Measurement of the workplace safety climate among hospital female nurses in Japan

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Aims Workplace safety climate has garnered attention as a factor encouraging organizational error management. We aimed to devise an instrument to measure this climate and examine the instrument’s reliability and validity for hospital nurses. We also examined the association between this instrument and work environment, behavior, mental health, and nurses’ attributes.

Methods The participants were hospital nurses in a public hospital in Japan. We conducted a survey involving a self-administered questionnaire. The survey items were about the workplace safety climate and various other parameters of the work environment, behavior, and mental health. Exploratory and confirmatory factor analyses were performed for instrument validation; internal consistency and item-total (I-T) correlation analyses were also performed. The factors relating to the workplace safety climate were examined by Spearman’s rank correlation coefficients, one-way ANOVA, and t-test.

Results The workplace safety climate scale was supported by a five-factor structure. Confirmatory factor analysis of a partially revised model resulted in a 0.917 CFI and a 0.067 RMSEA, indicating a good fit. The workplace safety climate scale was negatively correlated with experiences of incidents not being reported and mental health.

Conclusion The workplace safety climate scale was shown to be a valid and reliable instrument. This study suggested that a healthy workplace safety climate may reduce deleterious behaviors and help improve mental health.

Key words: safety climate, work environments, empowerment, error, prevention

I Introduction

In recent years, research has shown that the work environment is crucial for facilitating error management¹⁻⁴ and the ability to learn from errors⁵⁻⁷ in the health care field. This change of view represents a shift to approaches that plan to not only eliminate the causes of errors but also foster a work environment that helps prevent errors. The latter focuses on identifying the fragility in a workplace system before it fails and on taking remedial action⁸. One approach is to foster a safety climate. Zohar⁹ described this climate as “a summary of perceptions that employees share about their work environments” and defined the safety climate as “shared perceptions with regard to safety policies, procedures, and practices”¹⁰. The policies, procedures, and practices that are formally
enacted often differ from the policies, procedures, and practices that are actually enforced. Employees view the relative priority of safety and productivity in accordance with the policies and procedures implemented in their workplaces. Thus, the safety climate indicates the true priority placed on safety\(^{10}\).

Safety climate is a concept consisting of multiple components. Zohar\(^{9}\) reviewed literature on the organizational characteristics of companies in the industrial field, which influenced the rates of accidents. He found six elements common to companies that had low accident rates. These workplace characteristics were as follows:

1. a strong management commitment to safety,
2. an emphasis on safety training,
3. open communication and frequent contact between workers and management,
4. general environmental control and good housekeeping,
5. a stable workforce with little turnover, and
6. promotion of safety guidance and counseling.

These elements indicated how the organization and workplace managed any safety improvements and incorporated social interaction in their efforts. Based on a variety of cues present in their work environment, employees develop coherent sets of perceptions and expectations, which are the reasons for their specific behavior\(^{9,10}\). These perceptions are defined as organizational climates.

Previous studies on safety climate in the health care field have found an association between the safety climate and attitudes, behavior, health, and job satisfaction. The safety climate is significantly associated with compliance with universal precautions\(^{11-13}\), medication errors\(^{14}\), exposure to blood and bodily fluids\(^{15}\), needlesticks\(^{16}\), lower back pain, and job satisfaction of nurses\(^{16}\). However, the heightened interest in the safety climate is a recent phenomenon in the health care field, and the development of a safety climate scale has just begun in Japan. Those scales have been developed based on literature reviews or original interviews. The features of the construct of those scales have focused on different climatic levels. These climatic levels are either at the individual-level, workplace/unit-level, or organizational-level. For example, there are two scales for nurses. Matsubara et al.\(^{17}\) developed a scale for the workplace level that contained two factors, “attitude toward patient safety” and “climate that has a responsibility of patient safety.” Kudo et al.\(^{18}\) developed the measure that included the nurse’s work environment, comprising “intellectual development regarding medical safety,” “accumulated fatigue,” “nursing conditions,” “superiors’ attitudes,” and “communication with physicians.” In contrast, there are two scales for health care workers. Yamagishi et al.\(^{19}\) developed a scale for the individual and unit levels, comprising four factors. Matsubara et al.\(^{20}\) created a measure of two dimensions, comprising an individual and an organizational level. However, there has been little research, which focused on the climate at the workplace level for nurses. Our concern was identifying conditions that would help teams work together and solve problems\(^{7}\). Our special interest revolved around what type of influence they may have on safety or health. Thus, the current study sought to devise an instrument to assess the workplace safety climate among hospital nurses and to examine the reliability and validity of the instrument. This study also examined the association between this instrument and work environments, behavior, mental health, and their attributes.

