The Effect of Loneliness on Learning Burnout of Medical Students under the Normalization of Novel Coronavirus Pneumonia

-- The Mediating Role of Resilience

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Abstract

To explore the relationship between loneliness and learning burnout, and the mediating role of resilience in medical students isolated at home under the background of normalization of novel coronavirus pneumonia. A cross-sectional survey was conducted among 316 medical students in a medical college by cluster sampling. The general situation questionnaire, UCLA Loneliness Scale (3rd edition), Learning Burnout Scale, and Connor-davidson Resilience Scale (CD-RISC) were used to evaluate the results. The total scores of loneliness and learning burnout of medical students of different sex were statistically significant (t = 2.437, P = 0.015; t =2.214, P = 0.028), while the scores of resilience were not statistically significant (t =-0.68, P = 0.497). Resilience was negatively correlated with loneliness and learning burnout (r =-0.505, r =0.453, P < 0.01), loneliness was positively correlated with learning burnout (r = 0.513, P < 0.01), resilience played a mediating role between loneliness and learning burnout, the intermediary effect accounted for 32.5% of the total effect. Loneliness can directly affect learning burnout, and it also can affect learning burnout through resilience. High psychological resilience is a "protective factor" for medical students with high loneliness to overcome learning burnout.

Keywords

Loneliness; Resilience; Learning Burnout; Medical Students; Mediation; Novel Coronavirus Pneumonia.

1. Introduction

The outbreak of novel coronavirus pneumonia (coronavirus disease 2019,COVID-19) at the end of 2019 is characterized by its suddenness, infectivity, publicity and uncertainty, which has affected people's work life and mental health comprehensively[1]. It is very important to understand the mental health status of medical students in this period.

To enhance the public's psychological defense ability, China issued the Guidelines for Emergency Psychological Crisis Intervention in Novel Coronavirus Pneumonia Epidemic Infection on January 26, 2020, pointing out that it is necessary to master the psychological dynamic changes of various groups of people and carry out classified psychological crisis intervention for different groups of people in an organized and orderly way [2]. Due to the heavy study load, employment pressure, and other factors, medical students are more likely to

appear psychological problems [3], which will be an important research group under the normalization of novel coronavirus pneumonia.

Compared with middle school, the medical students at the stage of higher education mainly study independently. For the medical students who grow up in the cramming teaching environment, they lack certain autonomous learning ability, so it is easy to develop learning burnout which characterized by ongoing negative emotions and low motivation [4] and lose interest in learning after experiencing great psychological pressure from sudden traumatic events [5].

Resilience is the ability of individuals to adapt well to adversity, sadness, threats, trauma, or other stressful events and to grow through adversity. Studies have shown that good resilience can enable medical students to have a more optimistic perception of reality and the future, and to be more flexible and proactive in coping with learning burnout. Therefore, in the face of public health emergencies, people with higher resilience capacity are more likely to "bounce back" from stressful encounters [6].

Loneliness, a subjective state of distress between actual and perceived relationships [7], could bring about subsequent learning burnout. Several studies have also described loneliness as an unpleasant emotional experience that stems from inadequate social relations in important ways [8]. According to this definition, when medical students are confined to their homes because of the epidemic, loneliness occurs owing to a lack of peer support, face-to-face interaction, and supervision [8]. In addition, medical students were taking online classes at home at that time, and were receptive to smartphone apps [9]. Literature also has revealed that both excessive internet use and learning burnout reinforce each other [10]

COVID-19 is much more widespread than SARS and other epidemics on a global scale [11]. As the pandemic continues, medical students are facing different degrees of psychological barriers in all countries [12]. Mental health status in the medical student population will affect their physical and mental health, academic performance, professional identity and future quality of medical care [13-14]. Therefore, paying close attention to issues related to medical students' loneliness, learning burnout, and resilience, and intervening if necessary, is critical for their mental health [15].

The literature search found no direct study on the relationship among loneliness, learning burnout and resilience in medical students. Based on this, the present study hypothesizes that medical students' resilience plays a mediating role between loneliness and learning burnout under the public health emergency. This study aims to provide suggestions for improving the mental health of medical students and the teaching quality of medical colleges.

