





Research Article

Associations between Nonrestorative Sleep, Perceived Stress, Resilience, and Emotional Distress in Freshmen Students: A Latent Profile Analysis and Moderated Mediation Model

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Objective. This study aims to explore the mediation role of perceived stress between nonrestorative sleep (NRS) and emotional distress, as well as the moderation role of resilience among NRS, perceived stress, and emotional distress in university students. **Method.** We recruited 851 students from the Be Resilient to Nursing Career program (BRNC, registration number: NFKDX002) in June 2022. Nonrestorative sleep scale (NRSS), 10-item perceived stress scale (PSS-10), 10-item Kessler psychological distress scale (K10), and 10-item Connor–Davidson resilience scale (CD-RISC-10) were administered through a paper questionnaire. Latent profile analysis and moderated mediation analysis were performed. **Results.** Three profiles of perceived stress were identified: high ability-low stress (24.5%), middle ability-high stress (65.0%), and low ability-middle stress (10.5%). The mediation role of perceived stress between NRS and emotional distress was significant (SE = 0.025; 95% confidence interval = -0.369, -0.269). The moderation role of resilience among NRS, perceived stress, and emotional distress was not significant. **Conclusion.** Heterogeneity exists in freshmen students' perceived stress. Perceived stress plays a significant mediating role between NRS and emotional distress, while resilience cannot significantly moderate the associations among NRS, perceived stress, and emotional distress. The trial is registered with ChiCTR2000038693.

1. Introduction

Research has shown that approximately 30% of college students suffer from symptoms of insomnia [1]. Since the outbreak of the COVID-19 pandemic, sleep problems such as insomnia, insufficient sleep, and unrefreshing sleep have increased among college students [2]. In recent years, nonrestorative sleep (NRS) has attracted increasing attention of researchers from multiple disciplines. NRS is a core symptom of insomnia [3] and is characterized by waking up unrefreshed and restless following a normal sleep duration [4]. Studies have found that individuals with NRS are more likely to develop depression [5] and other psychological disorders [6] compared to those without NRS. Therefore, it is crucial to explore the association between emotional distress

and NRS, considering that anxiety and depression appear to worsen with NRS deterioration and may cause further harm to both physical and psychological health.

Emotional distress has been prevalent among college students during the COVID-19 pandemic [7], and 54.4% and 28.4% of college freshmen reportedly suffer from anxiety and depression, respectively [8, 9]. Negative emotions have aggravated due to specificity during pandemic of COVID-19. Freshmen students even response extremely nervous to anything written about COVID-19 [10]. Additionally, third year students are reported to have higher levels of life satisfaction, which is influenced by year level [11]. In other words, anxiety and depression may spread more among freshmen students. High academic pressure and maladaptation since the beginning of colleges are risk factors for

emotional distress which can cause serious daily impairment [12]. Additionally, NRS is a strong indicator of depression [13, 14]. A large body of research confirms that the relationship between insomnia symptoms and emotional distress is bidirectional and complex [15, 16]. Clinical studies have shown that emotional distress is easier to detect in those with insomnia symptoms [17]. However, little is known about the association between NRS and emotional distress in freshmen students.

Perceived stress is the subjective evaluation of exterior or interior stress [18], which can affect an individual's emotional state by adjusting cognitive function [19]. Previous studies have confirmed that perceived stress has a significant effect on emotional distress [20]. According to a transactional model of stress [21], perceived stress among students is affected by personal resources such as joy and self-efficacy, transforming perceived stress into tension and worries, which eventually cause emotional distress. In other words, higher perceived stress is positively related to higher emotional distress. Academic stress and excessive homework have disrupted the sleep patterns of freshmen worldwide: they go to bed late and get up early, which raises the risk of sleep deficiency [22]. A study found that lower sleep quality was related to higher perceived stress [23]. Additionally, the degree of perceived stress varies across gender and living conditions [24]. However, the role of perceived stress between NRS and emotional distress in freshmen students remains unknown.

The effect of NRS on emotional distress is still unclear, and resilience may play a moderating role in this association. According to resilience theory [18], the higher the dynamic adaptability in the face of stress or adversity [25], the better the mental state after resilience restructuring [26, 27]. Low resilience has been associated with increased perceived stress [28] and insomnia symptoms [16, 29]. Furthermore, previous study manifested a strong link between resilience and anxiety symptoms, and the lower the levels of resilience are, the more negative emotions they experienced [30]. Thus, it is reasonable to postulate that resilience may play an important role in the associations between NRS, perceived stress, and emotional distress.

Existing literature shows that NRS, perceived stress, and resilience have a significant influence on emotional distress. However, the mechanisms of their interactions are to be elucidated; therefore, this study aims to explore further the mediating role of perceived stress and the moderating role of resilience in the associations between NRS and emotional distress.

To this end, we put forward the following hypotheses (Figure 1(a)):

- (1) NRS is significantly associated with perceived stress, emotional distress, and resilience among college freshmen.
- (2) Several distinct perceived stress patterns can be identified by latent profile analysis (LPA).
- (3) Perceived stress may play a significant mediating role between NRS and emotional distress.