II  Methods

1. Research design and data collection

This study was conducted as part of a comprehensive research project on strategies to prevent errors. The participants were 94 registered nurses in four separate units (Internal Medicine and Surgery) at a hospital (about 400 beds) that provided
regional health care in the Kanto region in Japan. A survey was conducted through an anonymous self-administered questionnaire in 2006. There were 93 valid responses for a response rate of 98.9%. At the time of the planning research design, we intended that “the workplace safety climate” scale would be applicable irrespective of gender. The candidates had included male nurses. However, there were few male respondents to the survey, and the statistical estimation by gender might have become unbalanced. Therefore, the responses from the male nurses were excluded, leaving responses from 89 female participants to be analyzed.

2. Survey items and measurements

Participant attributes

We obtained information about gender, age, and years of nursing experience, education, and job status of the patients.

Workplace safety climate scale

To measure the nurses’ perceptions of safety in their workplace over the past six months, we reviewed the standard instruments currently being used in the health care field; however, none of these was available in Japanese. Therefore, we devised a workplace safety climate scale based on a review of key literature9,15 about the safety climate scales. The safety climate scale of Gershon et al.15 specifically measured blood–borne pathogen management. The scale was constructed of six elements: (1) management support for safety programs, (2) absence of hindrances to safe practices, (3) availability of protective and engineering control equipment, (4) minimal conflict and good communication among staff members, (5) frequent safety-related feedback/training by supervisors, and (6) cleanliness and orderliness of the work site. These dimensions were similar to the elements extracted from an earlier review of the literature, where Zohar9 had developed a safety climate scale. We then referred to these concepts and devised question items and concepts for the subscale mentioned below, to create an instrument evaluating a general “workplace safety climate.” We adjusted the scale to enable it to cover other aspects besides blood-borne infection management as well.

Our scale was based on five of the six elements of the Gershon et al. scale15. The third element of that scale, “personal protective and engineering control equipment availability,” was a specific element for blood–borne infection management; therefore, the third element was excluded. The contents of the scale may be able to express a general workplace safety climate. The question items were examined through discussions with co-researchers, nurses, and researchers working in related fields. To determine the validity of the content of the questions, the questions were evaluated two or more times to ensure that they were easily understood and to determine whether the question covered its intended topic. Needed corrections were added, and the provisional version was created. The provisional version was administered to researchers who had a clinical experience and nurses who were proficient in nursing (n = 13), any necessary corrections were added, and the 21 questions for the survey were finally created. These questions were answered on a five-point scale ranging from “strongly agree” to “strongly disagree,” and each response was scored with 1–5 points. A higher score indicated a better workplace safety climate.

Variables for workplace characteristics

Based on a previous study21 and information obtained from participant observation and interviews at a hospital before the survey, the instruments listed below were crafted to measure the workplace characteristics.

• Short-term work overload: To assess the work-
load in the workplace during the previous two weeks, we asked six questions like “My role often changes quickly due to sudden absence of a colleague,” which were graded on a five-point scale from “strongly agree” to “strongly disagree.” Responses were tallied after giving a score of 1–5 points to each answer. A higher score indicated a greater work overload. The Cronbach’s $\alpha$ was 0.79.

- Long-term work overload: To assess the workload in the workplace over the past six months, we asked nine survey items like “Inability to take breaks because of the workload;” these questions were based on a previous study\(^{21}\). These responses were scored as indicated above. The Cronbach’s $\alpha$ was 0.88.

