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## International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

## Research Paper

## Influencing factors associated with mental workload among nurses: A latent profile analysis

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## ARTICLE INFO

## Article history:

Received 25 October 2023

Received in revised form

26 February 2024

Accepted 24 April 2024

Available online 26 April 2024

## Keywords:

Mental workload

Perceived social support

Coping styles

Influencing factor

Latent profile analysis

Nurses

## ABSTRACT

**Objective:** This study aimed to examine the latent profile of nurses' mental workload (MWL) and explore the influencing factors via a person-centred approach.**Methods:** From March to July 2023, a quantitative cross-sectional study was carried out to investigate 526 Chinese clinical nurses from five tertiary hospitals in Sichuan Province, China, by using demographic information, the Perceived Social Support Scale, Simplified Coping Skill Questionnaire, and NASA-Task Load Index. Latent profile analyses were performed using Mplus 7.3 software. Pearson's chi-squared and logistic regression analysis was done using SPSS 24.0 software.**Results:** Three profiles of mental workload were identified based on the nurses' responses to the mental workload assessment, designated as "low MWL-high self-rated ( $n = 70$ , 13.3%)", "moderate MWL ( $n = 273$ , 51.9%)", and "high MWL-low self-rated ( $n = 183$ , 34.8%)". Based on the analysis of the three subtypes, nurses with working years < 5 years ( $\chi^2 = 12.135$ ,  $P < 0.05$ ), no children ( $\chi^2 = 16.182$ ,  $P < 0.01$ ), monthly income < 6000 ( $\chi^2 = 55.231$ ,  $P < 0.001$ ), poor health status ( $\chi^2 = 39.658$ ,  $P < 0.001$ ), no psychological training in the past year ( $\chi^2 = 56.329$ ,  $P < 0.001$ ) and suffering from workplace violence ( $\chi^2 = 19.803$ ,  $P < 0.001$ ) were significantly associated with MWL. Moreover, the multivariate logistic regression analysis showed that negative coping styles ( $OR = 1.146$ , 95% CI: 1.060–1.238,  $P = 0.001$ ) were accompanied by higher MWL while negatively associated with perceived social support ( $OR = 0.927$ , 95% CI: 0.900–0.955,  $P < 0.001$ ).**Conclusion:** Our results showed that the MWL of nurses could be classified into three subtypes. Monthly income, health status, psychological training, workplace violence, negative coping style, and perceived social support were the factors influencing MWL. Managers can employ personalised intervention strategies according to the individual characteristics of different subgroups to reduce nurses' MWL.© 2024 The authors. Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## What is known?

- Mental workload (MWL) refers to the amount of thinking, cognitive demand, or effort made by individuals to meet a given

task's physical and environmental requirements, which is considered a "subjective workload".

- Nurses have become an occupational group with a high MWL due to the shortage of human resources and heavy work tasks.
- Personal (demographic factors, personality, etc.), organisational (organisational support), psychological (psychological capital), and environmental factors (work) might affect MWL among nurses.

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Peer review under responsibility of Chinese Nursing Association.

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## What is new?

- This study found that the MWL of nursing staff could be divided into three subtypes, namely, “low MWL-high self-rated”, “moderate MWL”, and “high MWL-low self-rated”.
- Demographic factors (children, coping style, health condition), work-related influences (years of experience, monthly income, workplace violence), and perceived social support were associated with nurses’ MWL.
- Nurses with low monthly income, poor health, no psychological training, suffering from workplace violence, low social support, and a tendency to adopt negative coping styles had higher MWL.

## 1. Introduction

Human resources are considered modern healthcare systems’ most fundamental, scarcest, and crucial components. As the largest occupational group in healthcare, the shortage of nurses is particularly prominent [1]. It has been emphasised as one of the biggest impediments to achieve effective and sustainable development of health systems in any country or region [2]. A shortfall of 5.7 million nurses worldwide by 2030 has been estimated [3]. In this context, involuntary or voluntary overtime appeared to represent one of the main pathways to address the staffing shortages [4]. A severe ramification corresponding to overtime is the high level of task load, including the physical and mental workload (MWL). However, not all workloads can drive unsatisfactory job performance due to various tasks. Therefore, the valid assessment of MWL, distinguished from physical workload, is of significant interest in predicting nurses’ mental health, optimising human resource management, and ensuring medical services.