- (4) Resilience may play a significant moderating role among NRS, perceived stress, and emotional distress.

2. Method

2.1. Design and Participants. The study had a cross-sectional design and included 851 freshmen recruited using simple random sampling from two universities in June 2022. The inclusion criteria were as follows: (1) newly enrolled freshmen students in 2021; (2) willing to participate in this study; and (3) could communicate fluently in Chinese. The exclusion criterion included college freshmen with mental illness. The participants filled out paper questionnaires which took 15–20 minutes and were collected and sorted by the investigator. After excluding 33 questionnaires with missing data, a final sample of 818 freshmen (response rate: 96%) was analyzed. All participants provided informed consent before filling in the questionnaire. Trained research assistants were available to address participants' instrument-related problems.

2.2. Sample Size. The minimum sample size was 274, considering a confidence interval of 95%, a standard deviation of 15, an allowable error of 2.0, and a 20% sample attrition rate [31]. Thus, the final sample of 818 was appropriate for analysis.

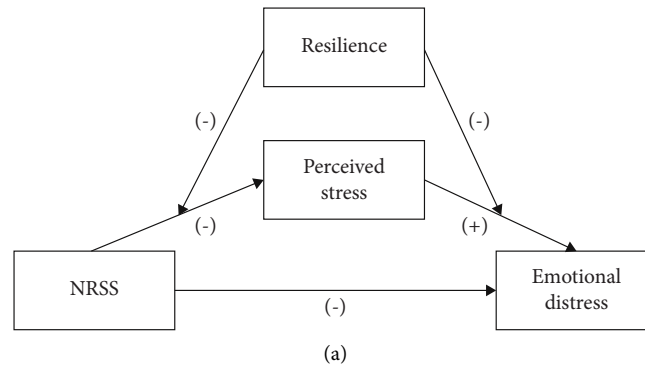
2.3. Ethical Approval. This study is part of the Be Resilient to Nursing Career program (BRNC, registration number: NFYKDX002). More details about BRNC are available from previous studies [32–37]. Informed consent was obtained from the participants before filling in the questionnaire. The personal information of the respondents was kept strictly confidential.

3. Instruments

3.1. Demographic Characteristics. Demographic characteristics including age, gender, place of birth, whether an only child, whether parents live separately, and parental marital status were collected based on previous studies [38, 39].

3.2. Nonrestorative Sleep Scale (NRSS). NRSS was developed by Wilkinson and Shapiro [40], and its Chinese version was validated by Li et al. ([41]; RMSEA = 0.06, SRMR = 0.06, and CFI = 0.97). The scale consists of 12 items and four domains: refreshment from sleep, somatic/medical symptoms, daytime dysfunction, and psychological symptoms. The score of the items ranges from 12 to 60, with a higher score indicating less NRS. Cronbach's alpha in this study was 0.836.

3.3. 10-Item Connor–Davidson Resilience Scale (CD-RISC-10). A 10-item short version of the CD-RISC-10 was developed by Campbell-Sills and Stein [42] based on the Connor–Davidson resilience scale [43]. The Chinese version of the scale has been validated (TLI = 0.914, CFI = 0.981,



Variables	M±SD	Overall sample (N=818)	P value
Gender			< 0.001
Male	19.04±6.871	226 (27.6%)	
Female	21.17±7.478	592 (72.4%)	
Place of birth			0.384
City	20.80±7.324	405 (49.5%)	
Countryside	20.36±7.423	413 (50.5%)	
Whether the only child?			0.226
Yes	20.02±6.873	195 (23.8%)	
No	20.75±7.520	623 (76.2%)	
Whether parents live separately?			0.009
Yes	21.75±7.747	203 (24.8%)	
No	20.19±7.21	615 (75.2%)	
Parental marital status			0.167
Married	20.48±7.321	756 (92.4%)	
Divorced	21.82±7.373	62 (7.6%)	

(b)

FIGURE 1: Conceptual model and demographic description of freshmen students. (a) The conceptual model. (b) Demographic and relevant variable differences in scores of emotional distress.

GFI = 0.962, NFI = 0.926, IFI = 0.979, RFI = 0.889, RMR = 0.042, and RMSEA = 0.041 [44]. The scale consists of 10 items, and the score ranges from 0 to 40, with a higher score indicating a higher level of resilience. The scale has been used extensively among college students with outstanding reliability and validity [34]. Cronbach’s alpha in this study was 0.920.

3.4. 10-Item Perceived Stress Scale (PSS-10). PSS-10 is the most widely used tool for measuring stress, which was developed by Cohen and colleagues [45], and its Chinese version was validated by Zhen et al. [46] (GFI = 0.925, NFI = 0.914, CFI = 0.965, RMR = 0.026, and RMSEA = 0.043). The scale has 10 items divided into two domains: negative feelings (items 1, 2, 3, 6, 9, and 10) and positive feelings (items 4, 5, 7, and 8) [46]. The score ranges from 0 to 40, with a higher score indicating higher perceived stress. Cronbach’s alpha in this study was 0.815.