- Organizational culture: The organizational culture in the past six months was assessed using six items. We posed survey items such as “Opinions on the workplace are reflected in hospital policies,” which were also based on a previous study\(^{21}\). These responses were scored on a five-point scale from “strongly agree” to “strongly disagree,” and any reverse-scored items were corrected and tallied. A higher score indicated a better organizational culture. The Cronbach’s $\alpha$ was 0.79.

Experiences of incidents not being reported

We asked the participants if they had experienced instances where incidents that should have been reported were not reported.

Mental health

A previous study\(^{14}\) had noted that organizations with strong safety climates signaled to employees that these organizations were concerned about their health and well-being. Thus, we assumed that the workplace safety climate could be associated with mental health. We examined the relationship between the workplace safety climate and mental health. Mental health was measured using a 12-item version of the General Health Questionnaire (GHQ)\(^{22}\). The GHQ was developed to gauge slight mental health problems. The reliability and validity of the Japanese version\(^{23}\) had been confirmed previously\(^{24}\). The scale scores for the GHQ were calculated using a Likert scale of 0, 1, 2, or 3 points and then tallying those points. A higher score indicated poorer mental health. The Cronbach’s $\alpha$ was 0.87.

3. Statistical analysis

To examine the construct validity of our workplace safety climate scale, the concepts and items were examined by several researchers. Exploratory (principal factor analysis with promax rotation) and confirmatory factor analyses using structural equation modeling were performed.

Reliability was determined by examining internal consistency using Cronbach’s $\alpha$ and Item–Total (I–T) correlation analysis.

To examine factors relating to the workplace safety climate, Spearman’s rank correlation coefficients were calculated for the workplace safety climate score and the short-term and long-term work overload, organizational culture, experience of unreported incidents, and the GHQ score.

The association between the workplace safety climate and participant attributes was examined by one-way ANOVA and t-test. The statistical software packages SPSS Statistics 17.0 and PASW Statistics (Amos) 17.0 were used for analysis.

4. Ethical considerations

This study was approved by the ethics committee at the Institute for Labor Science and the ethics committee of the hospital surveyed. This study was conducted as a part of comprehensive research for improving the working conditions of nurses. To ensure anonymity, consecutive ID numbers, which only the participant knew, were assigned to each
questionnaire, and the data could be analyzed in a blinded fashion. The participants were informed in writing of the purpose and methodology of the study, the voluntary nature of their participation, and their right to withdraw even after giving consent. Participants were also informed that their anonymity would be preserved and how the study data would be disclosed.

III Results

1. Participant attributes and backgrounds

Table 1 shows the participant attributes and backgrounds. Participants had a mean age of 30.7 ± 8.6 years; ≥90% participants were graduates of a technical school or junior college. Participants had an average nursing experience of 8.6 ± 7.8 years. Their ages correlated very closely with their years of nursing experience. A few of the nurses (11.9%) were assistant head nurses, but most (88.1%) were staff nurses.

A total of 32.1% of the nurses had experienced instances where incidents that should have been reported were not reported. The typical reasons mentioned for this were as follows: “No impact on the patient,” “Minor incidents such as delayed replacement of IVs or a blocked IV line are not
reported,” and “I put something off because I was busy and forgot about it later.”

The participants had a GHQ–12 score of 17.5 on average, which was higher than that of the general female population24.

2. Validity and reliability of the workplace safety climate scale

Construct validity

We first started with an exploratory factor analysis of all the items on the questionnaire that assessed workplace safety climate (21 items). The results showed five factors with eigenvalues of ≥1. We continued exploratory factor analysis with these five factors. Table 2 shows the results of the exploratory factor analysis. The results indicated that the items associated with “Management support” were separated into two components, Factors 1 and 2. Several items related to “Management support” and “Feedback/Training” were attributed to Factor 1. Other items related to “Management support” and the items associated with “Good communication and minimal conflict” were attributed to Factor 2. The “Absence of job hindrances at workplace” items were also separated into two components, Factors 4 and 5. Thus, we determined that the extracted factors did occasionally deviate from the anticipated attribution of factors, but some commonality of content was shown.

