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Article

# Characteristics and cellular and molecular biomechanical influencing factors of resilience: A cross-sectional study of nurses experiencing workplace violence in Jiangsu China

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**Abstract: Objective:** To investigate the resilience status of nurses after workplace violence and its influencing factors from the perspective of cellular and molecular biomechanics. **Methods:** From April to July 2024, a cross-sectional questionnaire study was conducted utilizing the General Information Questionnaire, the Medical Staff Resilience Scale (MSRS), the Workplace Violence Scale (WVS), the General Self-Efficacy Scale (GSE), and the Perceived Social Support Scale (PSSS) on a sample of 375 nurses who had been victims of workplace violence at six tertiary-level A general hospitals and three secondary-level hospitals in Jiangsu Province, China. The data were subsequently analyzed. **Results:** The nurses' resilience score was (72.37 ± 10.19) with a mean score of (4.02 ± 0.57). Multiple regression analysis showed that age, work experience, title, monthly income, self-efficacy, and social support independently influenced their resilience. ($P < 0.05$). Pearson's correlation analysis revealed a positive correlation between carers' levels of resilience with generic self-efficacy scale and social support ($P < 0.01$), and a negative correlation of resilience with workplace violence ($P < 0.01$). **Conclusion:** The resilience scores of nurses who had suffered workplace violence were found to be at a moderate level. Stressors from workplace violence might trigger complex intracellular signaling pathways and molecular changes in nerve cells and endocrine cells of nurses. Hormonal imbalances could further affect neurotransmitter systems and molecular cascades related to mood regulation and stress adaptation, thereby influencing the nurses' resilience. Higher self-efficacy could potentially enhance the activation of positive molecular pathways and the expression of certain genes related to stress resistance. Social support might buffer the negative impacts of workplace violence on cellular and molecular mechanisms by providing additional resources and positive molecular signals. It is recommended that managers consider the effects of age, years of work experience, job title, and monthly income when developing strategies to enhance resilience. It is also the responsibility of managers to facilitate the mobilization of resources, both internal and external, related to self-efficacy and social support. Furthermore, they should construct targeted training courses based on an analysis of the mechanisms involved in the occurrence of workplace violence, to improve the resilience of nurses.

**Keywords:** workplace violence; nurse; resilience; self-efficacy; social support; cellular and molecular biomechanics

## 1. Introduction

The term "workplace violence" (WPV) encompasses a range of behaviors, including verbal abuse, threats, or assaults directed towards an individual or group in the workplace. These actions, whether explicit or potential, can pose a serious risk to

the security, well-being, and health of the individuals involved. From a categorization perspective, WPV can be classified as either psychological or physical, depending on the nature of the incident [1–3]. The issue of WPV against nurses has now become a significant public safety concern in the healthcare sector, with rates varying considerably between countries. Globally, the prevalence of WPV against primary healthcare workers ranges from 45.6% to 90%. Verbal abuse was the most frequently reported form of violence, with rates ranging from 46.9% to 90.3% [4]. A meta-analysis of the prevalence of WPV among nurses in Southeast Asia and the Western Pacific by Varghese et al. involved 41 studies with 42,222 nurses in 13 countries and showed that the overall prevalence of WPV was 58%, with a 64% incidence of verbal abuse [5]. A systematic analysis of the prevalence of workplace violence among nurses in Africa included 27 studies involving 9831 nurses, with an overall prevalence of WPV of 62.3%. Verbal abuse was identified as the most common form of violence, with a prevalence of 51.2% [6]. This evidence demonstrates that nurses are the occupational group with the highest risk of experiencing WPV. Such incidents have a significant impact on the occupational safety and physical and mental health of nurses, which in turn contributes to the high rate of nurses leaving the profession [7]. It is therefore imperative to prioritize the maintenance of the physical and mental health status of nurses.