3.5. 10-Item Kessler Psychological Distress Scale (K10). K10 was developed by Kessler and colleagues [47] for assessing nonspecific psychological distress [48], and Zhou

et al. [49] validated its Chinese version (RMSEA = 0.094, GFI = 0.946, AGFI = 0.897, and AIC = 185.79). The scale consists of 10 items, and the score ranges from 10 to 50, with a higher score indicating a higher level of emotional distress. Cronbach’s alpha in this study was 0.936.

3.6. Data Analysis. Descriptive statistics were described as mean (SD) and proportion (%). Data distribution was checked before logistic regression, and univariate analysis was employed to explore the potential factors influencing emotional distress. Pearson’s analysis assessed the associations among NRS, resilience, perceived stress, and emotional distress. The strength of the relationship was divided as follows: weak ($|r| < 0.3$); moderate ($0.3 \leq |r| < 0.5$); and strong ($|r| \geq 0.5$) [50, 51]. LPA was conducted to explore potential profiles of perceived stress. We estimated models based on log-likelihood H0 value (Log), Akaike information criterion (AIC), Bayesian information criterion (BIC), sample-size adjusted Bayesian information criterion (aBIC), bootstrapped likelihood ratio test (BLRT), and entropy [52]. In addition, theory-based reasons for LPA-related profiles were also taken into consideration [52]. Univariate and multivariate logistic regressions were applied to identify

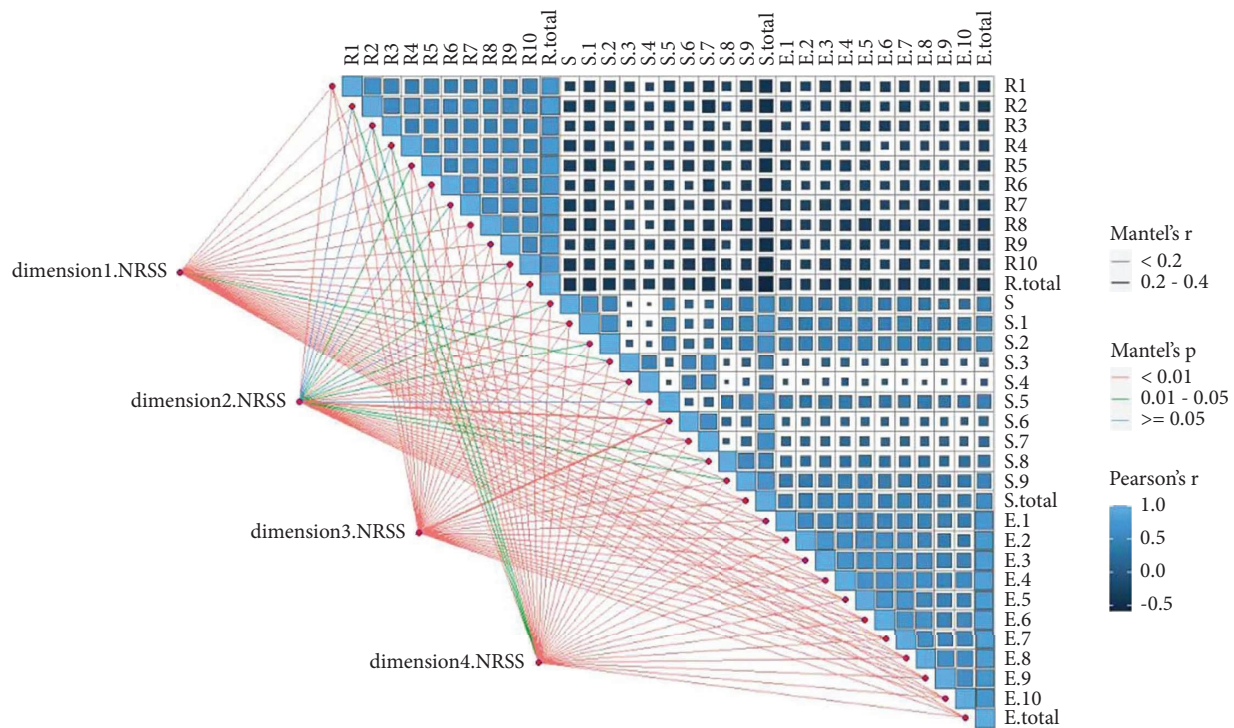


FIGURE 2: Pearson correlation heatmap among NRSS, perceived stress, resilience, and emotional distress. R = resilience, S = perceived stress, E = emotional distress, and NRSS = nonrestorative sleep scores.

potential indicators for different LPA-based profiles. Bayesian independent samples *t*-test was performed to compare emotional distress among freshmen based on LPA profiles (alternative hypothesis H1: differences exist between groups; null hypothesis H0: no differences between groups). Harman's one-factor model was constructed to estimate the potential existence of the common method bias [53]. A mediation analysis was performed to examine the mediating role of perceived stress between NRS and emotional distress. A moderation analysis based on LPA was conducted to investigate the moderating role of resilience among NRS, perceived stress, and emotional distress. SPSS (version 26.0), JASP (version 0.16.1), Mplus (version 8.3), and R (version X64 4.1.1) were used for statistical analyses.

