BMC Medical Education

RESEARCH Open Access

Predictive factors of stress response of nursing student repeaters under the background of abolishing the final supplementary examination in China

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Abstract

Background Academic pressure and frustration stimulation are significant stressors in college students, and response to the prolonged stimuli would cause adverse mental and physical outcomes. However, more is needed to know about the stress response and its predictors among undergraduate nursing students retaking failed course under the background of the abolition of the Final Supplementary Examination in China. This study aimed to investigate the stress response and its predictive factors of nursing student repeaters who are retaking at least one failed course.

Methods A cross-sectional study was conducted, utilizing convenience sampling to recruit 120 nursing student repeaters from four 4-year undergraduate medical universities in China between September 2020 and May 2021. Data collection instruments included a general information questionnaire, a stress response questionnaire, the Connor-Davidson resilience scale, a self-control scale, and a academic self-efficacy questionnaire. The data were analyzed using descriptive statistics, Pearson correlation coefficients, t-tests, analysis of variance (ANOVA), and multiple linear regression.

Results The average scores of the total stress response, emotional response, physical response, and behavioral response were 58.07 ± 26.72, 86.97 ± 17.12, 57.69 ± 9.75, 67.16 ± 9.22, respectively. Stress response was predicted by psychological resilience, self-control ability, academic self-efficacy and the number of retaking courses.

Conclusions The stress response among nursing student repeaters is relatively active. Higher psychological resilience, self-control ability, and academic self-efficacy predict lower levels of stress response. In order to help nursing students with failing and repeating course release their psychological stress and maintain well-being, nursing

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educators could adopt self-control promotion strategies and emphasize the cultivation of psychological resilience and academic self-efficacy as parts of health promotion programs for this particular student group.

Keywords Academic failure, Nursing student, Retake course, Stress, Survey

Background

The stress response is an adaptive defensive reaction exhibited by individuals in response to internal or external threats to homeostasis [1]. This process is highly individualized, involving subjective perception and assessment of stressors, and is influenced by factors such as age, gender, intelligence, and various characteristics of traits [1]. The stress response encompasses emotional, physiological, and behavioral changes; consequently, individuals may display different responses to stress even when faced with the same stimuli [1–3]. Moreover, the stress response can be maladaptive and detrimental to physiology, resulting in depression, anxiety, cognitive impairment, life-threatening effects, and even death when individuals are exposed to intense, repetitive, or prolonged stimuli, even if they possess mature and integrated personalities [1, 4].

Academic pressure and frustration are significant stressors for college students [5, 6]. Studies showed that nursing students suffered from high academic pressure and demonstrate low professional identity and high academic burnout [7–10]. The Final Supplementary Examination in China serves as a make-up examination, providing a last opportunity for college student repeaters who have failed the test after retaking the course prior to graduation [11, 12]. In October 2019, the Ministry of Education of China abolished the Final Supplementary Examination policy [13]. The change means that college student repeaters who do not pass the retake examination will no longer have the opportunity to take the make-up examination to earn the credits necessary for graduation. Logistically, nursing students who are retaking courses may lack confidence in their ability to pass the retake examination, leading to excessive worry about failing to graduate successfully which can result in severe stress [14]. Furthermore, nursing students with high stress would in turn affect their academic performance, leading to lower grade point averages and poor academic outcomes [15, 16].

Abolishing the Final Supplementary Examination is anticipated to effectively enhance the quality of teaching and learning at universities. Research indicated that college students exhibited a more positive attitude toward learning following the elimination of this examination system, particularly among juniors and seniors [17]. However, this change also increased the stress levels for course repeaters, potentially jeopardizing their mental health. In a qualitative study, we found that retaking courses has a notably greater psychological impact on nursing students, eliciting various stress responses, including negative emotions, denial of reality, physical symptoms, and social avoidance [18]. Reports indicated that the rate of college students who are retaking courses ranges from 12.99 to 28.83% [19, 20]. Considering this group's stress response profile while planning stress management interventions, as well as providing tailored strategies to mitigate the intensity of these responses, may be an effective approach to preventing further physical and mental complications, and avoiding academic failure. This would also equip college students with enhanced emotional and academic capacity to navigate the challenges associated with failing and repeating courses, thereby reducing financial burdens and conserving academic resources. Consequently, early identification of the risk of severe negative stress responses among nursing students who are retaking courses is a crucial initial step toward ensuring their emotional well-being.