MWL, also known as perceived workload, was first described in the ergonomics field and was defined as the sum of the evaluable effects of external and mental factors affecting humans [5]. An alternative definition of MWL is the information processing ability used to perform tasks, including perceptual and cognitive processes and mental and perceptual activities, such as communication, calculation, decision-making, and research [6]. According to Sonmez et al. [7], MWL refers to the amount of thinking, cognitive demand, or effort individuals make to meet a given task’s physical and environmental requirements. Researchers have attempted to apply various theoretical models to explain the concept of MWL. However, considering the complicity and multidimensionality of the concept, no unified conclusion on the definition of MWL has been reached [8].

Because of the special nature of nursing, nurses usually face high levels of MWL during their duties. The National Institute for Occupational Safety and Health classified nurses among the global top forty professions with a high prevalence of diseases due to heavy workloads [9]. It has been reported that a heavy MWL is associated with a variety of unfavourable outcomes for nurses, patients, and organisations. High MWL is recognised as one of the common and significant causes of musculoskeletal diseases in nurses [10]. A multicenter cross-sectional survey of Americans revealed the physiological response caused by the work pressure and high MWL of employees could manifest as muscular tension that could eventually lead to musculoskeletal disorders [11].

Regarding the effect on the patients, 71.1% of patient safety events have been reported to be significantly correlated with the high level of MWL among nurses [12]. For example, necessary patient care is missed or delayed substantially as a result of the high MWL of nurses, leading to less optimal care for patients and an increase in nursing errors [9,13]. Regarding organisations, an increased MWL can reduce nurses’ job satisfaction, increase

burnout, and force them to leave their positions, indirectly affecting the organisational performance and quality of medical services [14–16]. Thus, maintenance of a favourable level of MWL is critically important given the multiple negative consequences.

According to the human-based archetype of MWL, it can be affected by task demands, work-related characteristics, external environment, and individual factors in a complicated environment [17]. Objective evaluation of task demands poses significant challenges in practice, while subjective reflection of task demands is prone to bias. Therefore, identifying subgroups might focus on personal characteristics, work-related factors, and the environment associated with the MWL. Several studies have explored the factors associated with MWL. Psychological variables, such as psychological capital and psychological resilience, are important factors negatively associated with the MWL of nurses [7,8,18], while nursing interruptions and psychological stressors are positive predictor factors [19]. Some sociodemographic variables, including gender, marital status, and educational background, have been suggested to influence MWL [20,21]. Regarding individual characteristics and the external environment, coping style and perceived social support are also considered.

Coping style is an intrinsic factor that reflects personal resources associated with MWL and is considered a conscious, purposeful, and flexible cognitive and behavioural adjustment strategy to deal with realistic environmental changes and stressful events [22]. Based on the Transactional Model of Stress and Coping proposed by Lazarus et al. [23], individual responses to stressful events are mediated by the coping process. The classification of coping has a wide range of options, and the vast difference in psychological and behavioural responses caused by the opposite coping styles has resulted in the more common approach being positive and negative coping styles. Social support is a vital protection resource provided by the external environment. Perceived social support refers to the individual’s subjective feeling of objective support, the positive emotional experience generated by feeling supported. As a coping resource, it can significantly improve the mental health level of clinical nurses [24]. Hence, exploring the characteristics of perceived social support related to different subtypes of MWL among nursing staff can determine the target population for accurate intervention.

Even though these studies have extended our understanding of MWL among nurses, the results have focused mainly on the linear relationship between single factors. In addition, the results were only evaluated using scale scores, making individual differences often impossible to capture. Therefore, an individual-centred study be conducted to assess MWL will be better. Latent profile analysis (LPA) is an individual-centred analysis method that categorises individuals based on response patterns across continuous indicators that assess relevant items. It also has the advantage of providing probabilistic results of naturally formed subgroups of measurements. Researchers can characterise potentially different patterns of MWL among nurses by using LPA, which could accurately identify target populations that require intervention and can be used to explore the influence of multi-level factors, including individual and work-related characteristics and external environment on nurses’ MWL, and analyse the influencing factors among different subtypes. It is expected to provide a reference for the effective management and scientific intervention of the MWL of clinical nurses.

## 2. Methods

### 2.1. Design

An exploratory, cross-sectional LPA on the MWL of nurses was

conducted. The differences in sociodemographic and work-related characteristics, coping styles, and perceived social support between profiles were also tested.

## 2.2. Participants

A total of 526 registered nurses were recruited from five tertiary hospitals in Sichuan Province, China, through convenience sampling from March to July 2023. The inclusion criteria are as follows: 1) registered nurses; 2) working in the current department for at least one year; and 3) voluntary participation. Participants on vacation during the investigation period and who experienced significant life changes within six months were excluded.