4. Results

4.1. Demographic Characteristics. In total, 27.6% of freshmen students were male and 49.5% came from cities. Significant differences were identified between emotional distress based on gender ($P < 0.001$) and whether parents live separately ($P < 0.05$). Detailed information is provided in Figures 1(a) and 1(b).

4.2. Correlation among NRS, Perceived Stress, Resilience, and Emotional Distress. There were significant correlations between emotional distress, NRS, perceived stress, and resilience. Pearson's analysis showed that NRS was positively associated with perceived stress ($r = 0.608$, $P < 0.01$) and emotional distress ($r = 0.422$, $P < 0.01$). Perceived stress was positively related to emotional distress ($r = 0.614$, $P < 0.01$).

Pearson correlation heatmap and other details are demonstrated in Figure 2.

4.3. LPA of Perceived Stress. LPA models with 1 to 5 classes were analyzed to find the optimal model of perceived stress (see Figure 3(a)). A 3-class model was chosen in consideration of the following reasons: (1) sample size was more than 10%; (2) fitting index including AIC, BIC, and aBIC was relatively small; (3) Lo-Mendell-Rubin likelihood ratio test (LMR) and BLTR were significant ($P < 0.05$); and (4) variability existed between different profiles. Details about LPA-based profiles are presented in Figure 3(b). The three profiles were named as low ability-middle stress (10.5%, class 3), middle ability-high stress (65%, class 2), and high ability-low stress (24.5%, class 1). Significant differences were identified in emotional distress among LPA-based subgroups. Univariate logistic regression indicated that only gender was a significant indicator to profile types. Other details are described in Figure 3(c). The results of the Bayes factor robustness check analysis and sequential analysis are described in Figures 4(A-C).

4.4. Mediation Role of Perceived Stress Based on LPA (Perceived Stress as Category Variable). Harman's one-factor model indicated that the first factor accounted for 31.2% of total variances and the common method bias could be ignored in this study. All potential confounding variables were controlled in advance. Taking high ability-low stress (class 1) as the reference, middle ability-high stress (class 2) and low ability-middle stress (class 3) subgroups were

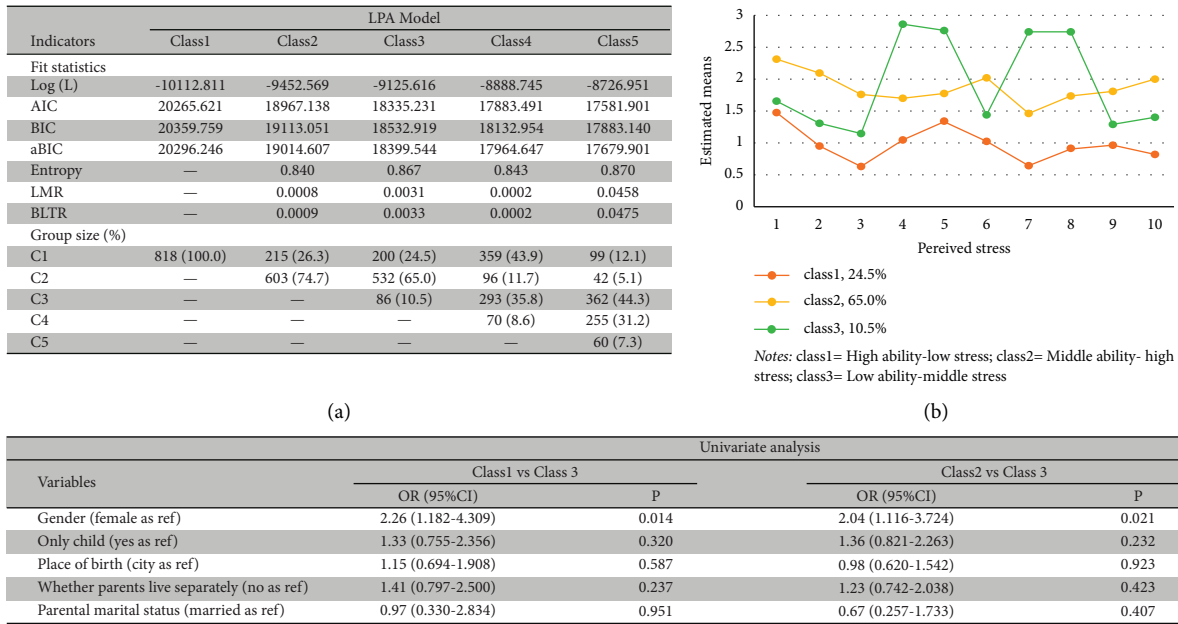


FIGURE 3: Fitting index and group size of latent profile analysis models and logistic regression for predicting external feature on the 3-class pattern. (a) Fitting index and group size of latent profile analysis models. (b) Parameters for the final 3 classes. (c) Univariate analysis logistic regression results based on LPA.

compared in the meditation analysis. The 95% confidence interval of model 1 (class 2 vs. class 1) and model 2 (class 3 vs. class 1) was (-1.64, -0.979) and (-1.03, -0.051), respectively; all of the above 95% confidence intervals did not contain zero, indicating that the relationship between NRS and emotional distress was significantly mediated by perceived stress. Other details are described in Figure 5(e).