It is urgent to identify protectors of the stress response. Tangney et al. [21] found that individuals with higher self-control scores exhibited better adjustment (fewer reports of psychopathology) and more optimal emotional responses. Additionally, research showed that psychological resilience is closely linked to the stress response [22], further emphasizing its importance. Moreover, higher academic self-efficacy is related to lower test anxiety and better academic success among nursing students [23–25]. Therefore, our study hypothesizes that self-control, psychological resilience, and academic self-efficacy are predictive factors on individual stress responses.

In summary, this study aimed to investigate the stress response and its predictive factors among nursing student repeaters who are retaking at least one failed course in the context of abolishing the Final Supplementary Examination in China. The findings may provide nursing educators valuable insights into psychological strategies for supporting undergraduate nursing students who are retaking courses, thereby mitigating academically related adverse stress responses, preventing physical or mental problems, and decreasing attrition.

Methods

Study design and setting

This study was a multicenter cross-sectional questionnaire survey. Data were collected from four 4-year undergraduate medical universities in China between September 2020 and May 2021. Undergraduate nursing students who are retaking courses were invited to take part in this study if they: (1) were full-time undergraduate

students majoring in nursing and volunteered to participate in this study; (2) failed at least one required course previously and were retaking it; (3) provided voluntary consent for participation. Moreover, those who had passed all of their repeated courses or were grade retention students were excluded.

Population and sampling

The sample size was estimated according to the rule that the sample size for multiple linear regression analysis should be ten times the number of independent variables included in the planned linear regression [26]. In the present study, the estimated influencing factors were 10. Thus, the sample size was calculated to be 100. A total of 127 nursing student repeaters submitted the questionnaire, 7 of whom were ineligible and excluded from analysis due to regular answers (participants who randomly selected the same answer, such as consistently choosing 'one'), or because they took less than 5 min to complete the questionnaire. Consequently, 120 valid questionnaires were collected, including 51 from Guizhou Medical University, 42 from Chongqing Medical University, 18 from Tianjin University of Traditional Chinese Medicine, and 9 from the School of Medicine of Yangtze University.

Measures

A general information questionnaire, stress response questionnaire (SRQ), Connor-Davidson resilience scale, self-control scale (SCS), and academic self-efficacy questionnaire were used in this study.

General information questionnaire

Participants' general information was categorized into demographic characteristics and academic-related data, which include age, gender, residence, grade, student leader or not, number of retaking courses currently and whether sought support from others when encountering learning or psychological problem.

Stress response questionnaire (SRQ)

The 28-item SRQ is used to evaluate the individual's perceived stress on the emotional, physical, and behavioral responses to stressors [27, 28]. The scale includes three subscales: Emotional Response (ER: anxiety, depression, anger, etc., i.e., "Feeling sullen and depressed"), Physical Response (PR: dizziness, body pain, fatigue, and lassitude, etc., i.e., "Feeling weak and tired easily"), and Behavioral Response (BR: avoidance, reduced physical activity, etc., i.e., "Too lazy to move"). Each item is scored on a 5-point Likert scale from 1 (indeed yes) to 5 (surely not). A higher total score indicates a higher intensity stress response [28]. The SRQ demonstrates adequate content validity, internal consistency, and test-retest reliability, with Cronbach's α 0.902 ~ 0.953 and the Cronbach' s α for ER, PR, and BR were 0.946, 0.915, and 0.847, respectively [27].