## 2.3. Sample size

The sample size was calculated according to Kendall's principle that the sample size should be 10–20 times the number of independent variables for the nature of the quantitative cross-sectional study [25]. Our study also conducted LPA of clinical nurses' MWL. Nylund-Gibson and Choi [26] has suggested that the minimum adequate sample size criterion for the LPA should be 300 cases. Hence, based on the above-described criteria and considering the probability of invalid questionnaires, 550 questionnaires were administered.

## 2.4. Date collection

This survey was conducted through the Questionnaire Star platform, a widely used and professional online questionnaire survey website in China (<https://www.wjx.cn>). The text containing the questionnaire, informed consent, and instructions was imported into the Questionnaire Star platform to produce an electronic questionnaire and generate links and QR codes. The questionnaire was sent to potential participants after consent was obtained from the hospitals to be investigated. Participants were recruited after they had read the informed consent and clicked the "agree" button. The survey was anonymous, and confidentiality and voluntariness were applied to ensure the reliability of the data. The questionnaires were screened for further to ensure a high-quality study by excluding the following: 1) questionnaires with fast response time (< 3 mins) and regular or repeated answers (the pre-survey results showed that the minimum time required to complete the questionnaire was a little over 3 mins, and hence, < 3 mins was proposed as one of the censoring criteria for the questionnaire); 2) questionnaires with duplicate IP addresses; and 3) questionnaires with contradictory sociodemographic characteristics.

## 2.5. Ethical considerations

Ethics approvals were obtained from the Ethics Committee of The Third People's Hospital of Chengdu (Number: 2023-S-248).

## 2.6. Instruments

### 2.6.1. NASA-Task Load Index

The NASA-Task Load Index (NASA-TLX) developed by the Human Performance Group at the National Aeronautics and Space Administration was used to evaluate the perceived workload caused by tasks [27]. The Chinese version of the NASA-TLX, revised by Liang et al. (2019) [28]. The scale has exhibited good reliability and validity and has been widely adopted in studies of Chinese nurses [29]. The internal consistency coefficient for the NASA-TLX

was Cronbach's  $\alpha = 0.773$ . This scale contains six dimensions: mental demand (MD), physical demand (PD), temporal demand (TD), effort (ET), frustration (FR), and overall performance (OP). Items were scored using a 20-point bipolar scale ranging from 0 to 100. For the OP dimension, the score of 0 represented the most successful performance of the task and the highest degree of self-satisfaction. However, for the remaining five dimensions, the score of 0 represented the lowest level of task load. The total (mean) MWL score can be obtained by summing up the six dimensions, with higher scores representing higher MWL levels of nurses.

### 2.6.2. Simplified Coping Skill Questionnaire

The Simplified Coping Skill Questionnaire (SCSQ), compiled by Xie (1998) [30], was used in this study to assess the coping style preferences of nurses. The SCSQ has been tested in nurse groups and demonstrated good validity and reliability [31]. It consists of 20 items and is divided into two dimensions: positive (12 items) and negative coping skills (8 items). Each item was scored on a four-point Likert scale from 0 (never take) to 3 (often take). The average score was calculated. The higher the average score on the corresponding dimension, the higher the tendency to adopt this coping style. In this study, the Cronbach's  $\alpha$  coefficient for the dimensions were 0.874 and 0.913.

### 2.6.3. Perceived Social Support Scale

The Perceived Social Support Scale (PSSS) was initially developed by Zimet et al. [32] to measure the perceived social support of individuals. The 12-item Chinese version of the PSSS (C-PSSS) revised by Jiang [33] was used in this study. The C-PSSS contains three dimensions with four items each: family support, friends support, and others support. Each item was scored using a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Higher total scores represent a higher level of perceived social support. The C-PSSS has been widely used by nurses with good internal consistency and reliability [31,34]. The Cronbach's  $\alpha$  coefficient for the whole scale and three dimensions were 0.964, 0.954, 0.937, and 0.895.

## 2.7. Statistical analysis

The LPA was conducted to explore subgroups of MWL based on the responses to each item via Mplus 7.3 software. The two-, three-, and four-profile models were tested sequentially, starting from the one-profile model. In terms of the information index, the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), adjusted Bayesian Information Criterion (aBIC), and entropy were applied to evaluate the classification accuracy [35]. A lower value of AIC, BIC, and aBIC suggested a better model fit. A higher entropy value indicated a more accurate profile classification. An entropy of 0.8 or above was considered a good classification of the model [36].

