered upon the ground mean.
Years as nurse manager: dummy-coded as 0 = 1st or 2nd year, 1 = 3rd or more.
β, standardized partial regression coefficient; *SE*, standard error; R^2, coefficient of determination.
**$p < 0.01$, *$p < 0.05$, †$p < 0.1$.
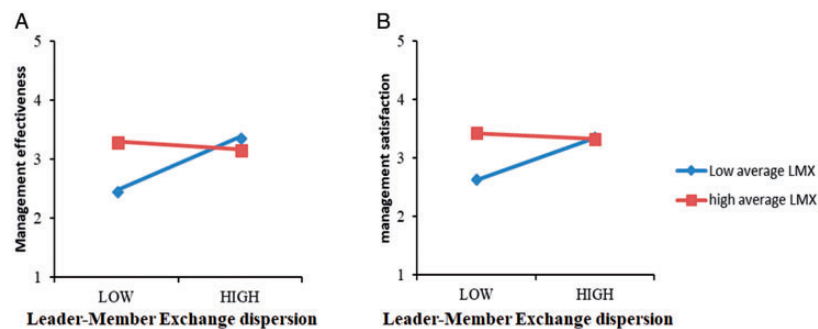
Figure 1. Interaction Effect of Average Leader-Member Exchange and Leader-Member Exchange Dispersion on Nurse Managers' Sense of Management Effectiveness and Management Satisfaction. A: Management effectiveness. B: Management satisfaction.

It has been noted that nurse managers, sensing a responsibility to mentor permanent nurses, have many opportunities to communicate with them and are more likely to be trusted by them while missing opportunities to interact and build trust relationships with other nurses (Gan, 2019). This suggests that it is common for nurse managers to work in a mixed workplace with subordinates who are building a high LMX and those who are in a low LMX with them. The finding of this study showing that the establishment of a high LMX relationship with subordinates, even if only partially and regardless of the average high or low LMX, has a positive effect on the psychological state of nurse managers may provide useful suggestions for many nurse managers.

The possibility of interaction was suggested in this study, but the small number of participants made the power insufficient, which necessitates follow-up studies with larger samples.

The mechanism by which LMX as perceived by nurse subordinates affects the psychological state of nurse managers requires further research. LMX, evaluated by both superiors and subordinates, has been observed to be highly correlated (Graen & Cashman, 1975), but also, conversely, as only moderately correlated (Gerstner & Day, 1997). Since LMX represents a bilateral relationship between a superior and each subordinate, the evaluations of both are considered to be correlated, but the previous study (Gerstner & Day, 1997) indicates that cases may be mixed in which the perceptions of the two do not match. Since we did not inquire regarding LMX among superiors, it remains unknown whether superiors' psychological states are influenced by superiors' perceived LMX with their subordinates, by subordinates' LMX as perceived by superiors, or by subordinates' performance affected by LMX. These points should be given attention in future research as well.

Strengths and Limitations

The findings here should be interpreted with caution due to several study limitations. First, the number of managers in our sample did not meet the required sample size, and it is possible that the effect size was too small. The alpha coefficient of management satisfaction was as low as 0.60, and the fact that sufficient internal consistency could not be confirmed should also be taken into consideration, although this could be due to the fact that there were only two items. There are limitations to the questionnaire survey as a data collection tool, such as subjectivity, possible inaccuracy, and bias toward answers perceived as desirable. In addition, the response rate and number of respondents differed by unit. Since the LMX dispersion variance was calculated by dividing by the number of respondents, it should not be affected by the number of respondents, but there may have been

a selection bias. It is also possible that the impact of the LMX dispersion on nurses' psychological status may differ depending on the number of nurses in the unit. Moreover, because this was a cross-sectional study, no causal associations could be confirmed. Influences from requesting participation through superiors and from the questionnaire submission method are conceivable but could not be tested. This study is nonetheless important, as it is the first to report the relationship between nursing teams' LMX characteristics and outcomes for their superiors. Finally, this study was conducted at two university hospitals, meaning the participants could have been disproportionately interested in education or research; therefore, caution is required in generalization.