4.5. Mediation Role of Perceived Stress in Different LPA-Based Subgroups (Perceived Stress as a Continuous Variable). For the whole sample, 95% bootstrap confidence intervals of indirect effect (-0.369, -0.269), direct effect (-0.253, -0.094), and total effect (-0.559, -0.417) demonstrated that perceived stress significantly mediated the relationship between NRS and emotional distress with a mediating effect of 65.16%. Similar results were identified in class 1 (95% total effect: -0.449, -0.257) and class 2 (95% total effect: -0.542, -0.332) but not in class 3 (95% total effect: -0.153, 0.240). Detailed information is described in Figures 5(a)-5(d).

4.6. Moderating Role of Resilience Based on LPA. All potential confounding variables were controlled in advance. The moderating role of resilience between NRS and perceived stress, NRS and emotional distress, and perceived stress and emotional distress was not significant. Other details are described in Figures 6(A-C).

5. Discussion

In the current study, there existed heterogeneity in freshmen students' perceived stress. Perceived stress played

a significant mediating role between NRS and emotional distress, while resilience could not significantly moderate the associations among NRS, perceived stress, and emotional distress. Although NRS has often been included in insomnia research, NRS does not necessarily mean insomnia [3]. Additionally, NRS has been relatively less explored in emotional distress-related studies based on a student sample [6, 54, 55]. The current study provides some insights for early identification and intervention.

First, in the current study, females had more anxiety and depression symptoms than males, which was consistent with previous research [56, 57] and could be attributed to the gender-based differences in sensitivity and self-cognition [58]. In addition, parental conflict resulting in separation is believed to put psychological burden on children, which was also confirmed in the current study [59].

Second, consistent with our first hypothesis, NRS was positively associated with emotional distress, which was also confirmed in a previous study [60]. In a two-year longitudinal study, NRS was found to have the ability to predict long-term depression [61]. Robust evidence has indicated that NRS causes disturbance in the circadian rhythm of cortisol levels, which can change the 24-hour sleep-wake cycle [62], and is related to the etiology of emotional distress [63], suggesting that interventions for emotional distress should focus on NRS. Psychotherapy can improve NRS [64]. Additionally, universities should organize orientations to help students adjust to the transition from high school to college.

Third, congruent with our second hypothesis, heterogeneity of perceived stress was verified in freshmen students and LPA recognized three profiles: high ability-low stress,