We also applied the Lo-Mendell-Rubin (LMR) and bootstrap likelihood ratio test (BLRT) to evaluate the change in model fit after adding a profile. LMR and BLRT with  $P < 0.05$  suggested that the current profile model performed better than the previous one [37].

SPSS 24.0 software was used for data processing and analysis. The sociodemographic and work-related characteristics of nurses were described in frequencies and percentages. Differences in population characteristics between different profiles were tested by chi-square test and analysis of variance (ANOVA). Statistically significant independent variables were incorporated into multivariate logistic regression analysis. Statistical testing was two-sided with a level of significance of 0.05.

### 3. Results

#### 3.1. Participant characteristics

In total, 550 questionnaires were distributed and returned, and 526 valid questionnaires were included after data screening, yielding a valid response rate of 95.64%. The average age of the 526 nurses in this study was  $31.52 \pm 8.61$  (21–55) years. The majority of the participants were female (85.0%), aged less than 40 years (81.6%) and had a bachelor's degree or higher (70.7%). In addition, approximately half of the nurses had experienced workplace violence (59.7%) and had attended psychological training (51.3%) in the past year. The detailed characteristics of the participants are presented in Table 1.

#### 3.2. Latent profiles of MWL

The total MWL score was  $69.57 \pm 16.93$ . When examining the data, four models were estimated progressively, starting with the 1-class latent profile models, and the fitted statistics for each latent profile structure are shown in Table 2.

Although the AIC, BIC, and aBIC values decreased from the 1-class profile model to the 4-class profile model, along with an increasing number of latent profiles. The *P*-values for LMR of the 4-class profile models were not statistically significant, and the entropy of the 3-class profile model was highest among the four models considered, indicating that the 4-class profile model was not superior to the 3-class profile model.

Moreover, from the attribution probability matrix of the 3-class latent profile model (Table 3), the average probability of each

profile assigned to this latent profile was 94%–94.5%, further suggesting that profile membership was well differentiated, and the 3-class profile solution is most credible (Table 3). Thus, a model consisting of three latent profile profiles was selected.

The scores of the three profiles on six items of the MWL are shown in Fig. 1. In class 1, nurses scored lower on MD, PD, TD, ET and FR, but higher on OP. Therefore, we named the profile “low MWL-high self-rated,” which accounted for 13.3% (*n* = 70) of the sample. Class 2 was designated “moderate MWL”, because the scores showed a uniform distribution in every item. The profile accounted for 51.9% (*n* = 273) of the sample. In class 3, the distribution of scores of the six items was the opposite of that in class 1, and we named it “high MWL-low self-rated.” Class 3 accounted for 34.8% (*n* = 183) of the sample.

#### 3.3. Sociodemographic and work-related characteristics of each latent profile

The difference in sociodemographic and work-related characteristics between the three latent profile subgroups was evaluated with the chi-square test and one-way ANOVA. Compared with nurses in class 1, a higher percentage of nurses in classes 2 and 3 had short work experience, low monthly income, and poor health status. They had experienced workplace violence and had not participated in any psychological training within a year. Additionally, concerning the differences in perceived social support and coping style among the subgroups, nurses in class 1 reported higher social support and positive coping style and lower negative coping style. Details are given in Tables 1 and 4.