Connor-Davidson resilience scale

Psychological resilience was measured by the 19-item Chinese version of the Connor-Davidson Resilience Scale (i.e., "I am able to adapt when changes occur", "I try to see the humorous side of things when I am faced with problems") [29], which was modified from the scale developed by Connor and Davidson [30]. Participants were asked to rate their responses according to the extent to which the items were compatible with their current situation on a scale of 1 point (completely incompatible) to 5 points (completely compatible). The rating of each item was summed up to form a total score of the whole scale. A higher score represents a higher level of psychological resilience. The whole scale demonstrated excellent internal consistency in this study, with a Cronbach's α of 0.963.

Self-control scale (SCS)

SCS was used to measure individual differences in self-control [31], which was adapted from the Self-control scale presented by Tangney et al. [21]. This scale comprises 19 items (i.e., "I am good at resisting temptation", "I have a hard time breaking bad habits"). Five-Likert ratings were used, with a scale ranging from 1 point (strongly disagree) to 5 points (strongly agree). Items 1, 5, 11, and 14 are positive-scoring questions, and the others are reverse-scoring. Higher scores indicate lower self-control among students. Its Cronbach's α of the Chinese version was 0.862 [31]. In this study, Cronbach's α of this scale was 0.874.

Academic self-efficacy questionnaire

The academic self-efficacy questionnaire for college students was compiled by Liang Yusong [32]. It consists of 22 items divided into learning ability self-efficacy (11 items: i.e., "I am good at resisting temptation", "I have a hard time breaking bad habits") and learning behavior self-efficacy (11 items:"I believe I have the ability to achieve good grades in my studies", "I think I have the ability to solve problems encountered in my studies"). A 5-point Likert scale is employed, with items 14, 16, 17, 20, and 21 designed as reverse-scoring questions, while the remaining items are positive-scoring questions; higher scores indicate greater academic efficacy. The Cronbach's α for this scale in this study was 0.884.

Data collection

The convenience sampling method was used for data collection. We collected all participants' information by the Questionnaire Star, a professional online survey platform.

First, we edited our e-questionnaire on the platform and generated a link for distribution via WeChat. The purpose, methods of our study, and the risk and benefits of participating in the survey were described on the first page of our e-questionnaire. It also stated that participants could quit the survey without any consequences by leaving the webpage. Secondly, we invited nursing student counselors fro*m* Guizhou Medical University, Chongqing Medical University, Tianjin University of Traditional Chinese Medicine, and the School of Medicine at Yangtze University to distribute the e-questionnaire link via their classes' official WeChat accounts, enabling the target group to access the questionnaire by simply clicking the link. Meanwhile, the nursing student counselors provided explanations regarding the survey's purposes, potential risks, and benefits. During the process of filling out the questionnaire, all participants were able to understand the questions' meaning and respond independently.

Statistical analyses

Survey data were exported from Questionnaire Star into the Statistical Package for Social Sciences (SPSS) package (v20.0, IBM, USA), which was used for all data analysis. Quantitative variables were expressed as the mean and standard deviation (SD). Qualitative variables were expressed as numbers and percentages. T-tests, ANOVA, or Pearson correlation coefficients were used to evaluate the differences in stress responses among undergraduate nursing students. Variables identified as significant ($p<0.05$) in these initial tests were then entered into multiple linear regression models to identify predictors for stress response levels among undergraduate nursing students who are retaking courses.

Ethical considerations

Institutional review board approval was obtained from the Ethics Committee of Guizhou Medical University (2020 Round Trial No.105: 20/04/2020). The research conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). The questionnaire included an introductory statement regarding the study aims and methods, and data usage. All respondents indicated their agreement to the informed consent by ticking a box before starting the online survey. The completion of the questionnaire was interpreted as consent to participate in the research.

Results

Socio-demographic characteristics of participants

Table 1 shows the demographic information of our participants. The ages of undergraduate nursing students who are retaking courses ranged from 18 to 25, with an average of 20.89 years (SD = 1.47), including 15 first-year, 31 sophomore, 38 junior, and 36 senior students. Most students were female (75, 62.5%), and 61.7% were from rural areas.