Implications for Practice

This study contributed to fourth-stage LMX research and provided suggestions to utilize LMX theory in nursing. Increasing LMX with a nurse manager for each nurse may contribute to good psychological states not only for that nurse but for all nurses in the unit. When LMX between nurse managers and their subordinates is low overall, improving LMX with a portion of them should be a priority in order to improve the psychological states of nurse managers themselves.

Conclusion

In this study, the LMX characteristics of Japanese nursing teams were related to the psychological states of both nurses and nurse managers, but these relationships differed between groups. Among nurses, LMX and average LMX were positively related to positive psychological states. Nurse managers displayed significant associations between high LMX dispersion and positive psychological states. When average LMX was low, management effectiveness increased as LMX dispersion increased; when it was high, management effectiveness was almost constant even if LMX dispersion increased.

ORCID iD

Yukie Takemura 🆔 https://orcid.org/0000-0003-2861-8673

References

Aiken, L. H., Clarke, S. P., Sloane, D. M., Sochalski, J., & Silber, J. H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *Journal of the American Medical Association*, *288*(16), 1987–1993. https://doi.org/10.1001/jama.288.16.1987

Bass, B., & Avolio, B. J. (1995). *The Multifactor Leadership Questionnaire–5x short form*. Mind Garden, Inc. https://www.mindgarden.com/16-multifactor-leadership-questionnaire

Bernerth, J. B., & Hirschfeld, R. R. (2016). The subjective well-being of group leaders as explained by the quality of leader–member exchange. *Leadership Quarterly*, *27*(4), 697–710. https://doi.org/10.1016/j.leaqua.2016.04.003

Chen, Y., Yu, E., & Son, J. (2014). Beyond leader–member exchange (LMX) differentiation: An indigenous approach to leader–member relationship differentiation. *Leadership Quarterly*, *25*(3), 611–627. https://doi.org/10.1016/j.leaqua.2013.12.004

Cole, M. S., Bedeian, A. G., Hirschfeld, R. R., & Vogel, B. (2010). Dispersion-composition models in multilevel research: A data-analytic framework. *Organizational Research Methods*, *14*(4), 718–734. https://doi.org/10.1177/1094428110389078

Dansereau, F., Cashman, J., & Graen, G. (1973). Instrumentality theory and equity theory as complementary approaches in predicting the relationship of leadership and turnover among managers. *Organizational Behavior and Human Performance*, *10*(2), 184–200. https://doi.org/10.1016/0030-5073(73)90012-3

Dulebohn, J. H., Bommer, W. H., Liden, R. C., Brouer, R. L., & Ferris, G. R. (2012). A meta-analysis of antecedents and consequences of leader-member exchange: Integrating the past with an eye toward the future. *Journal of Management*, *38*(6), 1715–1759. https://doi.org/10.1177/0149206311415280

Erdogan, B., & Bauer, T. N. (2010). Differentiated leader–member exchanges: The buffering role of justice climate. *Journal of Applied Psychology*, *95*(6), 1104–1120. https://doi.org/10.1037/a0020578

Erdogan, B., & Liden, R. C. (2002). Social exchanges in the workplace. In L. L. Neider & C. A. Schriesheim (Eds.), *Leadership* (pp. 65–114). Information Age.

Gan, I. (2019). How do nurses' work arrangements influence nurse managers' communication? A qualitative study. *Journal of Nursing Management*, *27*(7), 1366–1373. https://doi.org/10.1111/jonm.12817

Gerstner, C. R., & Day, D. V. (1997). Meta-analytic review of leader–member exchange theory: Correlates and construct issues. *Journal of Applied Psychology*, *82*(6), 827–844. https://doi.org/10.1037/0021-9010.82.6.827

Graen, G. B., & Cashman, J. F. (1975). A role-making model of leadership in formal organizations: A developmental approach. In J. G. Hunt & L. L. Larson (Eds.), *Leadership frontiers* (pp. 143–166). Kent State Press.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *Leadership Quarterly*, *6*(2), 219–247. https://doi.org/10.1016/1048-9843(95)90036-5