**Table 1**  
Comparison of the MWL subgroup by sociodemographic and work-related variable.

Characteristics	Category	Overall ( <i>n</i> = 526)	Classification of latent profiles			$\chi^2$	<i>P</i>
			Class 1 ( <i>n</i> = 70)	Class 2 ( <i>n</i> = 273)	Class 3 ( <i>n</i> = 183)		
Gender	Male	79 (15.0)	9 (12.9)	44 (16.1)	26 (14.2)	0.609	0.738
	Female	447 (85.0)	61 (87.1)	229 (83.9)	157 (85.8)		
Age (years)	≤30	301 (57.2)	33 (47.1)	158 (57.9)	110 (60.1)	9.403	0.052
	31–40	128 (24.3)	15 (21.4)	70 (25.6)	43 (23.5)		
	>40	97 (18.4)	22 (31.4)	45 (16.5)	30 (16.4)		
Years of work experience	≤5	223 (44.3)	20 (28.6)	120 (44.0)	93 (50.8)	12.135	0.016
	6–10	90 (17.1)	19 (27.1)	46 (16.8)	25 (13.7)		
	>10	203 (38.6)	31 (44.3)	107 (39.2)	65 (35.5)		
Marital status	Spinsterhood	211 (40.1)	21 (30.0)	112 (41.0)	78 (42.6)	6.714	0.142
	Married	296 (56.3)	45 (64.3)	149 (54.6)	102 (55.7)		
	Divorced/widowed	19 (3.6)	4 (5.7)	12 (4.4)	3 (1.6)		
Children	No children	252 (47.9)	23 (32.9)	126 (46.2)	103 (56.3)	16.182	0.005
	During pregnancy	27 (5.1)	3 (4.3)	17 (6.2)	7 (3.8)		
	1	199 (37.8)	39 (55.7)	105 (38.5)	55 (30.1)		
Education level	≥2	48 (9.1)	5 (7.1)	25 (9.2)	18 (9.8)	8.032	0.088
	Associate degree or less	154 (29.3)	25 (35.7)	85 (31.1)	44 (24.0)		
	Bachelor's degree	322 (61.2)	43 (61.4)	160 (58.6)	119 (65.0)		
Professional title	Master's degree or above	50 (9.5)	2 (2.9)	28 (10.3)	20 (10.9)	7.873	0.095
	Nurse	211 (40.1)	29 (41.4)	120 (44.0)	62 (33.9)		
	Senior nurse	211 (40.1)	32 (45.7)	97 (35.5)	82 (44.8)		
Monthly income (RMB)	Nurse supervisor and above	104 (19.8)	9 (12.9)	56 (20.5)	39 (21.3)	55.231	<0.001
	<6,000	239 (45.4)	17 (24.3)	125 (45.8)	97 (53.0)		
	6,001–8,000	133 (25.3)	15 (21.4)	77 (28.2)	41 (22.4)		
	8,001–10,000	99 (18.8)	14 (20.0)	51 (18.7)	34 (18.6)		
Health	>10,000	55 (10.5)	24 (34.3)	20 (7.3)	11 (6.0)	39.658	<0.001
	Good	192 (36.5)	36 (51.4)	113 (41.4)	43 (23.5)		
	Moderate	143 (27.2)	17 (24.3)	84 (30.8)	42 (23.0)		
Psychological training	Poor	191 (36.3)	17 (24.3)	76 (27.8)	98 (53.6)	56.329	<0.001
	Yes	270 (51.3)	39 (55.7)	177 (64.8)	54 (29.5)		
	No	256 (48.7)	31 (44.3)	96 (35.2)	129 (70.5)		
Workplace violence	Yes	314 (59.7)	25 (35.7)	168 (61.5)	121 (66.1)	19.803	<0.001
	No	212 (40.3)	45 (64.3)	105 (38.5)	62 (33.9)		

Note: Data are *n* (%). MWL = mental workload. Class 1: low MWL-high self-rated. Class 2: moderate MWL. Class 3: high MWL-low self-rated.

**Table 2**  
Fit statistics for each profile structure.

Model	Loglikelihood	AIC	BIC	aBIC	Entropy	LMR P	BLRT P	Probability of class
1-class	-9,017.122	18,058.244	18,109.427	18,071.336	–	–	–	–
2-class	-8,577.660	17,193.319	17,274.360	17,214.049	0.820	<0.001	<0.001	0.500/0.500
3-class	-8,403.363	16,858.726	16,969.624	16,887.093	0.864	<0.001	<0.001	0.133/0.519/0.348
4-class	-8,346.085	16,758.171	16,898.926	16,794.175	0.831	0.052	<0.001	0.120/0.424/0.357/0.099

Note: AIC= Akaike Information Criterion. BIC = Bayesian Information Criterion. aBIC = adjusted Bayesian Information Criterion. LMR = Lo-Mendell-Rubin. BLRT = Bootstrap Likelihood Ratio Test.