Stress response, psychological resilience, self-control ability, and academic self-efficacy of participants

Table 2 presents the stress response levels of undergraduate nursing students who are retaking courses was (mean = 58.07, SD = 26.72); psychological resilience

Table 1 Characteristics of the participants ($n=120$)

Characteristic	Mean ± SD	f	%
Age (year)(18 ~ 25)	20.89 ± 1.47		
Gender			
Male		45	37.5
Female		75	62.5
Grade			
Freshman		15	12.5
Sophomore		31	25.8
Junior		38	31.7
Senior		36	30.0
Residence			
City		31	25.8
Town		15	12.5
Rural		74	61.7
Student leader			
Yes		28	23.3
No		92	76.7
Number of courses required to be retaken currently (1 ~ 5)	1.51 ± 0.81[#]		
Getting psychological support from others			
Yes		32	26.7
No		88	73.3

Table 2 Stress response, psychological resilience, self-control ability, academic self-efficacy of nursing students failing and repeating courses ($n=120$)

	Range of total scores	Minimum of actual score	Maximum of actual score	Mean scores (Mean ± SD)
Stress response	28.00 -140.00	28.00	140.00	58.07 ± 26.72
Emotional state	12.00–60.00	12.00	60.00	24.72 ± 12.30
Somatic responses	8.00–40.00	8.00	40.00	17.13 ± 8.19
Behavioural responses	6.00–30.00	6.00	30.00	12.58 ± 5.86
Psychological resilience	25.00-125.00	25.00	125.00	86.97 ± 17.12
Self-control ability	37.00–90.00	37.00	90.00	57.69 ± 9.75
Academic self-efficacy	22.00–11.00	37.00	93.00	67.16 ± 9.22

Abbreviation: SD: standard deviation

Table 3 Differences in stress responses among various demographic sub-groups of nursing students failing and repeating courses ($n=120$)

Characteristic	stress response				
	Mean ± SD	t	F	*r*	*P*
Age (year)				-0.074	0.419
Gender		-0.598			0.551
Male	56.18 ± 24.82				
Female	59.20 ± 27.89				
Grade			0.93		0.428
Freshman	66.80 ± 25.83				
Sophomore	53.65 ± 24.34				
Junior	59.92 ± 27.64				
Senior	56.28 ± 28.06				
Residence			0.506		0.604
City	54.26 ± 29.02				
Town	62.00 ± 29.79				
Rural	58.86 ± 25.25				
Student leader		0.0289			0.773
Yes	56.79 ± 31.69				
No	58.46 ± 25.19				
Number of retaking courses(1 ~ 5)				0.208	**0.023***
Getting psychological support form others		1.913			0.058
Yes	65.72 ± 27.54				
No	55.28 ± 26.01				
Psychological resilience				-0.497	**<0.001***
Self-control ability				-0.314	**<0.001***
Academic self-efficacy				-0.249	**0.006***

*statistically significant in t-test, ANOVA, and Pearson correlation coefficients; *P*-value < 0.05

was (mean = 86.97, SD = 17.12); self-control ability was (mean = 57.69, SD = 9.75) and academic self-efficacy was (mean = 67.16, SD = 9.22).

Predicting the level of stress response of participants

Univariate analysis identified several factors that were significantly associated with the stress response of the participants: psychological resilience ($r=-0.497$, $p<0.001$), self-control ability ($r=-0.314$, $p<0.001$), academic self-efficacy ($r=-249$, $p=0.006$), number of retaking courses ($t=0.208$, $p=0.023$) (Table 3).

A best-fit multiple linear regression model identified several significant predictors of the level of stress response of participants: psychological resilience (B = -0.730, $p<0.001$), self-control ability (B = -0.811, $p=0.002$), academic self-efficacy (B = -0.459, $p=0.042$), number of retaking courses (B = 8.583, $p=0.001$). The variables co-explained 33.0% variation in stress response (Table 4).