Resilience is the ability to endure and overcome difficulties and is used to describe and explain the characteristics that enable an individual to withstand adversity and develop positively and has been shown to have a positive energetic effect on negative events [8]. Higher levels of resilience can reduce staff turnover and increase job satisfaction. A resilience survey of nurses who had worked for one year found that resilience was related to personal and environmental factors [9]. Peng Han's study showed that nurses' levels of resilience may vary depending on the work environment or the influence of related factors [10]. Nevertheless, the extant literature indicates that the overall level of resilience among nurses is relatively low. A cross-sectional survey conducted at a New Zealand hospital, which included 93 intensive care unit nursing staff, revealed that 55.9% of nursing staff exhibited low levels of resilience, 29.7% demonstrated moderate levels of resilience, and only 5.4% displayed high levels of resilience [11]. A study of resilience in a hospital in the UK revealed that nurses exhibited a resilience score of 67.6 (SD = 8.8) on the CD-RISC, indicating a low level of resilience [12]. Similarly, a cross-sectional survey of Chinese psychiatric nurses experiencing workplace violence found that nurses had low mean resilience levels [13]. Therefore, there is a need to understand the personal, environmental, and other related factors associated with nurses' resilience to improve the resilience level of nursing staff. However, there are more studies on WPV and related studies and fewer studies have focused on the development of resilience and factors influencing it after nurses have been exposed to WPV.

The objective of this study is to gain insight into the resilience-building process of nurses who have experienced WPV and to identify the factors that influence this process. The findings will serve as a guide for promoting the physical and mental health and professional development of this group of nurses, as well as informing the development of psychological resilience intervention strategies by hospital administrators.

## 2. Research methodology

### 2.1. Participants

From May to July 2024, 375 nurses who experienced WPV in six tertiary general hospitals and three secondary hospitals in Jiangsu Province, China, were selected for the study using whole-cluster random sampling.

#### 2.1.1. Inclusion criteria

Registered nurse;

Informed consent and voluntary participation;

Working time ≥12 months;

Nurses who have experienced WPV within 1 year.

#### 2.1.2. Exclusion criteria

The survey period included nurses who were off duty for reasons such as sabbatical leave, maternity leave, sick leave, and other absences;

Nurses on rotation or further training;

Those who withdrew in the middle or did not complete the survey.

### 2.2. Sample size

The Maxwell multiple linear regression sample content rough estimation method indicates that the sample content should be at least five to ten times the number of variables [14]. This study comprises 25 variables. These include 16 items from the General Information Questionnaire, 1 dimension of the Workplace Violence Scale, 1 dimension of the General Self-Efficacy Scale, 3 dimensions of the Social Support Scale, and 4 dimensions of the Medical Staff Resilience Scale. One dimension of the general self-efficacy scale, three dimensions of the social support scale, and four dimensions of the healthcare worker resilience scale. Additionally, 20% of the questionnaires were deemed invalid, following the calculation formula $N = 25 \times (5\sim10) \times (1 + 20\%)$, which determined the sample size range to be 150–300 cases. A total of 375 people were included in the study to meet the sample size criteria.

### 2.3. Research tools

#### 2.3.1. Questionnaire for general information

The following items were included in the questionnaire: hospital name, hospital bed ratio, hospital type, gender, age, years of working experience, title, position, education level, marital status, family relationship, form of employment, monthly income, number of night shifts per month, and so on, a total of 16 entries.

#### 2.3.2. Medical staff resilience scale (MSRS)

The MSRS was developed to measure the frequency of WPV that was experienced by nurses in the past 12 months by Zhu et al. [15]. The scale is comprised of 18 items, which are organized into 4 dimensions: decision-coping, interpersonal connection, rational thinking, and flexible self-adaptation. The questionnaire is a self-assessment tool comprising statements on a five-point Likert scale, with scores varying from 1 to 5 indicating degrees of disagreement and agreement. Higher scores are indicative of elevated levels of resilience among

healthcare workers. The scale has good reliability and has been used by other researchers to measure levels of resilience in medical staff [16]. The Cronbach's alpha coefficient for this scale in the present study was 0.918, demonstrating a high level of internal consistency.

#### 2.3.3. Workplace violence scale (WCS)

The Chinese version of the WPV Scale [17] is a reliable and valid instrument for assessing the frequency of WPV experienced by nurses in China [18,19]. The scale consists of a total of 5 items: physical assault, emotional abuse, intimidation, verbal harassment, and physical harassment. Each item is rated on a scale from 0 to 3, which indicates the frequency of violence. A score of 0 indicates no violence, 1 represents a single occurrence, 2 denotes two or three instances, and 3 signifies four or more incidents. The total score ranges from 0 to 15. The frequency scale is graded as follows: The frequency scale is graded as follows: zero frequency (scale score of 0), low frequency (scale score of 1–5), medium frequency (scale score of 6–10), and high frequency (scale score of 11–15). In this study, the Cronbach alpha coefficient was 0.75.