**Table 3**  
Three latent profiles probability matrices of nurses' MWL.

Classification of latent profiles	Probability of belonging to profiles (percentage, %)		
	Class 1	Class 2	Class 3
Class 1	94.0	6.0	0
Class 2	2.0	94.2	3.8
Class 3	0.0	5.5	94.5

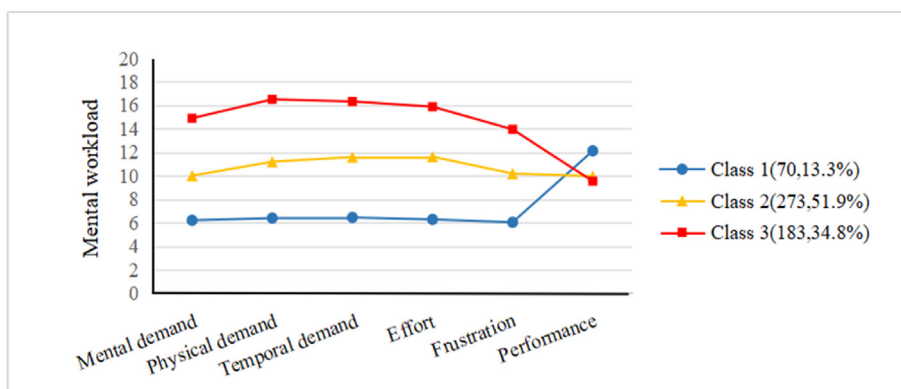
Note: Class 1 = low MWL-high self-rated. Class 2 = moderate MWL. Class 3 = high MWL-low self-rated.

3.4. Factors associated with nurses' MWL

Multiple logistic regression was performed further to identify the predictors related to nurses' MWL with the class 1 latent profile as the reference group. The independent variables in the regression model were assessed for collinearity using the tolerance (TOL) and variance inflation factor (VIF). The results showed that the TOL values were greater than 0.1 (0.397–0.947), and the VIF was less than 10 (1.056–2.520), indicating the absence of multicollinearity. The results of the predictors of nurses' MWL are shown in Table 5 and include negative coping, perceived social support, monthly income, health, psychological training, and workplace violence.

4. Discussion

The current study offers a novel investigation into the MWL of nurses using LPA. Three latent profiles of nurses' MWL were discerned during the model fitting and were named low MWL-high self-rated, moderate MWL, and high MWL-low self-rated. The majority (86.7%) of the nurses belonged to classes 2 (moderate MWL) and 3 (high MWL-low self-rated), suggesting that nurses' MWL was at a medium-high level, similar to the findings of the previous studies [38]. A recent systematic review involving 16,189 nurses from different parts of the globe demonstrated that the prevalence of nurses' MWL was 54% [8]. This result was lower than that of the present study because of our study's single source of research objects (all from Sichuan province, China). The subgroup analysis involving different regions also showed that the level and prevalence of MWL across nurses were much higher than those reported in other countries (Iran and the United States) [8,20]. The result was also higher than administrative staff in comparable hospitals, possibly due to the differences in work demands and content [14]. This result also hinted that the overall MWL among clinical nurses is unfavourable and that further improvements are needed. Nursing managers should pay more attention to the situation. Several interventions could also be introduced to mitigate



**Fig. 1.** Three subtypes of MWL based on the LPA results  
Note: MWL = mental workload. LPA = Latent profile analysis. Class 1 = low MWL-high self-rated. Class 2 = moderate MWL. Class 3 = high MWL-low self-rated.

**Table 4**  
Comparison of the different subgroups by perceived social support and coping style.

Variables	Overall (n = 526)	Class 1 (n = 70)	Class 2 (n = 273)	Class 3 (n = 183)	F	P
Perceive social support	57.35 ± 15.94	69.06 ± 12.90	57.26 ± 14.74	52.98 ± 16.59	28.386	<0.001
Family support	28.94 ± 5.61	23.10 ± 4.17	18.91 ± 5.27	17.40 ± 5.79	28.899	<0.001
Friends support	19.16 ± 5.33	22.84 ± 4.49	19.09 ± 4.94	17.86 ± 5.56	24.133	<0.001
Other Support	19.24 ± 5.58	23.11 ± 4.56	19.26 ± 5.15	17.72 ± 5.84	25.932	<0.001
Positive coping	21.06 ± 8.56	26.27 ± 8.92	21.25 ± 8.03	18.79 ± 8.32	20.941	<0.001
Negative coping	13.25 ± 5.58	9.86 ± 6.05	12.85 ± 4.87	15.14 ± 5.67	26.454	<0.001