2. Material and Methods

2.1. Study Design and Participants

A cross-sectional survey was conducted on loneliness, learning burnout and resilience among 316 medical students isolated at home from a medical college in Henan province. The inclusion criteria were as follows: (1) Voluntary filling; (2) Informed Consent; (3) The basic life trajectory is home isolation; (4) Full-time medical students. The exclusion criteria were as follows: (1) Non-medical students;(2) Medical students who practice in hospitals or do not take online courses at home;(3) Take a part-time job outside the home.

A total of 303 valid questionnaires were collected in this study, of which 90 were male (29.70%) and 213 were female (70.30%). 141 persons (46.53%) were registered as agricultural residents and 162 (53.47%) as non-agricultural residents. There are 92 freshmen (30.36%), 120 sophomore students (39.60%), 55 junior students (18.15%), 23 senior students (7.59%), and 13 more senior students (4.29%).

2.2.   Instruments

2.2.1. Self-prepared General Information Questionnaire

Self-made questionnaires were used to carry out the general investigation, which mainly included the demographic characteristics of the respondents (gender, grade, major, residence), whether for the only child, whether as a student cadre

2.2.2. UCLA Loneliness Scale (UCLA-LS)

The UCLA Loneliness Scale was developed by Russell (1996). The original questionnaire consists of 20 items, on a four-point Likert scale (1 = never, 4 = often). The total score is the loneliness score, which is divided into the boundary value of 44, and the score above 44 indicates high loneliness [16] [17]. The scale has a wide range of applications. In the study of college students, Cronbach's coefficient alpha was 0.94, and test-retest reliability was 0.85.

2.2.3. Learning Burnout Questionnaire (LBQ)

The Learning Burnout Questionnaire, as compiled by Lian [18], was divided into three dimensions: depression (LBQ-D), misconduct (LBQ-M), and a low sense of achievement (LBQ-LSA) with a total of 20 entries. In this study, the questionnaire's general Cronbach's coefficient alpha was 0.81, and the Cronbach's coefficient alpha of each dimension was: depression 0.70, misconduct 0.64, low sense of achievement 0.67. The questionnaire used a five-point Likert scale, from 1 (completely inconsistent) to 5 (fully consistent); higher scores indicated higher levels of learning burnout.

2.2.4. Connor-davidson Resilience Scale (CD-RISC)

The Connor– Davidson Resilience Scale (CD-RISC) is a 25-item scale that measures the ability to cope with adversity [19] [20]. Respondents rate items on a scale from 0 (not true at all) to 4 (true nearly all the time) and higher scores reflect greater resilience. The CD-RISC was translated by Yu and Zhang (2007) and divided into three dimensions [19]: tenacity (RISC-T), strength (RISC-S), and optimism (RISC-O). In this study, the Cronbach's coefficient alpha for the CD-RISC was 0.92, and Cronbach α coefficients of the three subscales were 0.80, 0.86 and 0.60, respectively.

2.3.   Procedure

The online survey platform "Questionnaire Star" was used to create the questionnaire, and the QR code of the questionnaire was issued by the medical school teachers and medical students in the medical student groups by WeChat and QQ. The electronic questionnaire survey was conducted from 8 o 'clock on July 12, 2020, to 20 o 'clock on July 17, 2020. The medical students answered the questions according to the guidance of the questionnaire by mobile phone. All the questionnaires were submitted anonymously. A total of 316 questionnaires were collected, of which 13 were rejected as unqualified, and 303 were valid with an effective recovery rate of 95.89%.

2.4.   Data Analysis

SPSS 26.0 was used to conduct descriptive statistics, t-test and pearson correlation analysis on the data, and Model 4 in SPSS macro program Process was used to test the mediating effect.

3. Results

3.1.   The Scores of Loneliness, Resilience and Learning Burnout among Medical Students

The scores of loneliness, resilience and learning burnout were (43.95±8.07), (60.52±13.23) and (56.72 ±9.56) respectively. A total of 156 people were highly lonely (the overall score for loneliness was greater than 44 points), accounting for 51.49% of the total respondents.