General Self-Efficacy Scale (GSE)

The General Self-Efficacy Scale was developed by Zhang and Schwarzer [20,21]. The scale has one dimension with 10 items and is scored on a 4-point Likert scale, where 1 is not at all true, 2 is somewhat true, 3 is mostly true, and 4 is completely true. The range of the total score is from 10 to 40, with higher scores indicating a higher level of self-efficacy. A total score of 10–20 is considered low, 21–30 as moderate, and 31–40 as high. With a Cronbach's alpha coefficient of 0.946, the results of this study show excellent reliability.

#### 2.3.4. Perceived social support scale (PSSS)

The PSSS was developed by Zimet et al. [22] and has good reliability and validity across all types of international populations [23–25]. The items are divided into three dimensions: family support (items three, four, eight, and eleven), friend support (items six, seven, nine, and twelve), and other support (items one, two, five, and ten). A 7-point Likert scale was utilized, with scores ranging from 1 (indicating strong disagreement) to 7 (indicating strong agreement). Higher scores indicate a greater subjective perception of social support. The Cronbach's alpha coefficient for the PSSS in this study was 0.929, demonstrating a high level of internal consistency.

### 2.4. Survey method

Before the survey, contact the nursing management department and the person in charge of the ward in advance, introduce the purpose and content of the study to them, and obtain consent and assistance. The research object is determined according to the criteria of the nano-row, based on the questionnaire star platform to generate electronic questionnaire links and two-dimensional code to distribute the questionnaire. Completing the questionnaire was permitted only once per individual, to prevent the possibility of multiple responses from the same study participant. Each question was designated as mandatory, to ensure the inclusion of all relevant data and to prevent any potential for bias in the measurement process. Should any issues arise during the completion of the questionnaire, the survey subject can be contacted

by the researcher to resolve the matter promptly. The number of recovered questionnaires is then statistically analyzed, and the data is entered. Questionnaires with regular distribution of answers; duplicate mobile phone numbers and IP addresses were excluded from the entry.

### 2.5. Data analysis

Data were statistically analyzed using SPSS 28.0 software. The measured data were expressed as mean ± standard deviation. The comparison of multiple sample means was analyzed by one-way ANOVA, the comparison of two sample means was analyzed by t-test, the correlation was analyzed by Pearson correlation analysis, and the multi-factor analysis was analyzed by multivariate linear regression. Results were considered to be statistically significant if the $p < 0.05$.

## 3. Results

### 3.1. Data validity analysis

A hypothesis test was conducted to verify the normal distribution of the sample data. In this study, the SPSS 28 software was initially employed to analyze the mean, standard deviation, skewness, and kurtosis of the scale scores. It is commonly accepted that when the absolute value of the skewness of the sample data does not exceed 3 the absolute value of the kurtosis does not exceed 10 [26], and the sample size of this study is 375, which is a large sample of data, it can be assumed that the sample data essentially conforms to a normal distribution. In this study, the maximum value of the absolute value of the skewness of the sample data is 2.676, and the maximum value of the absolute value of the kurtosis is 6.736. Furthermore, the absolute value of the kurtosis skewness of most scales is close to 0, which is within the normal range. Consequently, it can be assumed that the data in this study conformed to a normal distribution (**Table 1**).

**Table 1.** Descriptive statistics of data.

| Items | Minimum value | Maximum value | Mean value | Standard deviation | Skewness | kurtosis |
|---|---|---|---|---|---|---|
| decision-making response | 8 | 30 | 24.84 | 3.75 | −0.722 | 1.001 |
| interpersonal connection | 4 | 20 | 16.54 | 2.62 | −0.603 | 1.079 |
| rational thinking | 6 | 20 | 15.52 | 2.98 | −0.448 | 0.113 |
| flexible self-adaptation | 4 | 20 | 15.47 | 3.09 | −0.632 | 0.59 |
| Nurse resilience | 41 | 90 | 72.37 | 10.19 | −0.203 | −0.293 |
| Workplace violence | 1 | 15 | 2.70 | 2.27 | 2.267 | 6.736 |
| General Self-Efficacy | 10 | 40 | 27.13 | 6.28 | 0.107 | −0.034 |
| social support Scale | 20 | 84 | 62.09 | 11.87 | −0.356 | −0.434 |

### 3.2. Scores of nurses on resilience and related factors

The total resilience score was (72.37 ± 10.19), with an entry mean score of (4.02 ± 0.57), and the scores for each dimension were: decision-making and coping (24.84 ± 3.75), interpersonal connection (16.54 ± 2.62), rational thinking (15.52 ± 2.98), and flexible self-adaptation (15.47 ± 3.09). (**Table 2** and **Figure 1**).