Following this initial analysis, we examined a confirmatory factor analysis, which was based on the theoretical background for the safety climate. The five factors, “Management support,” “Absence of job hindrances at workplace,” “Feedback/Training,” “Cleanliness and orderliness,” and “Good communication and minimal conflict,” served as first-order factors, and the workplace safety climate served as a second-order factor; the analysis was done using a second-level factor model. The result showed low fidelity (CFI<0.9, RMSEA>0.07). Thus, revisions were made by removing an item with low absolute values of factor loading. Item 9 (factor loading : 0.18) was removed, resulting in a 20-item model with adequate fidelity (CFI =0.917, RMSEA=0.067). This instrument then facilitated an analysis with a second-level factor model (Fig. 1 : Appendix A).

Internal consistency

Table 3 shows the item distribution and reliability of our workplace safety climate scale. The Cronbach’s α for the total indices of the workplace safety climate (20 items) was 0.74, and the Cronbach’s α for the subscales ranged from 0.64–0.89.

I-T correlation analysis

I-T correlation was low for the questions numbered 8 (0.25) and 14 (0.35). Removing these items led to a higher α. I-T correlation for the other items was good.

3. Association between the workplace safety climate scale and work environment, participant behavior, mental health, and their attributes

Table 4 shows the bivariate relationships of workplace safety climate scale with other variables. In the examination of relationships, the short-term work overload was negatively associated with the workplace safety climate \(r=-0.36, p=0.001\), whereas the long-term work overload was not. Organizational culture was positively associated with the workplace safety climate \(r=0.72, p=0.000\). Furthermore, the workplace safety climate was negatively associated with the experience of incidents not being reported \(r=-0.25, p=0.05\) and the GHQ–12 score \(r=-0.41, p=0.000\).

A significant difference was found in the workplace climate score according to years of nursing experience \(F=3.88, P<0.05\). The nurses with four to nine years of experience had significantly higher scores on the workplace climate scale than
Table 2  Exploratory factor analysis of Workplace safety climate items  

| Item                                                                 | In my workplace | Factor and loading$^1$ |
|---------------------------------------------------------------------|-----------------|-----------------------|
|                                                                     |                 | 1         | 2         | 3         | 4         | 5         |
| 3 Managers have instructed staff members to have concern for their own health and safety. |                 | 0.57      | 0.35      | -0.04     | 0.04      | -0.07     |
| 4 Managers understand that patient and staff safety are related.     |                 | 0.68      | 0.27      | -0.06     | -0.09     | -0.16     |
| 5 Managers have repeatedly explained that there is always a potential for accidents at work. |                 | 0.62      | 0.18      | -0.03     | -0.11     | -0.05     |
| 10 Managers caution staff when they perform unsafe acts or provide unsafe care. |                 | 0.70      | -0.12     | 0.10      | -0.03     | 0.05      |
| 11 Managers have repeatedly instructed staff members to constantly keep safety in mind while working and providing care. |                 | 1.03      | -0.24     | -0.04     | 0.11      | 0.15      |
| 12 We often talk with managers about safe work practice and safe provision of care. |                 | 0.62      | 0.00      | 0.10      | 0.21      | -0.04     |
| 15 Staff are instructed to use protective equipment (gloves and gown) for the safety of the patient and themselves. |                 | 0.57      | 0.05      | 0.11      | -0.10     | -0.01     |
| 1 Managers put patient safety first.                                 |                 | 0.15      | 0.62      | -0.05     | 0.02      | -0.05     |
| 2 Managers have instructed staff to take steps to preclude accidents. |                 | 0.22      | 0.67      | 0.00      | -0.06     | 0.00      |
| 13 The rationale for steps in the manual on medication preparation and administration is explained within the hospital or unit. |                 | 0.29      | 0.40      | -0.06     | 0.12      | 0.14      |
| 19 There is minimal conflict within my unit.                         |                 | -0.21     | 0.51      | 0.05      | 0.30      | 0.21      |
| 20 Staff members fulfill their respective roles and support one another. |                 | -0.10     | 0.87      | 0.10      | -0.03     | -0.06     |
| 21 There is open communication between supervisors and staff members. |                 | 0.07      | 0.66      | 0.07      | -0.04     | 0.07      |
| 16 My work area (nurse/staff station, medicine preparation room and counter, and medication dispensing cart) is clean and organized. |                 | 0.10      | -0.03     | 0.67      | 0.20      | -0.02     |
| 17 Medications and supplies are appropriately restocked and organized. |                 | -0.09     | 0.13      | 0.90      | 0.03      | -0.05     |
| 18 My work area (nurse/staff station and medicine preparation room) is crowded. |                 | -0.08     | 0.06      | -0.37     | -0.03     | 0.25      |
| 6 My job duty (receiving doctors' orders, preparing medications, and administering them to the patient) do not often interfere. |                 | 0.06      | 0.00      | 0.07      | 0.60      | -0.03     |
| 7 I have enough time to safely do my work and provide care.           |                 | -0.02     | 0.03      | 0.01      | 0.93      | -0.04     |
| 8 We do our work and provide care despite a shortage of manpower.     |                 | 0.02      | -0.01     | 0.12      | -0.15     | 0.93      |
| 9 I am busy and sometimes don't have time to always follow the manual. |                 | 0.07      | 0.12      | -0.31     | 0.13      | 0.54      |

