

Graduate Students' Emotional Disorders and Associated Negative Life Events: A Cross-Sectional Study from Changsha, China

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Purpose: The aim of this study was to develop a scale to quantify the negative life events of graduate students; and to identify the associations between negative life events and emotional disorders among them.

Methods: Based on a literature review, qualitative interviews and direct consultation with experts in relevant fields, the study served to identify the items that could be included in the Negative Life Events Scale for graduates (LES-GS). Psychometrics was used to analyze the items for reliability and validity. A cross-sectional survey was conducted in Changsha, China to explore the association between negative life events and emotional disorders among master's and PhD students. LES-GS, Patient Health Questionnaire-9 (PHQ-9), and the Generalized Anxiety Disorder Scale-7 (GAD-7) were utilized in the survey.

Results: The LES-GS exhibited acceptable reliability and validity. A total of 13.24% of master's and 16.60% of PhD students experienced moderate to severe depression symptoms. Additionally, a total of 9.04% of master's students and 15.47% of PhD students experienced moderate to severe anxiety symptoms. Among the master's students, five long-term events and one short-term event life events (these included "tension with family members"; "the graduation project is not going well"; "not interested in the major"; "poor relationship with partner or spouse"; "long-term financial stress", and "dispute with the mentor") were associated with an increased likelihood of emotional disorders among them. Among the PhD students, "death of a close family member" and "the publication of academic papers fails to meet the graduation requirements" were associated with an increased likelihood of emotional disorders.

Conclusion: The LES-GS could be used to assess life events for graduate students. The treatment of emotional problems for the master's students and the doctoral students should be designed differently.

Keywords: graduate students, negative life events, emotional disorders, depression, anxiety

Introduction

Emotional disorders (eg, depression and anxiety) are an important cause of injury and death globally. Emotional disorders experienced by graduate students impact both their output in the scientific field and their entry into the research industry. There is a growing concern for emotional disorders (depression, anxiety) among graduate students, whose work constitutes a major source of scientific advancement. For example, Levecque et al conducted a survey among 3659 doctoral students in Flanders, Belgium, in 2015 and reported that 32% of PhD students

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were at risk of having or developing a psychiatric disorder, especially depression.¹ Evans et al found that the graduate students were more than six times as likely to experience depression and anxiety as compared to the general population; a total of 41% of graduate students reported moderate to severe anxiety and 39% reported moderate to severe depression.² There is an absence of regional or national documentation of graduate students' emotional disorders (depression and, anxiety) and associated factors in China.

Numerous cross-sectional³ and longitudinal^{4–6} studies have proven the association between negative life events and emotional disorders among general population⁵ and clinical samples.⁷ However, this association has not been replicated in master's and doctoral students. Holmes and Rahe, drew from the Meyer's Life Event Scale to develop the "Social Readjustment Rating Scale",⁸ which includes 43 life events. The Munich Event List developed in 1983,⁹ assesses short-term events and chronic conditions in 11 areas of life. The Adolescent Self-Rating Life Events Checklist developed by Liu (1987) was adopted by many Chinese researchers.¹⁰ Chinese scholars Yalin Zhang and Desen Yang developed a stressful life events scale in 1990.¹¹ Interview procedures that use semi-structured contextual methods have also been developed by Paykel in 1997, Dohrenwend et al in 1993, and Hammen et al in 1985.¹² The instruments mentioned above were developed dozens of years ago and there are currently no updated life-event assessment scales for graduate students.

In order to address the gap in the research on the association between negative life events and emotional disorders among graduate students, a two-step research study was conducted in China. First, a life events scale for graduate students (LES-GS) was developed. Second, a survey among graduate students was conducted in Changsha, the capital of Hunan province, which is located in central southern China. The potential risk factors of negative life events on students' emotional disorders (depression, as well as anxiety symptoms) were explored.

Methods

Ethics Considerations

The study protocol was approved by the Ethics Committee of Xiangya School of Public Health Central South University. Written informed consent was obtained prior to both studies.

Study 1 Development of LES-GS

A thorough literature review; in-depth interviews and a panel discussion with five experts were conducted to generate the item pool for the LES-GS. The item pool was developed with two sub-scales named LES-GS I and LES-GS II, with 27 and 14 items respectively ([Appendix 1](#)). The first sub-scale was designed to capture short-term stressors, while the second was to capture long-term stressors. "B" represented the life events in LES-GS I; "c" represented life events in LES-GS II.

Respondents were recruited from a university website in Changsha. In total, 650 graduate students were recruited and 599 completed the survey, with a response rate of 92.15%. The LES-GS as well as the Patient Health Questionnaire-9 (PHQ-9), and the Generalized Anxiety Disorder Scale-7 (GAD-7) were utilized to establish the psychometrics of LES-GS among the participants.