Discussion

To our best knowledge, this was the first study to explore the stress response level and its influencing factors among undergraduate nursing students who are retaking courses in the context of the abolition of the Final Supplementary Examination in China. The results revealed that

Table 4 Multiple linear regression analysis of stress response of undergraduate nursing students retaking course ($n=120$)

Variable	B	SE -B	β	t	*p*	95% Confidence Interval		VIF
						Low	Up	
Constant	185.117	27.775	-	6.665	<0.001	130.099	240.135	-
Psychological resilience	-0.730	0.127	-0.469	-5.729	<0.001	-0.982	-0.477	1.193
Number of retaking courses	8.583	2.518	0.260	3.409	0.001	3.596	13.570	1.034
Self-control ability	-0.811	0.250	-0.296	-3.249	0.002	-1.305	-0.317	1.475
Academic self-efficacy	-0.459	0.223	-0.190	-2.055	0.042	-0.902	-0.017	1.513

Abbreviations: B, unstandardized coefficient beta; SE -B, standard error of B; β, standardized coefficient beta; VIF, variance inflation factor.; $R=0.353$, adjusted $R^2=0.330$, $F=15.676$, $p<0.001$

nursing students tend to have higher stress responses, including emotional, somatic, and behavioral responses, which were even more robust than those of individuals troubled by the COVID-19 epidemic [28, 33]. In addition, the increased number of retaking courses correlated with heightened stress response. High-stress responses can lead to mental illnesses, substance use disorders, self-harm, and even suicidal behavior [34, 35]. Moreover, high-stress responses would affect students' academic performance, resulting in lower grade point averages, and poor academic outcomes [15, 16]. Thus, it follows that nursing students who are retaking courses need and worthy of attention, although this issue is often overlooked.

We also found that high psychological resilience, self-control, and academic self-efficacy contribute to lower stress responses among nursing students who are retaking courses. García-León et al. [36] reported that resilience seems to be a determinant of perceived stress. Ulteriorly, Bacchi, and Licinio [22] also found that higher levels of resilience could respond better to stress responses, especially the emotional response (e.g., psychological distress) in psychology and medical students. Psychological resilience is defined as "the ability to maintain or regain mental health, despite experiencing adversity" [37, 38], which helps individuals learn from realistic demanding situations and turn challenges into opportunities [39, 40]. Thus, psychological resilience could keep nursing students who are retaking courses far away from mental illness and stress response.

Additionally, an integrative review has found that psychological resilience in nursing students is crucial for the sustainability of the healthcare system [41]. Notably, resilience is not an inherent trait or a static characteristic, but rather a dynamic process [39, 42]. However, research by McGowan and Murray [43] indicated that educational interventions to promote resilience are sparse among nursing students. Consequently, as highlighted by Cleary et al. [44], nursing educators emphasize that cultivating resilience as part of nursing programs allow students to better deal with the unique challenges in nursing study and future practice.

A Chinese study conducted during the 2019 coronavirus disease found that perceived stress and related stress response behaviors could be relieved by self-control [45]. Tangney et al. [21] also showed that higher scores in self-control are associated with a higher grade point average, fewer reports of psychopathology, less binge eating and alcohol abuse, and more optimal emotional responses. Those findings were similar to the present study. Self-control refers to one's ability to resist temporary impulses to achieve larger and more long-term goals or resist behaviors that provide instant gratification, including cognitive, emotional, and behavioral control [21, 46]. Studies reported that a high level of self-control helps individuals to overcome undesirable thoughts, emotions, and behavior and improve problem-solving skills, and aids in addressing daily frustration and difficulties, thereby maximizing psychosocial adjustment [47, 48]. Conversely, low self-control is a significant risk factor for a broad range of personal and interpersonal problems [21]. A quasi-experimental study found that using an extracurricular program (mainly developed based on the cognitive behavioral or positive psychological model) might be helpful for nursing students to have anger self-control [49]. Therefore, nursing educators could adopt self-control promotion strategies based on the cognitive behavioral and/or positive psychological models to reduce stress response and maintain well-being among nursing students who are retaking courses.