Eigen values  

|       | 6.18 | 5.88 | 3.24 | 2.51 | 1.85 |

$^1$Principal factor analysis with promax rotation. *reverse-scored item.
Appendix A. Workplace safety climate scale

私の職場では、

管理者のサポートの良さ（5項目）
1. 管理者は患者の安全を最優先にしている
2. 管理者は職員に事故を起こしにくい手順をとるよう指導している
3. 管理者は職員が自分たちの安全と健康の問題に関心をもつように指導している
4. 管理者は、患者の安全と職員の安全が相互に関係していることを理解している
5. 管理者は、職場における事故の危険が常に潜んでいることを繰り返し説明している

職務妨害の少ない（3項目）
6. 私たちの薬剤業務（指示、薬剤の準備、患者への薬剤の投与）は中断されることは殆どない
7. 私には、作業やケアを安全に実施するために、必要な時間が十分にある
8. 人手が不足している状況で作業やケアが行われている

フィードバック・トレーニングの良さ（6項目）
9. 管理者は、不安全な行動やケアをしているときには注意をしてくれる
10. 管理者は、安全な行動やケアについて目指す意識として職員に繰り返し指導している
11. 管理者は、不安全な行動やケアについてよく話し合っている
12. 薬剤業務の手順書に書かれている手順が、重要ではないか病院または病床内でよく教育されている
13. 手順書がいつでも利用できる状況にある
14. 職員は、患者との安全を守るために保護具（手袋やガウン）を使用するよう指導されている

整理整頓の良さ（3項目）
15. 作業環境（スタッフステーション、準備室、準備台、配菜カート）は、きちんと片付けられている
16. 薬剤や資材は、適切に補充され、整理されている
17. 作業環境（スタッフステーションや準備室）は混雑している

コミュニケーション・葛藤の解消の良さ（3項目）
18. メンバーや同士で意見が対立することは殆どない
19. メンバーや同士で意見が対立することは殆どない
20. メンバーや同士で意見が対立することは殆どない
21. 上司や同僚と職場の問題についてオープンに話せる

選択肢
1. 全くそうか、2. ややそうか、3. どちらでもない、4. まあなと思う、5. 全くその通り

*: 逆転項目。
the nurses with ten to nineteen years of experience. No significant differences in the workplace safety climate score were found between age, education, job status, and units. Although not shown in the table, significant differences between units were found for three of the five subscales of workplace safety climate, i.e., management support, feedback/training, and cleanliness and orderliness ($p = 0.03$ with all the variables).