**Table 2.** Nurses' total resilience score and scores for each dimension ($n$ = 375).

| Items | dimensionality score | Number of questions | entry parity (accountancy) |
|---|---|---|---|
| decision coping | 24.84 ± 3.75 | 6 | 4.14 ± 0.63 |
| interpersonal connection | 16.54 ± 2.62 | 4 | 4.13 ± 0.65 |
| rational thinking | 15.52 ± 2.98 | 4 | 3.88 ± 0.74 |
| flexible self-adaptation | 15.47 ± 3.09 | 4 | 3.87 ± 0.77 |
| Nurse resilience | 72.37 ± 10.19 | 18 | 4.02 ± 0.57 |
| Workplace violence | 2.70 ± 2.27 | 5 | 0.54 ± 0.45 |
| General Self-Efficacy | 27.13 ± 6.28 | 10 | 2.71 ± 0.63 |
| social support Scale | 62.09 ± 11.87 | 12 | 5.17 ± 0.99 |

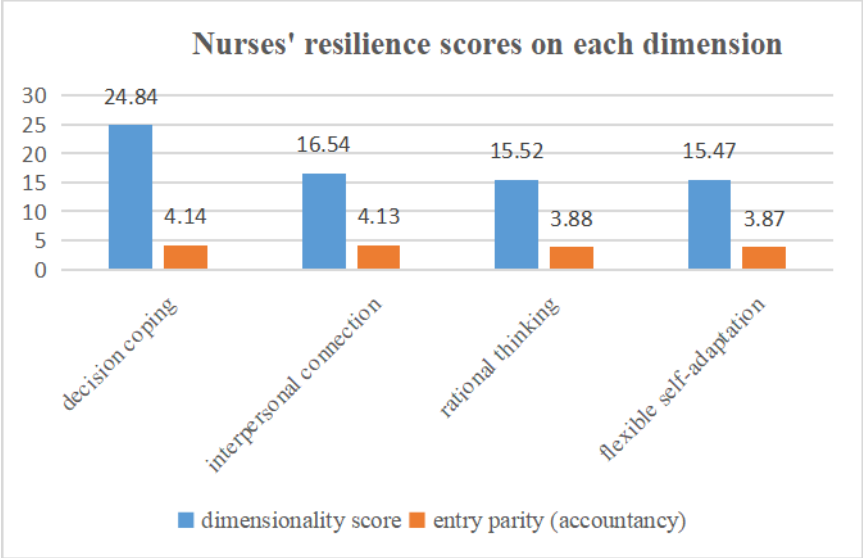


**Figure 1.** Nurses' resilience scores on each dimension.

### 3.3. Univariate analysis of the effect of different demographic characteristics on nurses' resilience levels

The univariate analysis indicated that statistically significant differences were observed for bed ratio, gender, age segment, years of experience, professional title level, and monthly income. However, no significant differences were observed in scores for different hospital types, hospital natures, departments, educational qualifications, family relationships, positions, marital status, forms of employment, family relationships, number of night shifts per month, and nurse tiers. See **Table 3** for details.

**Table 3.** Comparison of resilience scores among different basic characteristics.

| Characteristic | Classification | Number | Resilience | *T*/*F*-value | *P*-value |
|---|---|---|---|---|---|
| Nature of hospital | Public Hospitals | 361 | 72.26 ± 10.16 | 1.12 | 0.26 |
| | Private hospitals | 14 | 75.36 ± 10.88 | | |
| Hospital bed ratio | 0–500 | 90 | 71.33 ± 10.3 | 3.55 | 0.03 |
| | 500–1000 | 106 | 73.23 ± 9.85 | | |
| | ≥ 1000 | 179 | 72.39 ± 10.33 | | |