Han, G. H., & Jekel, M. (2011). The mediating role of job satisfaction between leader-member exchange and turnover intentions. *Journal of Nursing Management*, *19*(1), 41–49. https://doi.org/10.1111/j.1365-2834.2010.01184.x

Harris, T. B., Li, N., & Kirkman, B. L. (2014). Leader–member exchange (LMX) in context: How LMX differentiation and LMX relational separation attenuate LMX's influence on OCB and turnover intention. *Leadership Quarterly*, *25*(2), 314–328. https://doi.org/10.1016/j.leaqua.2013.09.001

Henderson, D. J., Liden, R. C., Glibkowski, B. C., & Chaudhry, A. (2009). LMX differentiation: A multilevel review and examination of its antecedents and outcomes. *Leadership Quarterly*, *20*(4), 517–534. https://doi.org/10.1016/j.leaqua.2009.04.003

Herzberg, F. (1965). The motivation to work among Finnish supervisors. *Personnel Psychology*, *18*(4), 393–402. https://doi.org/10.1111/j.1744-6570.1965.tb00294.x

Hu, J., & Liden, R. C. (2013). Relative leader–member exchange within team contexts: How and when social comparison impacts individual effectiveness. *Personnel Psychology*, *66*(1), 127–172. https://doi.org/10.1111/peps.12008

Japanese Nursing Association. (2018). *2017 Survey on nursing staff*. https://www.nurse.or.jp/home/publication/pdf/research/92.pdf [in Japanese].

Konishi, E., Yahiro, M., Nakajima, N., & Ono, M. (2009). The Japanese value of harmony and Nursing Ethics. *Nursing Ethics*, *16*(5), 625–636. https://doi.org/10.1177/0969733009106654

Laschinger, H. K. S., Finegan, J., & Wilk, P. (2011). Situational and dispositional influences on nurses' workplace well-being: The role of empowering unit leadership. *Nursing Research*, *60*(2), 124–131. https://doi.org/10.1097/NNR.0b013e318209782e

Laschinger, H. K. S., Purdy, N., & Almost, J. (2007). The impact of leader-member exchange quality, empowerment, and core self-evaluation on nurse manager's job satisfaction. *The Journal of Nursing Administration*, *37*(5), 221–229. https://doi.org/10.1097/01.NNA.0000269746.63007.08

Le Blanc, P. M., & González-Romá, V. (2012). A team level investigation of the relationship between Leader–Member Exchange (LMX) differentiation, and commitment and performance. *Leadership Quarterly*, *23*(3), 534–544. https://doi.org/10.1016/j.leaqua.2011.12.006

Omura, M., Stone, T. E., & Levett-Jones, T. (2018a). Cultural factors influencing Japanese nurses' assertive communication. Part 1: Collectivism. *Nursing & Health Sciences*, *20*(3), 283–288. https://doi.org/10.1111/nhs.12411

Omura, M., Stone, T. E., & Levett-Jones, T. (2018b). Cultural factors influencing Japanese nurses' assertive communication: Part 2: Hierarchy and power. *Nursing & Health Sciences*, *20*(3), 289–295. https://doi.org/10.1111/nhs.12418

Regts, G., Molleman, E., & van de Brake, H.J. (2019). The impact of leader–member exchange on follower.

Human Relations, *72*(8), 1265–1291. https://doi.org/10.1177/0018726718806351

The Japan Institute for Labour Policy and Training. (2003). *Research and development on the foundation scale for diagnosis and activation of tissue: Development and utilization of HRM check list* (Research Report No. 161). http://www.jil.go.jp/institute/reports/jil_report/documents/0161.pdf [in Japanese].

Trybou, J., Gemmel, P., Pauwels, Y., Henninck, C., & Clays, E. (2014). The impact of organizational support and leader–member exchange on the work-related behaviour of nursing professionals: The moderating effect of professional and organizational identification. *Journal of Advanced Nursing*, *70*(2), 373–382. https://doi.org/10.1111/jan.12201

Uhl-Bien, M., & Graen, G. B. (1992). Self-management and team-making in cross-functional work teams: Discovering the keys to becoming an integrated team. *The Journal of High Technology Management Research*, *3*(2), 225–241. https://doi.org/10.1016/1047-8310(92)90013-R