3.2. Comparison of Scores of Loneliness, Resilience and Learning Burnout among Medical Students with Different Characteristics (Table 1)

The total scores of loneliness and resilience were affected by different genders (P<0.05), but the score of learning burnout was not significantly affected (P>0.05). Living in rural or urban areas and whether working as a student cadre did not affect loneliness, resilience and learning burnout scores of medical students (P>0.05).

Table 1. Comparison of scores of loneliness, learning burnout and resilience among medical students with different demographic characteristics ($\bar{x}\pm s$)

Project	Sort	Population	UCLA-LS	LBQ	CD-RISC
gender	male	90	45.68±8.43	58.58±10.23	59.72±14.30
	female	213	43.23±7.82	55.93±9.18	60.85±12.77
t			2.437	2.214	-0.68
P			**0.015***	**0.028***	0.497
residence	Countryside	141	44.10±7.89	57.23±9.07	60.45±14.29
	city	162	43.83±8.24	56.27±9.98	60.58±12.28
t			0.292	0.874	-0.87
P			0.77	0.383	0.931
Whether as a student cadre	yes	133	42.95±8.10	55.65±9.87	62.01±14.31
	no	170	44.74±7.98	57.56±9.25	59.35±12.23
t			-1.914	-1.734	1.739
P			0.057	0.084	0.083

Note: *P <0.05; **P <0.01

Abbreviations: UCLA-LS, loneliness; LBQ, learning burnout; CD-RISC, resilience; LBQ-D, depression; LBQ-M, misconduct; LBQ-LSA, the low sense of achievement; RISC-T, tenacity; RISC-S, strength; RISC-O, optimism.

3.3. Correlation Analysis of Loneliness, Resilience and Learning Burnout among Medical Students

Table 2. Correlation analysis of loneliness, resilience and learning burnout (r-value)

	UCLA-LS	LBQ	LBQ-D	LBQ-M	LBQ-LSA	CD-RISC	RISC-T	RISC-S	RISC-O
UCLA-LS	1								
LBQ	**0.513****	1							
LBQ-D	**0.448****	**0.834****	1						
LBQ-M	**0.362****	**0.859****	**0.637****	1					
LBQ-LSA	**0.332****	**0.549****	0.089	**0.320****	1				
CD-RISC	**-0.505****	**-0.505****	**-0.271****	**-0.362****	**-0.573****	1			
RISC-T	**-0.435****	**-0.507****	**-0.271****	**-0.381****	**-0.556****	**0.955****	1		
RISC-S	**-0.497****	**-0.446****	**-0.242****	**-0.301****	**-0.520****	**0.912****	**0.786****	1	
RISC-O	**-0.459****	**-0.351****	**-0.183****	**-0.233****	**-0.425****	**0.774****	**0.642****	**0.641****	1

Note: *P <0.05;**P <0.01

Abbreviations: UCLA-LS, loneliness; LBQ, learning burnout; CD-RISC, resilience; LBQ-D, depression; LBQ-M, misconduct; LBQ-LSA, the low sense of achievement; RISC-T, tenacity; RISC-S, strength; RISC-O, optimism.

A bivariate analysis of loneliness, resilience and learning burnout was conducted in pairs (Table 2). The results showed that loneliness was negatively correlated with resilience (r=-0.505), and resilience was negatively correlated with learning burnout (r=-0.453) too. There was a significant positive correlation between loneliness and learning burnout (r=0.513).

3.4.   Regression Analysis of Loneliness, Resilience and Learning Burnout among Medical Students

Taking learning burnout as the dependent variable and loneliness as the independent variable, unitary linear recursive analysis was conducted. The results showed that loneliness could predict learning burnout (t=10.375, P<0.01). According to the mediation effect of inspection procedures [21-22], the Model 4 test in SPSS macro program Process compiled by Hayes is used to examine the mediating effect of resilience on loneliness and learning burnout. It is found that loneliness can negatively predict resilience (t = 10.147, P < 0.01), resilience can negatively predict learning burnout (t = 6.105, P < 0.01), and loneliness can positively predict learning burnout (t = 6.398, P < 0.01), as shown in Table 3.