**Table 5**  
Results of multivariate regressions predicting MWL.

Variables	Class 2					Class 3				
	$\beta$	SE	Wald $\chi^2$	P	OR (95%CI)	$\beta$	SE	Wald $\chi^2$	P	OR (95%CI)
Positive coping style	-0.005	0.028	0.031	0.861	0.995 (0.942–1.052)	-0.038	0.031	1.492	0.222	0.963 (0.906–1.023)
Negative coping style	0.083	0.035	5.589	0.018	1.087 (1.014–1.164)	0.136	0.039	11.898	0.001	1.146 (1.060–1.238)
Perceive social support	-0.06	0.014	18.627	<0.001	0.942 (0.916–0.968)	-0.075	0.015	24.598	<0.001	0.927 (0.900–0.955)
Years of experience										
≤5	0.352	0.496	0.505	0.477	1.422 (0.538–3.756)	0.589	0.557	1.119	0.290	1.802 (0.605–5.369)
6–10	-0.189	0.433	0.189	0.663	0.828 (0.354–1.936)	-0.130	0.504	0.067	0.796	0.878 (0.327–2.360)
Children										
No children	-0.306	0.665	0.212	0.645	0.736 (0.200–2.711)	-0.373	0.728	0.262	0.608	0.689 (0.165–2.871)
During pregnancy	0.205	0.924	0.049	0.824	1.228 (0.201–7.504)	-0.539	1.032	0.272	0.602	0.584 (0.077–4.415)
1	-0.79	0.601	1.726	0.189	0.454 (0.140–1.475)	-1.153	0.66	3.047	0.081	0.316 (0.087–1.152)
Monthly income (RMB)										
<6,000	1.982	0.495	16.014	<0.001	7.260 (2.750–19.169)	2.239	0.592	14.312	<0.001	9.380 (2.941–29.913)
6,001–8,000	1.619	0.486	11.084	0.001	5.047 (1.946–13.090)	1.693	0.595	8.085	0.004	5.435 (1.692–17.458)
8,001–10,000	1.594	0.501	10.117	0.001	4.924 (1.844–13.150)	1.799	0.607	8.768	0.003	6.042 (1.837–19.870)
Health										
Poor	-0.371	0.392	0.898	0.343	0.690 (0.320–1.487)	-1.624	0.428	14.380	<0.001	0.197 (0.085–0.456)
Moderate	0.096	0.462	0.043	0.836	1.101 (0.445–2.724)	-0.991	0.497	3.985	0.046	0.371 (0.140–0.982)
Participated in psychological training	0.442	0.328	1.814	0.178	1.555 (0.818–2.958)	-1.227	0.37	10.967	0.001	0.293 (0.142–0.606)
Have not experienced workplace violence	-1.356	0.338	16.126	<0.001	0.258 (0.133–0.500)	-1.252	0.373	11.256	0.001	0.286 (0.138–0.594)

Note: SE= standard error. OR= odds ratio.

the impact of MWL to nurses.

From the distribution of nurses in each latent profile, the MWL varied among nurses because of differences in occupational experience, work environment, and individual characteristics. The proportion of nurses with < 5 working years, no children, < 6,000 monthly income, poor health status, no psychological training in the past year, and suffering from workplace violence in class 3 (high MWL-low self-rated) was significantly higher than other subgroups.

Although different evaluation procedures were used, similar results have been reported in the literature that poor sociodemographic status could exacerbate MWL in nurses [8,29]. Regarding age and work experience, nurses' self-control ability at work is negatively correlated with age and working years, which can indirectly negatively affect MWL [39]. Therefore, those of younger age and those of lower seniority are more likely to show a higher MWL. Another possible reason is that such groups have a short entry time and insufficient work experience for junior employees to cope with heavy clinical tasks and examinations. Additionally, young nurses tend to have greater professional competition pressure and are more likely to lack the support of a nuclear family based on marriage [40,41]. Thus, nurses with multiple pressures that cannot be eliminated effectively exhibit a high MWL. Compared with those with children, nurses without children have a higher MWL.

Salary is another important factor affecting nurses' work experience, significantly predicting employee job satisfaction [42]. Inadequate income might cause a lack of subjective initiative for ability improvement that could aggravate the MWL.

Physical health status has been proven to be linked with MWL health conditions, including compassion fatigue, psychological distress, and so on, which was also reconfirmed by our study. As reported by Zhang et al. [43,44], gastroenteritis, lumbar back pain, and other chronic occupational diseases are prevalent among nurses. Poor health conditions have been shown to affect the presenteeism of clinical nurses, which has a negative impact on organisational behaviour and job performance, further increasing MWL [45]. We noted that the proportion of nurses who have been subjected to workplace violence within one year was up to 66.1% in the "high MWL-low self-rated" subgroup, similar to previous