**IV Discussion**

1. **Factor validity and reliability of the workplace safety climate scale**

   To promote preventive strategies for fostering a
work environment that helps prevent errors, this study attempted to devise an instrument consisting of five subscales that could measure the workplace safety climate. The results of the exploratory factor analysis showed that the subscales of “Management support” and “Absence of job hindrances at the workplace” were each separated into two factors. In other words, some items of “Management support” and some items of “Feedback/Training” were both attributed to Factor 1. The results inferred that although the items (3),(4), and (5) under “Management Support” represented informational support for safe practices, these items are also relevant to the concept of feedback, i.e., providing information that would help one reach goals by showing that the current progress was either on or off target. In addition, this study showed that the other items associated with “Management support” and one item related to “Good communication and minimal conflict” were all attributed to Factor 2. Item 1 (“Managers put patient safety first”) and Item 2 (“Managers have instructed staff to take steps to prevent accidents”) under “Management support” can be provided by open communication in the workplace; therefore, these two items may be indistinguishable from “Good communication

Table 4  Bivariate relationships of Workplace safety climate scale with other variables

| Variable                                      | Workplace safety climate |
|-----------------------------------------------|--------------------------|
| Mean±SD                                       | r                        |
| Short-term work overload                       | -0.36                    |
| Long-term work overload                       | -0.12                    |
| Organizational culture                        | 0.72                     |
| Experiences not reporting incidents           | -0.25                    |
| GHQ-12 score                                  | -0.41                    |
| Age†                                         |                          |
| 20–30                                        | 71.8±8.7                 |
| 30–40                                        | 67.9±12.2                |
| 40–50                                        | 69.3±15.5                |
| ≥50                                          | 68.7±13.2                |
| Education†                                    |                          |
| 3-year technical school/college               | 69.7±10.8                |
| 4-year university/college                    | 76.7±15.6                |
| Years of nursing experience†                 |                          |
| ≤3                                           | 67.7±7.3                 |
| 4–9                                          | 73.8±10.1                |
| 10–19                                        | 63.4±13.8                |
| ≥20                                          | 67.6±9.9                 |
| Job status†                                   |                          |
| Head nurse or assistant head nurse            | 70.6±10.8                |
| Normal nurse                                 | 66.9±9.9                 |
| Unit†                                        |                          |
| Unit 1                                       | 74.6±7.9                 |
| Unit 2                                       | 66.7±9.1                 |
| Unit 3                                       | 70.9±11.5                |
| Unit 4                                       | 68.2±13.8                |

† Spearman’s correlation; † One-way analysis of variance and multiple comparisons (Tukey’s procedure); † t-test. *p<.05, ***p<.001.
and minimal conflict." These could be explained because of the affinity between concepts. Thus, although some items deviated from the anticipated factor attribution, a certain amount of content commonality was found.

Based on the theoretical background of the safety climate scale, we accordingly performed confirmatory factor analysis with a second-level factor model, which provided a good fit (CFI > 0.9, RMSEA < 0.07). Thus, this study supported a five-factor structure of the workplace safety climate, i.e., “Management support,” “Absence of job hindrances at the workplace,” “Feedback/Training,” “Cleanliness and orderliness,” and “Good communication and minimal conflict,” and indicated a degree of construct validity for the instrument. The criterion validity needs to be examined in a future study.

With regard to the instrument’s reliability, Cronbach’s α for “Absence of job hindrances at the workplace” was slightly low (0.64). The I–T correlation for Item 8 (“We do our work and provide care despite a shortage of manpower”) was < 0.4, and removing this item caused the instrument’s Cronbach’s α to increase by a small amount. Although the “Absence of job hindrances at the workplace” meant “Absence of job hindrances to safe practices at work,” the wording may have been a little confusing and may have given the respondents the impression that this item referred to the continuing manpower shortage. This study also showed that item 14 (“Manuals are readily available in my work area”) under the “feedback/training” also had an I–T correlation of < 0.4. Removing this item also caused the instruments’ α to increase. Positive responses to items under “Feedback/Training” meant that there was adequate feedback/training on safety in the workplace, but this item may not have been readily perceived as a result of feedback and training by the survey respondents. Furthermore, to avoid adding the phrase “in your workplace” to all questions in the workplace safety climate scale, we added this phrase to the main question and on the front head of the questionnaire table. This kind of wording may need closer examination in future research. Thus, some items had a slightly lower I–T correlation, but the instrument had a certain degree of internal consistency and reliability.