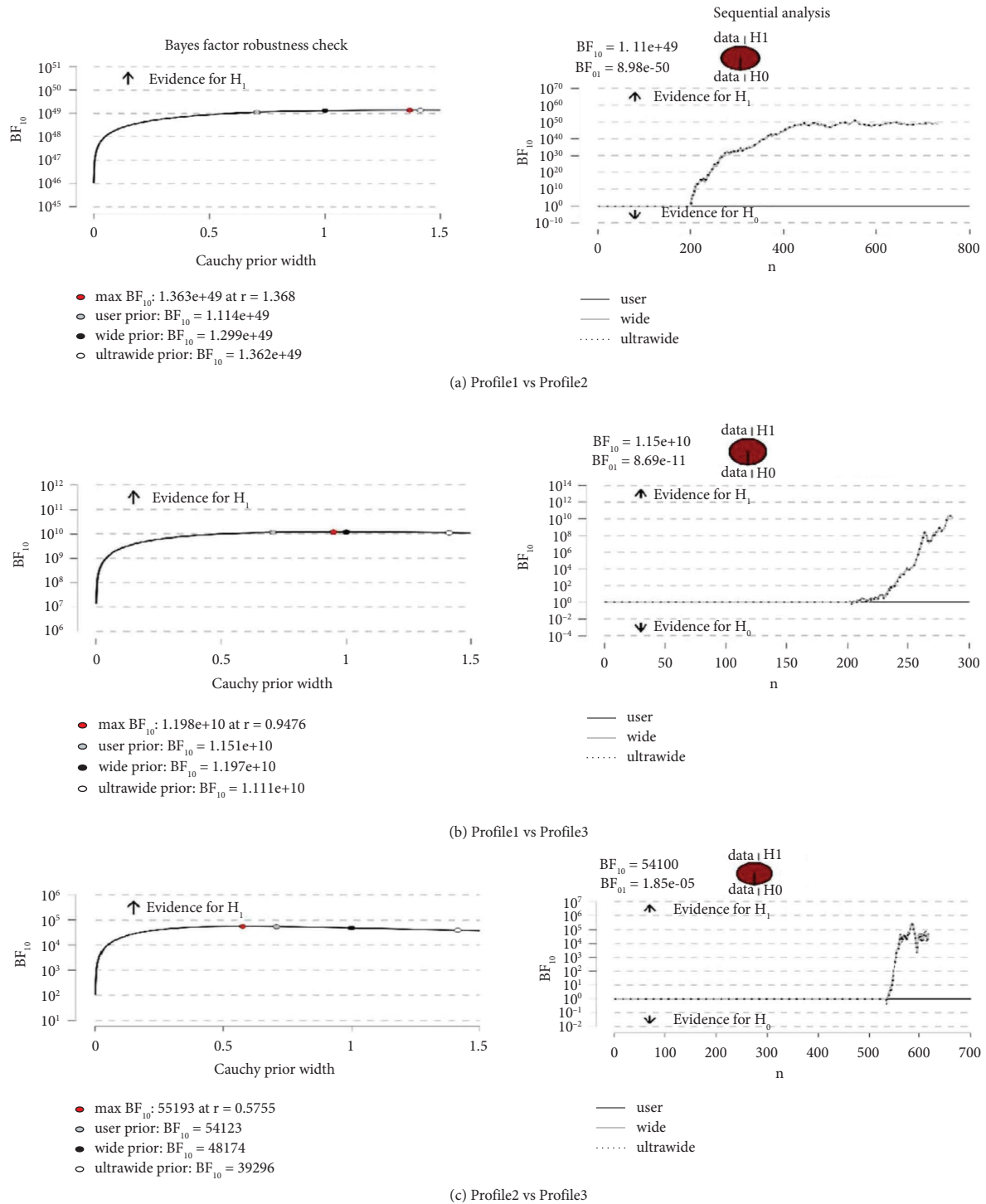


FIGURE 4: A comparison of differences in emotional distress under LPA-based profiles.

middle ability-high stress, and low ability-middle stress. According to the transactional model of stress and coping, primary and secondary appraisals occur after exposure to stress, and this cognitive process is moderated by perceived stress [65]. High perceived stress can lead to anxiety-depression-oriented cognition and behavioral outcomes [66]. Thus, more attention should be given to the middle ability-high stress group. In addition, females were more likely to be

classified into high perceived stress subgroups. As their social status and family role are complex relative to males, females seek more external support and are considered more emotional and sentimental [67, 68], with different stressors contributing to higher perceived stress which is consistent with previous research [69, 70]. From a physiological perspective, the gender-based difference in perceived stress might be attributed to the stronger high-sensitivity C-

Regression		Fitting index			Significance		
Outcome variables	Predictor variables	R	R ²	F	SE	t	P
Emotional distress		0.635	0.403	137.126			
	Gender				0.449	2.497	0.013
	separation				0.463	2.157	0.031
	NRSS				0.026	-4.759	0.000
	Perceived stress				0.049	14.804	0.000
Perceived stress		0.61	0.372	160.448			
	Gender				0.320	1.507	0.132
	Separation				0.331	0.113	0.91
	NRSS				0.020	-21.643	0.000
Emotional distress		0.492	0.242	86.581			
	Gender				0.505	2.915	0.004
	separation				0.522	1.967	0.049
	NRSS				0.032	-15.277	0.000
		<i>Estimate</i>	<i>SE</i>	<i>LLCI</i>	<i>ULCI</i>	<i>Proportion (%)</i>	
Indirect effect		-0.318	0.025	-0.369	-0.269	65.16	
Direct effect		-0.169	0.04	-0.253	-0.094	34.63	
Total effect		-0.488	0.036	-0.559	-0.417	100.00	

(a)

Regression		Fitting index			Significance		
Outcome variables	Predictor variables	R	R ²	F	SE	t	P
Emotional distress		0.558	0.311	22.001			
	Gender				0.564	2.462	0.015
	separation				0.616	-0.470	0.639
	NRSS				0.051	-5.612	0.000
	Perceived stress				0.082	3.511	0.001
Perceived stress		0.434	0.189	15.195			
	Gender				0.493	0.849	0.397
	Separation				0.540	-0.254	0.800
	NRSS				0.041	-6.525	0.00
Emotional distress		0.517	0.267	23.847			
	Gender				0.579	2.606	0.849
	separation				0.634	-0.519	-0.254
	NRSS				0.048	-7.611	0.000
		<i>Estimate</i>	<i>SE</i>	<i>LLCI</i>	<i>ULCI</i>	<i>Proportion (%)</i>	
Indirect effect		-0.076	0.022	-0.122	-0.034	20.99	
Direct effect		-0.286	0.057	-0.396	-0.166	79.01	
Total effect		-0.362	0.049	-0.449	-0.257	100.00	

(b)

Regression		Fitting index			Significance		
Outcome variables	Predictor variables	R	R ²	F	SE	t	P
Emotional distress		0.570	0.325	63.436			
	Gender				0.562	2.441	0.015
	Separation				0.585	2.980	0.003
	NRSS				0.044	-5.567	0.000
	Perceived stress				0.087	10.285	0.000
Perceived stress		0.424	0.180	38.592			
	Gender				0.282	1.562	0.119
	Separation				0.294	0.170	0.865
	NRSS				0.020	-10.504	0.000
Emotional distress		0.435	0.190	41.153			
	Gender				0.614	2.873	0.004
	separation				0.641	2.792	0.005
	NRSS				0.044	-9.886	0.000
		<i>Estimate</i>	<i>SE</i>	<i>LLCI</i>	<i>ULCI</i>	<i>Proportion (%)</i>	
Indirect effect		-0.189	0.028	-0.249	-0.139	43.35	
Direct effect		-0.247	0.053	-0.352	-0.146	56.65	
Total effect		-0.436	0.054	-0.542	-0.332	100.00	