studies demonstrating that workplace violence negatively affects nurses' career commitment, work well-being, and associated with high burnout [44,46]. A cross-sectional study of homecare workers conducted in the US reported that experiencing any form of workplace violence was connected to adverse health or work outcomes [47], while work-related stress would, in turn, increase the likelihood of being a victim of workplace violence [48]. Our findings further showed that exposure to any form of workplace violence increases the probability of being in a high MWL subgroup. Thus, drawing attention to psychological training courses to alleviate MWL to a certain extent is important and may be related to the ability of psychological training courses to cultivate and develop nurses' psychological capital [40]. The theory of job demands-resources model also pointed out that psychological capital is one of the positive psychological resources that can help alleviate the negative impact of job demands on exhaustion [49]. This result suggested that individuals should focus actively on their mental health and participate in psychological education activities regularly.

The results of the multiple logistic regression analysis showed that negative coping styles and perceived social support were also significantly associated with the MWL in nurses. Negative coping styles were accompanied by a higher MWL, which is consistent with findings in the frontline nurses during the COVID-19 pandemic [50]. Coping style refers to the individual's conscious, purposeful, and flexible adjustment behaviour to the changes in the natural environment. Individuals who adopt negative coping strategies tend to focus more on the negative aspects of events, negate the sense of achievement from work and self-worth, and increase MWL. Mohr et al. [51] also showed that groups with higher MWL were more inclined to yield and avoid when faced with work pressure. Thus, interventions such as stress management, mindfulness resilience, and activities such as experience sharing in groups and scenario simulation should be implemented to improve nurses' coping ability and negative coping styles [52,53].

Notably, nurses' less perceived social support corresponded with a higher MWL. Social support is beneficial for individuals to minimise negative effects and facilitate more positive emotional experiences [54]. Previous studies have confirmed that social support is closely related to work-related variables. Higher social

support is conducive to improving nurses' professional identity and job performance [55], while lower social support may result in adverse outcomes, such as burnout and compassion fatigue [56]. A previous study of Paraguayan workers also suggested that social support can identify and predict MWL in the workplace [57]. Therefore, hospital managers should pay attention to nurses with low social support and create a good social support atmosphere through interpersonal relationships and organisational support. Nurses should also keep close contact with their families and colleagues to relieve their MWL promptly in multiple ways.

## 5. Limitations

The present study has the following limitations. First, causality between variables could not be identified because of the nature of the cross-sectional study. Further, longitudinal studies are needed to explore the cause of the formation of MWL. Second, all data were obtained based on self-reported questionnaires, which may be subject to bias. Third, the recruitment method of voluntary participation may have introduced selection bias, with nurses experiencing psychological problems being more likely to choose to participate in our study, which may have resulted in over-reporting. Finally, the participants were all recruited from Sichuan, China; thus, the results cannot be generalised.

## 6. Conclusions

In this study, three subtypes of nurses' MWL, namely "low MWL-high self-rated", "moderate MWL", and "high MWL-low self-rated", were identified through LPA. Significant differences in the distribution of years of experience, children, monthly income, health status, psychological training in the past year, and workplace violence were observed among different subtypes of nurses. Regression analysis showed that monthly income, health status, psychological training, workplace violence, negative coping style, and perceived social support were the factors influencing nurses' MWL. Nursing managers should actively understand the individual characteristics of clinical nurses, identify the group with high MWL, and provide effective intervention measures in time to reduce their MWL.

## Funding

This study was supported by Sichuan Applied Psychology Research Center of Chengdu Medical College (Number: CSXL-23408) and the Humanities and Social Science Research Planning Fund of the Ministry of Education of the People's Republic of China (22YJA630087).

## Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

## Credit authorship contribution statement

**Man Jin:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing, Project administration. **Rong Qian:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - review & editing, Supervision, Project administration. **Jialin Wang:** Conceptualization, Methodology, Validation, Formal analysis, Resources, Data curation, Writing - review & editing, Project administration. **Juan**

**Long:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing - review & editing. **Zhongqing Yuan:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing - review & editing. **Li Zeng:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing, Supervision, Project administration. **Dan Liao:** Conceptualization, Methodology, Validation, Formal analysis, Funding acquisition, Writing - review & editing. **Xu Liu:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing, Investigation. **Sikai Tang:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing. **Shuangying Huang:** Conceptualization, Methodology, Validation, Formal analysis, Writing - review & editing.

## Declaration of competing interest

All authors disclosed no relevant interest relationships.

## Acknowledgments

We would like to express our gratitude to all collaborating participants.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2024.04.002>.

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