Table 3. Regression analysis of variables in the model

Outcome variable	Predictor variable	R^2	F-value	Regression coefficient	Standard error	t	95% confidence interval
LBQ	UCLA-LS	0.2634	107.6445	**0.608**	0.0586	**10.375****	[0.4927,0.7233]
CD-RISC	UCLA-LS	0.2549	102.9696	**-0.8276**	0.0816	**-10.147****	[-.9881, -0.6671]
LBQ	CD-RISC	0.3448	78.9412	**-0.2388**	0.0391	**-6.105****	[-0.3158, -0.1619]
	UCLA-LS			**0.4103**	0.0641	**6.398****	[0.2841,0.5365]

Note: *P <0.05; **P <0.01

Abbreviations: UCLA-LS, loneliness; LBQ, learning burnout; CD-RISC, resilience.

3.5.   The Mediating Effect of Resilience on Loneliness and Learning Burnout among Medical Students

Bootstrap analysis was used to test the mediating effect of resilience on loneliness and learning burnout. First, learning burnout was taken as the dependent variable and loneliness as the independent variable to establish model A. Then, resilience was added as the mediating variable to establish model B. In Model A, the effect coefficient of loneliness on learning burnout of medical students was 0.608(t=10.375, P<0.01). In Model B, when resilience was included as a mediating variable, the direct effect of loneliness on resilience was -0.8276(t=-10.147, P<0.01), the direct effect of resilience on learning burnout was -0.2388(t=-6.105, P<0.01), and the direct effect of loneliness on learning burnout was 0.4103(t=6.398, P<0.01). The direct and indirect effects of loneliness on learning burnout were significant, as shown in Table 3. Table 4 showed that the Bootstrap confidence intervals did not include 0, indicating that resilience played a partial mediating role between loneliness and learning burnout. The indirect effect of loneliness on learning burnout, namely, the mediating effect of resilience, was 0.1977, and the proportion of the mediating effect to the total effect was 0.1977/0.608=32.52%.

In conclusion, given that the mediating effect retains a decimal number, the mediating effect accounts for 32.5% in the model that takes loneliness as an exogenous variable, learning burnout as an outcome variable, and resilience as a mediating variable.

Table 4. Bootstrap analysis of mediation effect significance test

Influence path	Normalized path coefficient	Standard error	95% confidence interval	Effect proportion
UCLA-LS - LBQ	**0.608[a]**	0.0586	[0.4927,0.7233]	--
UCLA-LS - CD-RISC	**-0.8276[b]**	0.0816	[-.9881, -0.6671]	--
CD-RISC - LBQ	**-0.2388[b]**	0.0391	[-0.3158, -0.1619]	--
UCLA-LS - LBQ	**0.4103[b]**	0.0641	[0.2841,0.5365]	67.48%
UCLA-LS - CD-RISC - LBQ	**0.1977[c]**	0.0416	[0 .1228,0.2873]	32.52%

Note：a Total Effect; b Direct Effect; c Indirect Effect

Abbreviations: UCLA-LS, loneliness; LBQ, learning burnout; CD-RISC, resilience.
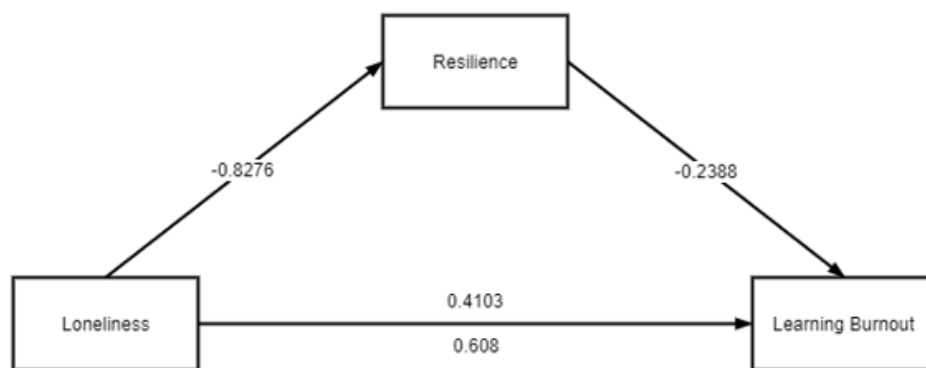
Figure 1. The mediating effect model of resilience in the relationship between loneliness and learning burnout