(c)

Regression		Fitting index			Significance		
Outcome variables	Predictor variables	R	R ²	F	SE	t	P
Emotional distress		0.382	0.146	3.461			
	Gender				1.581	0.364	0.717
	separation				1.28	-0.937	0.352
	NRSS				0.107	1.601	0.113
	Perceived stress				0.197	3.522	0.001
Perceived stress		0.371	0.138	4.368			
	Gender				0.879	1.249	0.215
	Separation				0.717	0.413	0.681
	NRSS				0.056	-3.44	0.001
Emotional distress		0.123	0.015	0.421			
	Gender				1.671	0.799	0.427
	separation				1.364	-0.728	0.468
	NRSS				0.107	0.351	0.726
		<i>Estimate</i>	<i>SE</i>	<i>LLCI</i>	<i>ULCI</i>	<i>Proportion (%)</i>	
Indirect effect		-0.134	0.059	-0.269	-0.041	43.79	
Direct effect		0.172	0.104	-0.007	0.398	56.21	
Total effect		0.038	0.100	-0.153	0.240	100.00	

(d)

	Variables	<i>Estimate</i>	<i>SE</i>	<i>t</i>	<i>P</i>	<i>LLCI</i>	<i>ULCI</i>	<i>R</i> ²
Indirect effect	Middle ability-High stress	-1.273	0.168	-7.579	< 0.001	-1.619	-0.959	-
	Low ability-Middle stress	-0.544	0.251	-2.182	0.015	-1.055	-0.069	-
Direct effect	Middle ability-High stress	-0.435	0.035	-12.299	< 0.001	-0.505	-0.366	0.398
	Low ability-Middle stress	-0.248	0.048	-5.199	< 0.001	-0.342	-0.154	0.240

(e)

FIGURE 5: The mediating effect of perceived stress between NRSS and emotional distress. (a) The mediating effect of perceived stress on emotional distress (continuous variable: total). (b) The mediating effect of perceived stress on emotional distress (continuous variable: profile 1). (c) The mediating effect of perceived stress on emotional distress (continuous variable: profile 2). (d) The mediating effect of perceived stress on emotional distress (continuous variable: profile 3). (e) The mediating effect of perceived stress on emotional distress (category variable).

reactive protein (CRP) regulation in males than in females [71]. Gender differences call for parallel but distinct developmental schemes for female and male students [72]. Hence, teachers need to transform their communication and teaching styles to suit the needs of male and female students. For females under stress, psychological counseling or activities can promote socialization and release of stress.

Fourth, consistent with our third hypothesis, the mediating role of perceived stress (as both a continuous variable and category variable) was confirmed between NRS and emotional distress. Thus, the new pathway of NRS-perceived stress-emotional distress was established in the current study, which had been less explored in previous research. This pathway shows that individuals with different perceived stress profiles will respond differently to the same level of

NRS, resulting in varied levels of anxiety or depression [73]. Relevant research has attributed this finding to the corticotropin-releasing hormone (CRH). High perceived stress will stimulate chronic hyperactivity of the stress system and release CRH antagonists, causing human pathologic states, such as depression and chronic anxiety [74]. The mediation role of perceived stress also provides insights for developing interventions for NRS-induced anxiety and depression.

Fifth, contrary to our fourth hypothesis, resilience did not significantly moderate NRS, perceived stress, and emotional distress. This phenomenon might be attributed to the inclusion of LPA-based category variables in the moderation analysis, which was less explored in previous research. Additionally, the current moderating effect was

Profile1 vs profile 2

Variables	Estimate	SE	P	Exp (B)	LLCI	ULCI
Gender	-0.110	0.246	0.656	0.896	0.553	1.452
Live separately	0.120	0.265	0.650	1.128	0.670	1.897
NRSS	-1.134	0.167	0.000	0.322	0.232	0.446
Resilience	-1.284	0.146	0.000	0.277	0.208	0.369
NRSS × resilience	-0.294	0.184	0.110	0.745	0.519	1.069

Profile1 vs profile 3

Variables	Estimate	SE	P	Exp (B)	LLCI	ULCI
Gender	0.412	0.481	0.392	1.509	0.588	3.875
Live separately	0.617	0.437	0.158	1.853	0.787	4.362
NRSS	-2.296	0.296	0.000	0.101	0.056	0.180
Resilience	-0.797	0.274	0.004	0.451	0.263	0.772
NRSS × resilience	-0.150	0.347	0.665	0.86	0.436	1.699

(a) Model 1 NRSS to Perceived stress

Variables	Estimate	SE	t	P	LLCI	ULCI
Outcome variables: emotional distress						
Constant	6.989	1.133	6.17	0.000	4.765	9.213
Gender	2.122	0.504	4.208	0.000	1.132	3.112
Live separately	1.711	0.533	3.208	0.001	0.664	2.758
Middle ability-high stress	6.865	0.706	9.723	0.000	5.479	8.252
Resilience	-1.546	1.118	-1.382	0.167	-3.741	0.650
Middle ability-high stress × Resilience	-0.003	0.623	-0.004	0.997	-1.225	1.220
Increase of R ² with interaction	F		R ²		P	
	71.251		0.329		0.000	