**Table 3.** (*Continued*).

| Characteristic | Classification | Number | Resilience | *T*/*F*-value | *P*-value |
|---|---|---|---|---|---|
| Type of hospital | Tertiary Hospitals | 279 | 72.58 ± 10.09 | 1.99 | 0.11 |
| | Secondary Hospitals | 69 | 72.28 ± 10.18 | | |
| | Primary Hospitals | 17 | 70.71 ± 10.98 | | |
| | Specialist hospitals | 10 | 70.1 ± 12.5 | | |
| Department | Internal Medicine | 133 | 73.26 ± 9.86 | 1.20 | 0.30 |
| | Surgery | 89 | 72.51 ± 10.46 | | |
| | Gynecology | 5 | 73.4 ± 6.11 | | |
| | Pediatrics | 27 | 72.37 ± 10.16 | | |
| | Emergency Medicine | 31 | 69.97 ± 11.18 | | |
| | Outpatient | 8 | 79.25 ± 6.63 | | |
| | ICU | 14 | 73.57 ± 8.31 | | |
| | other | 68 | 70.44 ± 10.65 | | |
| Gender | Male | 13 | 66.69 ± 8.99 | 2.06 | 0.04 |
| | Female | 362 | 72.58 ± 10.18 | | |
| Ages | ≤ 30 | 156 | 69.78 ± 10.6 | 4.45 | 0.00 |
| | 31–39 | 135 | 73.31 ± 9.49 | | |
| | 40–49 | 70 | 74.83 ± 9.29 | | |
| | ≥ 50 | 14 | 80 ± 8.53 | | |
| Years of Working | ≤ 5years | 101 | 69.06 ± 10.06 | 2.76 | 0.04 |
| | 6–10years | 87 | 70.52 ± 9.92 | | |
| | 11–15years | 93 | 73.89 ± 10.04 | | |
| | ≥ 16years | 94 | 76.15 ± 9.26 | | |
| Education level | Secondary education | 2 | 66.5 ± 10.61 | 0.92 | 0.43 |
| | Specialist qualifications | 73 | 68 ± 10.28 | | |
| | Undergraduate degree | 295 | 73.51 ± 9.97 | | |
| | Postgraduate and above | 5 | 71.8 ± 3.03 | | |
| Professional title level | Junior | 163 | 69.93 ± 10.14 | 2.64 | 0.07 |
| | Intermediate | 155 | 73.43 ± 9.77 | | |
| | Senior | 57 | 76.51 ± 9.76 | | |
| posts | Responsible Team Leader | 302 | 72.12 ± 10.3 | 1.51 | 0.22 |
| | Nurse Manager | 57 | 73.81 ± 8.82 | | |
| | Nurse Manager and above | 16 | 72 ± 12.48 | | |
| Marital status | Single | 117 | 72.63 ± 11 | 0.73 | 0.48 |
| | Married | 254 | 72.15 ± 9.83 | | |
| | Others (divorced, cohabiting, widowed) | 4 | 79 ± 6.16 | | |
| Form of employment | Official bodies | 90 | 72.39 ± 9.12 | 0.66 | 0.52 |
| | Personnel agencies | 17 | 71.82 ± 10.24 | | |
| | Contractual employment | 268 | 72.4 ± 10.55 | | |
| Family relationships | cordial | 369 | 72.43 ± 10.06 | 0.86 | 0.39 |
| | tense | 6 | 68.83 ± 17.15 | | |

**Table 3.** (*Continued*).

| Characteristic | Classification | Number | Resilience | *T*/*F*-value | *P*-value |
|---|---|---|---|---|---|
| Monthly income | < ¥4000 | 47 | 67.53 ± 10.39 | 3.06 | 0.02 |
| | ¥4000–¥5999 | 101 | 69.54 ± 10.01 | | |
| | ¥6000– < ¥7999 | 101 | 73.96 ± 9.58 | | |
| | ¥8000– < ¥9999 | 82 | 74.26 ± 9.67 | | |
| | ≥ ¥10,000 | 44 | 76.89 ± 9.28 | | |
| Number of nights per month | < 4 | 155 | 72.46 ± 9.6 | 0.33 | 0.80 |
| | 4–7 | 120 | 71.99 ± 10.23 | | |
| | 8–11 | 57 | 72.98 ± 11.3 | | |
| | 12–16 | 43 | 72.3 ± 10.86 | | |
| Nurse level | N0 | 57 | 72.7 ± 9.9 | 0.16 | 0.96 |
| | N1 | 44 | 72.95 ± 11.75 | | |
| | N2 | 127 | 72.39 ± 10.68 | | |
| | N3 | 110 | 71.41 ± 9.56 | | |
| | N4 | 37 | 74 ± 8.88 | | |

## 3.4. Correlation analysis of nurses' resilience with WPV, self-efficacy, and social support

Pearson correlation analysis revealed a negative correlation between nurses' psychological resilience and WPV ($P < 0.01$), while positive associations were found between resilience self-efficacy, and social support. (**Table 4**).