4. Discussion

4.1. Loneliness, Resilience and Learning Burnout of Medical Students Isolated at Home

The results showed that it had more than half of medical students with high loneliness under the background of normalization of novel coronavirus pneumonia, which indicated that most medical students were faced with loneliness caused by changes in the learning environment and living environment [23]. There are gender differences in the scores of loneliness and learning burnout, which indicates that men are more likely to fall into a lonely state than women, and also more likely to show learning burnout and improper behavior, such as being late, absent from school and absent-minded in class. Through literature search, it is found that the loneliness of this study is consistent with the research conclusion of Liu Ning et al. [24], but the learning burnout is inconsistent with the research conclusion of Zhang Ping et al [25], which may be related to different research objects and research tools. Gender has no significant effect on the resilience of medical students, which is consistent with the research conclusion of Lee Kuan Yew et al [26].

4.2. The Influence of Resilience on Learning Burnout

This study found that resilience is negatively correlated with learning burnout, which is consistent with the conclusion of Tan Huayu et al [27]. Previous research results show that psychological resilience can not only directly reduce the psychological disturbance symptoms of medical students, promote their adaptation abilities, but also effectively alleviate or offset the negative impact of public health emergency on mental health [28]. In the face of the same stress state, people with high resilience can stimulate their potentials, make full use of internal and external resources, maintain a positive state, and thus getting rid of the influence of bad

emotions in learning burnout, and reducing the level of learning burnout [29]. However, people with low resilience tend to pay more attention to negative information, emotions and evaluation [30], lack the courage and ability to actively deal with the environment, and adopt more defensive, avoidance and withdrawal behaviors, resulting in learning burnout symptoms such as depression and improper behavior [31].

4.3. The Influence of Loneliness on Learning Burnout

This study shows that loneliness is positively correlated with learning burnout. The higher the level of loneliness is, the more serious the learning burnout is, which is consistent with the research results of Li Yan et al. [31]. For medical students, school daily life is an important coping mechanism [32]. The isolation under the background of epidemic prevention and control means that they can not get information resources [33] through peer support and face-to-face communication. Therefore, due to the lack of close social interaction and extensive social support, the sense of belonging of medical students is difficult to be satisfied, which often leads to loneliness. Moreover, those with high loneliness tend to be less self-regulating and more likely to adopt inappropriate strategy [34] to deal with the psychological feelings such as emptiness, depression and even complaint during the epidemic period, and then it is difficult to maintain good learning habits or complete the school normally [35].

4.4. The Mediating Role of Resilience between Loneliness and Learning Burnout

This study found that psychological resilience played a partial mediating role between loneliness and learning burnout of medical students, and the intermediary effect accounted for 32.5% of the total effect. Studies have shown that loneliness is a psychological feeling when an individual's interpersonal relationship fails to reach the expected level, often accompanied by negative psychological experiences such as emptiness, helplessness and depression [36-37]. And long-term loneliness may lead to a variety of psychological problems, emotional disorders, the decline in mental health [38-39], and decrease in resilience. However, resilience, as an important protective factor, is a buffer in the face of stress or adversity [40]. Therefore, the decrease of psychological resilience caused by the increase of loneliness will cause medical students to be at a loss in the face of public health emergencies and changes in the learning environment, resulting in learning burnout and even fall into a vicious circle.

5. Limitations

This study was conducted through an online survey, the survey object may have volunteer bias; and it only takes the medical students of a medical college in Henan Province as the research object, the data may have regional limitations. It is suggested that more researchers can improve the research conditions and conduct in-depth research. Further follow-up research in the future will help to dynamically observe the changes of loneliness, learning burnout, and resilience of medical students under the background of normalization of epidemic prevention and control.

6. Conclusion

Given the intermediary role of psychological resilience, the government should take appropriate mental health intervention measures according to the characteristics of medical students, and guide the society to show more respect and care for medical workers; medical colleges and universities should try their best to take measures in the daily education process to promote medical students to cultivate excellent psychological resilience, help them to establish a high level of psychological construction, and thus reducing the impact of public

health emergencies. At the same time, online mental health lectures, individual counseling, and peer group counseling also needed to be carried out during the epidemic period to intervene the loneliness of medical students, improve their psychological resilience and reduce their learning burnout.

Acknowledgments

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