Meanwhile, academic self-efficacy is an essential protective factor influencing the stress response of nursing students. In academic contexts, self-efficacy often refers to academic self-efficacy. It is one's self-perceived confidence to successfully achieve educational goals [24, 25]. Academic self-efficacy is well-known to be associated with academic success. Nursing students with higher academic self-efficacy were related to higher problem-solving ability and better academic success [24, 50].

Conversely, lower academic self-efficacy among nursing students is associated with higher stress and stress responses (e.g., test anxiety, and burnout) [23, 25, 38, 51]. Our study also revealed a negative association between academic self-efficacy and stress response. In other words, nursing students who are retaking courses exhibited lower stress responses when they possessed higher academic self-efficacy. It is important to note that the

study participants were nursing students who had experienced course failure. Compared to academic success students, nursing students who are retaking courses had lower academic self-efficacy. Brennan [52] showed that the Self-Efficacy Prebriefing Model enhances nursing students' self-efficacy and clinical competency in simulation. Other studies also found that social media, when utilized as an educational tool to foster a favorable learning environment, might improve the academic self-efficacy of nursing students [25, 51]. Therefore, screening variables that influence academic self-efficacy and implementing strategies based on the self-efficacy theory to promote self-efficacy can be critical in reducing stress responses among nursing students who are retaking courses.

Limitations

This study has several limitations that should be considered. Firstly, the generalizability of the findings is limited by the fact that participants were recruited from four medical universities by convenient sampling. Secondly, due to the particularity of the group of nursing students who are retaking courses, a relatively small but statistically acceptable sample size was obtained in this study. Randomized samples from more universities are suggested for future research. Thirdly, due to the cross-sectional design of this study, causal relationships between the variables cannot be determined. For future work, longitudinal design studies should be recommended.

Conclusion

The increased frequency of course retakes correlates with a heightened stress response among nursing students. Psychological resilience, self-control, and academic self-efficacy were protective factors of stress response among nursing students who are retaking courses. In order to help nursing students who are retaking courses release their stress response and maintain well-being, nursing educators could adopt self-control promotion strategies, emphasize the cultivation of psychological resilience and academic self-efficacy within health promotion programs tailored for this group. Such measures would equip nursing students with better emotional and academic capacity to deal with the challenges caused by retaking courses, thereby decreasing financial burdens and the attrition of academic resources.

Acknowledgements

We would like to extend our sincere appreciation to all the participates, and other colleagues and experts who have helped us with our program.

Author contributions

ZL designed of the work, analyzed and interpreted of data, drafted the article and substantively revised the article; XW conceptualized and designed the study, guided research design, interpreted of data and revised all manuscript drafts critically. BY edited the manuscript for correct English language usage, grammar, punctuation and spelling and substantively revised all manuscript drafts. YJ, HL, YL and HC were responsible for data collection and revised all manuscript drafts critically. JT was responsible for quality control, reviewing the literature, revised all manuscript drafts critically. All authors approved the final version of the manuscript.

Funding

This work was supported by the National Natural Science Foundation of China (82260646); Guizhou Education Department Youth Science and Technology Talents Growth Project (KY[2022]240); Special Nursing Project of Guizhou Medical University in 2022 (YJ22004); Science and Technology Program of Guizhou Province(gzwkj2023-532); Ministry of Education's industry-University cooperative Education project in 2022 (220602007262732); Chongqing college students Innovation and Entrepreneurship Training project in 2024 (S202410631129X); and School of Nursing, Chongqing Medical University 2023 scientific research project (20230401).

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Guizhou Medical University (2020 Round Trial No. 105) .

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 15 October 2023 / Accepted: 14 August 2024
Published online: 25 August 2024

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