**Table 4.** Correlation analysis of MSRS, GSE, GSE and PSSS.

| Item | Workplace Violence | General Self-Efficacy | Social support |
|---|---|---|---|
| Total Resilience Score | −0.240** | 0.468** | 0.326** |
| decision coping | −0.183** | 0.366** | 0.265** |
| interpersonal connection | −0.198** | 0.377** | 0.319** |
| rational thinking | −0.249** | 0.393** | 0.234** |
| flexible self-adaptation | −0.163** | 0.403** | 0.256** |

Note: ** At 0.01 level (double tail), relevance is significant.

## 3.5. Multiple linear regression analyses of factors influencing nurses' resilience

A series of multiple stepwise regression analyses were conducted with the total score of nurses' resilience as the dependent variable, and the variables identified as influencing factors in the univariate analysis, along with the total scores of WPV, self-efficacy, and social support, as the independent variables. The results demonstrated that age segmentation, working experience, job title, monthly income, social support, and self-efficacy were significant predictors of resilience ($P < 0.05$). Furthermore, these variables collectively explained 31.9% of the variation in the nurses' total resilience score. (Please refer to **Table 5** and **Table 6** for further details).

**Table 5.** Variable assignment.

| Indicator | Variable | Assignment |
|---|---|---|
| Hospital bed ratio | X1 | 0–500 = 1; 500–1000 = 2; ≥1000 = 3 |
| Gender | X2 | Male = 1; female = 2 |
| Ages | X3 | ≤30 years = 1; 31–39 years = 2; 40–49 years = 3; ≥50 years = 4 |
| Years of Working | X4 | ≤ 5 years = 1; 6–10 years = 2; 11–15 years = 3; ≥ 16 years = 4 |
| Professional title level | X5 | Junior = 1; Intermediate = 2; Senior = 3 |
| Monthly income | X6 | < RMB 4000 = 1; RMB 4,000–RMB 5999 = 2; RMB 6000–RMB 7999 = 3; RMB 8000–RMB 9999 = 4; ≥RMB 10,000 = 5 |
| Workplace Violence | X7 | measured value |
| General Self-Efficacy | X8 | measured value |
| Social support | X9 | measured value |
| The resilience of nurses | Y | measured value |

**Table 6.** Multifactorial analysis of nurses' resilience.

| | Bias regression coefficient | Standard error | Standardized regression coefficient | *T*-value | *P*-value | Tolerance | VIF |
|---|---|---|---|---|---|---|---|
| Constant | 30.988 | 6.663 | —— | 4.651 | 0 | | |
| Hospital bed ratio | 0.039 | 0.545 | 0.003 | 0.072 | 0.943 | −1.033 | 1.111 |
| Gender | 3.169 | 2.584 | 0.057 | 1.227 | 0.221 | −1.911 | 8.249 |
| Ages | 1.390 | 0.536 | 0.117 | 2.596 | 0.010 | 0.337 | 2.444 |
| Years of Working | 1.356 | 0.406 | 0.151 | 3.344 | 0.001 | 0.559 | 2.154 |
| Professional title level | 1.628 | 0.644 | 0.114 | 2.527 | 0.012 | 0.361 | 2.895 |
| Monthly income | 1.297 | 0.384 | 0.154 | 3.375 | 0.001 | 0.541 | 2.053 |
| Workplace Violence | 0.184 | 0.237 | 0.041 | 0.776 | 0.438 | −0.282 | 0.649 |
| Self-Efficacy | 0.528 | 0.077 | 0.325 | 6.846 | 0.000 | 0.376 | 0.679 |
| Social support | 0.124 | 0.040 | 0.145 | 3.086 | 0.002 | 0.045 | 0.204 |

Note: $F = 20.49$, $P < 0.001$; $R = 0.579$, $R^2 = 0.336$, adjusted $R^2 = 0.319$.