Variables	Estimate	SE	t	P	LLCI	ULCI
Outcome variables: emotional distress						
Constant	12.260	0.705	17.395	0.000	10.872	13.647
Gender	1.625	0.609	0.008	0.008	0.472	2.824
Live separately	-0.346	0.616	0.575	0.575	-1.559	0.867
Middle ability-high stress	1.405	0.328	4.286	0.000	0.760	2.051
Resilience	-1.096	-0.210	0.067	0.067	-2.268	0.076
Middle ability-high stress × Resilience	-0.317	-0.210	0.289	0.289	-0.905	0.270
Increase of R ² with interaction	F		R ²		P	
	21.952		0.282		0.000	

(b) Model 2 Perceived stress to Emotional distress

Variables	Estimate	SE	t	P	LLCI	ULCI
Outcome variables: emotional distress						
Constant	19.123	0.443	43.176	0.000	18.254	19.993
Gender	1.770	0.492	3.600	0.000	0.805	2.735
Live separately	1.335	0.520	2.568	0.010	0.314	2.356
NRSS	-3.353	0.251	-13.345	0.000	-3.847	-2.860
Resilience	-1.696	0.251	-6.748	0.000	-2.190	-1.203
NRSS × Resilience	0.132	0.205	0.643	0.521	-0.271	0.535
Increase of R ² with interaction	F		R ²		P	
	84.460		0.368		0.000	

Variables	Estimate	SE	t	P	LLCI	ULCI
Outcome variables: emotional distress						
Constant	14.578	0.543	26.847	0.000	13.51	15.647
Gender	1.472	0.596	2.468	0.014	0.298	2.645
Live separately	-0.267	0.601	-0.445	0.657	-1.449	0.915
NRSS	-1.756	0.289	-6.082	0.000	-2.325	-1.188
Resilience	-1.464	0.288	-5.091	0.000	-2.030	-0.898
NRSS × Resilience	0.328	0.270	1.216	0.225	-0.203	0.859
Increase of R ² with interaction	F		R ²		P	
	25.685		0.314		0.000	

(c) Model 3 NRSS to Emotional distress

FIGURE 6: The moderating effect of resilience among NRSS, perceived stress, and emotional distress.

based on LPA, and the sample distribution of each subgroup was uneven, resulting in biased results. Too few samples under the profiles may also lead to an insignificant moderation effect. Also, the excessive influence of other factors on the dependent variable may affect the moderating effect. In the current study, heterogeneity of perceived stress resulted in three distinct profiles, and the results could be theoretically explained by the difference among different subgroups. In addition, the gender variable in this study was not balanced, resulting in potential selection bias. These findings should be replicated in males and females separately with a large sample.

In summary, this study demonstrated a better understanding of associations among NRS, perceived stress, emotional distress, and resilience based on the sample of Chinese college freshmen students. The findings showed that (1) there was heterogeneity in college freshmen's perceived stress; (2) the association between NRS and emotional distress was significantly mediated by perceived stress; and (3) resilience did not play a significant moderating role among NRS, perceived stress, and emotional distress.

6. Limitations

Some limitations of the current study should be considered. First, considering the cross-sectional design, the findings derived from the present study should be further validated in intervention studies. In future research, we will provide insights into the mechanisms influencing emotional distress in Be Resilient to Nursing Career program (BRNC) and, at the same time, expand the scope of our study population to facilitate generalization of the findings. Second, the sample is recruited from two universities in Guangzhou, resulting in

potential selection bias, and these findings might not be generalized to individuals with different races or cultural backgrounds. Thus, the results should be explained with caution. Third, the gender variable is not balanced in the current study, and these findings are recommended to be replicated in males and females separately, which could not be achieved here due to the small sample size of males. The current study found significant differences in emotional distress by gender. Therefore, gender-specific psychological intervention strategies can be recommended for college counseling units. To avoid the interaction of negative emotions among individuals, a group mindfulness dialogue format can be recommended to regulate individual emotional states.

7. Conclusion

Heterogeneity exists in perceived stress among freshmen students. Perceived stress plays a significant mediating role between NRS and emotional distress while resilience cannot significantly moderate the associations among NRS, perceived stress, and emotional distress.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

This study was approved by the Ethics Review Committee of the participating universities (No: ZYYEC-ERK[2020]132),

which was registered online prior to recruitment at <https://www.chictr.org.cn/index.aspx> (ChiCTR2000038693).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Shuhan Li was responsible for conceptualization, data curation, methodology, software, and original draft preparation. Yuan Liao was responsible for investigation, resources, and validation. Xiaona Wu, Xiaoxiao Mei, and Yihao Zeng were responsible for investigation and resources. Jiahua Wu and Zengjie Ye were responsible for supervision and review and editing. All authors contributed to the article and approved the submitted version.

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