Meanwhile, in this study, the third element of the “availability of protective equipment and engineering control equipment” was deleted from the instrument so that a general “workplace safety climate” could be assessed. Nonetheless, “adhering to appropriate safety rules” in the workplace is necessary26 for the promotion of the appropriate “climate.” The present study was conducted in only one hospital and includes a small sample of participants; accordingly, the workplace safety climate scale was shown to be a valid and reliable instrument in this study. Further examination will be required.

2. Association between the workplace safety climate scale and work environment, behavior, and mental health

This study revealed that the workplace safety climate was negatively associated with negative working conditions, i.e., short-term work overload, and positively associated with a positive work environment, i.e., organizational culture. The results suggested that the workplace safety climate could be damaged by negative working conditions and fostered by positive synergistic interactions in the workplace27. However, the workplace safety climate was not associated with long-term work overload. This study had a limited number of participants, thus additional studies should be conducted in the future.

This study also found that the workplace safety
climate was negatively associated with the experience of incidents not being reported and the GHQ-12 score. The results suggested that a healthy workplace safety climate reduced the number of times that an incident went unreported and helped improve mental health. Previous studies had found that the safety climate was associated with behavior\textsuperscript{11-16} and health\textsuperscript{14}. The results of this study suggested that approaches to safety and health in the workplace were accepted by nurses as signs of concern regarding their behavior and well-being\textsuperscript{14}, leading to an improvement in their behavior and mental health.

3. Association between the workplace safety climate scale and nurses attributes

This study found that the participants with four to nine years of nursing experience had evaluated the workplace safety climate significantly higher than the participants who had ten to nineteen years of nursing experience. Previous research has reported that the older nurses\textsuperscript{19} and the nurses with longer nursing experience\textsuperscript{17} evaluated the workplace safety climate higher. There is a possibility that being in a leadership role in the workplace may also influence nurses’ attitudes and behaviors\textsuperscript{28}. However, evaluation of the workplace safety climate score was low by the nurses who had ten to nineteen years of nursing experience in this study. Further examinations will be required.

4. Career levels of participants

Participants in this study had a mean age of 30.7 years and an average nursing experience of 8.6 years. According to the Survey of Nurses by the Japanese Nurses Association\textsuperscript{29}, practicing nurses had a mean age of 37.4 years and an average experience of 16.3 years. The fact that the sample in this study was proportionately younger and had fewer years of experience must be taken into account.

5. Implications and limitations

The significance of this study was the demonstration of the reliability and validity of the workplace safety climate scale and of the factors relating to the instruments. Nonetheless, this study has several limitations. Here, we devised a scale that can evaluate the general “workplace safety climate” with reference to such a concept and the relevant items/questions reported in the literature. The exploratory factor analysis showed that some items cannot be differentiated into factors as anticipated, whereas some items show a slightly lower-than-expected I-T correlation. Because the scale was accepted for its reliability and validity, we conducted a more advanced analysis.

The participants in this study was also constituted a small sample, so cautions must be required for assuming that the result of this research was a predisposition for workplace safety climate among Japanese nurses. It was believed that the knowledge acquired from this research corresponded to a middle-scale public medical institution from the viewpoint of the number of beds and nursing personnel.

This research was a cross-sectional study; thus, we cannot draw conclusions about the causality. Future studies need to include male nurses and hospitals of different sizes and functions; these studies also need to take into account the formation and role of the workplace safety climate.

V Conclusion

A questionnaire survey of hospital nurses yielded three findings. The workplace safety climate scale revealed a five-factor structure, and its reliability and validity were confirmed to a considerable extent. An inferior work environment was negatively associated with the workplace safety cli-
mate; whereas a better work environment was positively associated with that score. Moreover, this study suggested that a healthy workplace safety climate may reduce deleterious behaviors and help to improve mental health.

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