## 4. Analysis of the current status of nurses' resilience after suffering WPV

The findings indicate that the resilience score of nurses who suffered from WPV was (72.37 ± 10.19), and the mean of the entries was (4.02 ± 0.57), which indicated that the resilience of nurses was at a medium level. The results of this study align with those of Guo et al. [27], though they are lower than those of the study by Cheng et al. [16]. The possible reasons for this are that WPV is an important stressor, the physical and mental health of nurses is affected after suffering from WPV, which

may contribute to a reduction in resilience. The results of this study indicate that the highest score for the resilience dimensions was 4.14 ± 0.63 for the decision-coping scale, while the lowest score was 3.87 ± 0.77 for the flexible and adaptive scale. This may be attributed to the occupational requirements of nurses, which necessitate the ability to cope with emergencies and unexpected events. Additionally, the influence of workplace violence (WPV) is lessened with the accumulation of experience in dealing with various stressful events, particularly among nurses with higher levels of resilience. The lower the influence of violence, so the decision-making response dimension scores are relatively high [28,29]. However, nurses are in a long-term stressor, and a calm state of mind is difficult to maintain for a long period, which inevitably leads to an imbalance, resulting in the lowest score of flexible self-adaptation.

Furthermore, the results demonstrated that workplace violence (WPV) was negatively correlated with nurses' resilience. However, the analysis indicated that WPV was not a statistically significant factor influencing resilience. Huaqian et al. indicated that the development of resilience is influenced by both personal and external factors, not by a single factor, so the development of resilience after WPV is also influenced by personal characteristics and internal and external resources [30]. WPV is also influenced by the level of violence, and the higher the level of violence, the greater the impact on resilience [31,32]. The mean score for WPV in this study was 2.70 ± 2.27, and the frequency of violence was low, so there was no significant effect on resilience. This study suggests that resilience is correlated with WPV, but is influenced by the internal and external environment and the intensity of violence. Therefore, hospital administrators should consider the interaction between violence intensity, and personal and environmental factors when developing workplace prevention policies and resilience intervention strategies for nurses experiencing workplace violence.

### 4.1. Influence of demographic characteristics on nurses' resilience

The findings of the analysis indicated that the primary factors influencing nurses' psychological resilience were age, working years, job title, and monthly income. The resilience scores for those aged 50 and above were higher than those for other age groups. This finding aligns with the results reported by Min Leng and colleagues [33]. As age increases, so does work experience, job title, and monthly income. Nurses in the older age group tend to hold more senior roles and have accumulated more experience. The experience of nurses allows them to demonstrate greater proficiency in technical operations [34]. Additionally, they may possess more robust crisis management skills. These older nurses may also be more adept at recognizing potential signs of violent behavior and taking appropriate precautions. Their extensive clinical experience enables them to respond flexibly to emergencies, thereby reducing the psychological and emotional impact of violent incidents. Furthermore, research indicates that as nurses advance in age, they tend to cultivate more extensive and robust social support systems, comprising family, friends, and colleagues [35]. Such networks can provide emotional support, advice, and assistance to nurses who have been exposed to WPV, thereby increasing their

resilience. This is probably because older nurses are more proficient at seeking out and utilizing these support resources. Furthermore, financial security has a notable impact on an individual's mental health. Studies have demonstrated that income increases nurses' work engagement [36]. Nurses with high average monthly incomes demonstrate higher levels of job satisfaction and recognition, lower burnout, and a reduced likelihood of leaving their jobs [36]. They are also more likely to be recognized by their families and the community. Therefore, nurses with high average monthly incomes exhibit high levels of resilience. Nevertheless, the extant training programmers for resilience enhancement are deficient in individualization and advance prediction. The implementation of ongoing mental health monitoring for nurses would facilitate the identification of issues and enable the implementation of improvements in a timely and proactive manner [37]. Mental health monitoring can be conducted regularly for nurses who are relatively inexperienced and have limited work experience. It is incumbent upon hospital administrators to pay heed to the management of nurses' career development, and to provide them with adequate opportunities for training, further training, and study [38]. It is recommended that administrators establish a range of training programmers tailored to the specific academic qualifications, work experience, roles and positions of nurses [39]. This will enable them to ascertain their career development aspirations, manage occupational stress and enhance their resilience. It is therefore essential to consider a range of factors, including age, title, and years of experience, when developing targeted training and intervention strategies to enhance the resilience of nurses. It is recommended that hospitals and nursing organizations focus on improving remuneration, increasing income levels for nurses, and enhancing job satisfaction and resilience.

## 4.2. Influence of self-efficacy on nurses' resilience

Correlational analysis results show a positive correlation between nurses' general self-efficacy and resiliency, and multiple linear regression results show that nurses' self-efficacy influences their resiliency, indicating that higher self-efficacy levels are associated with higher resiliency levels. According to Bandura [40,41], self-efficacy is the degree or strength of an individual's degree or strength of one's own beliefs about one's ability to complete tasks and achieve goals, which directly influences an individual's motivation to act. Research has shown that nurses with higher levels of self-efficacy perform better and provide higher-quality care than nurses with lower levels of self-efficacy [42]. These nurses are more engaged in their work, show greater perseverance in the face of problems, are more optimistic and confident in their ability to view and adapt to the stresses and disadvantages in their environment, and reduce various stresses and conflicts, resulting in greater job satisfaction [43]. Self-efficacy is an indispensable personal resource and constitutes a fundamental element in the process of developing resilience [44]. Studies have suggested that self-efficacy can be enhanced through training programs that increase nurses' confidence and competence in dealing with violence [45]. The findings of this study indicate that managers must prioritize the advancement of nurses' self-efficacy. This can be achieved by minimizing the workload, fostering a culture of

professionalism, promptly acknowledging progress and effectiveness, and implementing self-efficacy training programs to equip nurses with the resilience to persevere in the face of adversity.

### 4.3. The effect of social support on the resilience of nurses

The concept of social support can be defined as a personal emotional experience in which an individual is supported, respected, and understood within a social context [46]. This emphasizes the subjective feelings of the individual. Correlational analysis indicated a positive association was present between nursing social support and resilience. Furthermore, Multiple linear regression analysis results demonstrate that nurses' social support is an influencing factor on nurses' resilience, suggesting that an augmentation in the degree of social support experienced by nurses is correlated with an improvement in their resilience. The findings of this study are in alignment with those of Han-jun Huang et, which indicate that social support is a crucial external factor influencing resilience, with a direct and positive impact on resilience [30,47]. Perceived social support enables nurses to regulate negative emotions and reduce anxiety and depression [46]. It has been demonstrated that nurses who experience elevated levels of emotional support are more prone to maintaining a positive outlook in the presence of stress and adversity, thereby enhancing their resilience [48]. Some studies have indicated that support from friends, family, and colleagues can assist nurses in more effectively managing challenges at work by providing coping strategies and solutions [49]. When suffering from WPV, advice from family, friends, or co-workers can help nurses cope with difficulties at work and increase their coping skills and confidence. In the event of WPV, the input of family, friends, or colleagues can assist nurses in managing the associated difficulties and developing their coping abilities and self-assurance. Social support is important in protecting psychological resilience, it can only be transformed into a driving force to break through adversity and alleviate negative emotions when individuals are willing to accept and make full use of it. Otherwise, individuals will produce rejection psychology, which will aggravate psychological problems and run counter to the original purpose [50,51]. It is therefore recommended that hospitals implement measures to foster an open, supportive, and respectful working environment, intending to encourage teamwork and mutual assistance. Nurses' coping and problem-solving skills should be enhanced through the provision of regular training and coaching [52].

## 5. Study limitations

This study was conducted only with nurses from six tertiary general hospitals and three secondary hospitals in Jiangsu Province, China, and there were limitations in the scope of the study, so the sample lacked a certain degree of representativeness, and the geographical area could be expanded for further research in the future.

## 6. Conclusions

The resilience scores of nurses who had experienced workplace violence were found to be at a moderate level. The influencing factors of resilience were identified

as age, years of working experience, job title, monthly income, self-efficacy, and social support. A negative correlation between workplace violence and resilience was found in this study. This suggests that hospitals should implement robust safety management strategies, provide nurses with a secure working environment, and enhance training programs related to violence response to reduce the occurrence of WPV. In the aftermath of an incident of violence, it is essential to mobilize internal and external resources and construct targeted training courses based on the specific mechanisms involved in different individual cases. This approach can be effective in building nurses' resilience, promoting their physical and mental health, and facilitating healthy career development. In terms of research methodology, this study employed a cross-sectional survey design to investigate the current status of nurses' resilience and the factors influencing it. It did not, however, conduct an intervention study. Future research could attempt to unite different geographical areas and combine it with a longitudinal intervention study.

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**Ethical approval:** The study was conducted in accordance with the Declaration of Helsinki, and approved by Jiangsu Medical College Ethics Committee (protocol code 2024-K-121 and date of approval MAY 2024). Informed consent was obtained from all subjects involved in the study.

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