The PHQ-9 developed by Kroenke et al,¹³ is based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)¹⁴ and was utilized to assess Depression symptoms. Each question was accompanied by a rating scale to measure the frequency of symptom occurrence, with values ranging from 0 ("not at all"), to 3 ("nearly every day"). A higher total score (possible range 0–27) indicated a greater prevalence of depressive symptoms. The Chinese version of the PHQ-9 has been reported to have a Cronbach's alpha of 0.86¹⁵–0.91.¹⁶

The GAD-7, a 7-item self-report scale, developed by Spitzer et al¹⁷ was employed for the measurement of anxiety symptoms. Participants evaluated how often they experienced anxiety symptoms, on a 4-point Likert scale from 0 (never) to 3 (daily). The total score was calculated by taking the sum of the ratings for each item and ranged from 0 to 21. The reported Cronbach's α coefficient of the GAD-7 among Chinese subjects is 0.92.¹⁸

Study 2 Graduate Students' Emotional Disorders and Associated Negative Life Events

Sampling of master's students

An estimation of the number of master's students required for this study was determined according to the stratified random sampling method. The first stratum referred to nationally renowned universities. The positive rate of depressive symptoms in the stratum was $p_1 = 18.6\%$ (the negative rate is $q_1 = 81.4\%$).¹⁹ The second stratum

referred to graduate students in ordinary universities. Students from that stratum demonstrated a positive rate of $p_2=21.2\%$ (the negative rate was $q_2=78.8\%$).²⁰ There were 34,199 master's students in first stratum universities and 13,577 in second stratum universities; yielding a total of 47,776 master's degree candidates.

According to the stratified sampling formula that $n = \left(\sum_{i=1}^W i \sqrt{P_i Q_i} \right)^2 / \left(V + \sum_{i=1}^W i P_i Q_i / N \right)$, $W_i = n_i / N$ and $V = (\delta / u_{\alpha/2})^2$. The maximum allowable error δ was set to 3%, and the $u_{\alpha/2}$ with a confidence interval of 90% was 1.64. The calculation required a sample size of 1315 graduate students. The refusal rate was estimated to be 20%, and the sample size was extended to 1643 students. The ratio of the number of graduates in the first stratum to the number of graduates in the second stratum was approximately 3:1. Therefore, the sample for the first stratum was 1232 participants, and 410 participants were included in the second stratum. Multi-stage stratified sampling was used. Two universities were included from the first stratum. Five colleges were randomly selected from each university, for a sample of 124 students from each. Forty master's students were sampled from each grade. There were approximately 40 to 50 master's students in each class. Therefore, one class was randomly selected for sampling from each grade. Two universities were sampled from the second stratum to obtain 410 participants. Two colleges were randomly selected from each university, and 103 master's students were recruited from each college. One class was selected from each grade.

Sampling of PhD Students

There are fewer PhD students than master's students. There is an absence of reporting on the differences in depressive symptoms ratios between students from renowned and ordinary universities. Therefore, the simple random sample formula $n = Z^2 P(1-P) / E^2$ was adopted to estimate the sample of PhD students. The total number of PhD students in Changsha is 9447, with a positive detection rate of depressive symptoms among PhD students of 41.9%.²¹ The maximum allowable error δ was set to 5%, with $Z_{\alpha/2}$ set at 1.64. The total required sample size was calculated to be 262, and the rejection rate was estimated to be 20%. Therefore the estimated sample size of PhD students was 327.

Multi-stage stratified sampling was utilized. The ratio of PhD students' in the first and second stratum was approximately 7:1 (8238:1209). Approximately 280

people were required to be sampled from the first stratum (renowned university), and about 40 people were required from the second stratum (ordinary university). Two universities in the first stratum (renowned university) were sampled. The ratio of PhD students' in the two universities was approximately 11:1; 257 and 24 students were sampled from the two universities, respectively. Five colleges were selected from the first renowned university with a sample of 60 PhD students from each college. Fifteen students were from each of the four grades of the university (1st grade, 2nd grade, 3rd grade, and delayed graduation). A convenient sampling approach was employed in the second renowned university. Two universities (ordinary university) were sampled from the second strata. The ratio of PhD students in the two universities was approximately 3:1. Therefore, convenience sampling was used to include 30 and 10 doctoral students respectively.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: 1) participant permission to be interviewed face to face; and 2) participants gave informed consent. Exclusion criteria included: 1) severe physical or mental disorder, or an inability to communicate verbally; and 2) contact not established after three attempts.

Survey Content

Social-demographic information was collected, including gender, age, major, grade, and cost of living per month. The LES-GS developed in this study was used to assess the life events of graduate students. Emotional disorders were surveyed by PHQ-9 and GAD-7.

Procedures

A cross-sectional study was conducted in the sampled universities. After providing written informed consent, each eligible respondent was invited to complete the LES-GS, PHQ-9, and GAD-7 questionnaires. All participants were reimbursed for their participation with a small gift such as a coffee voucher (RMB ¥ 10). This cross-sectional survey was conducted from March 2017 to October 2017. The principal investigator contacted the graduate administration offices of the sampled universities and organized face-to-face interviews with the administration officials, who were responsible for the mental health of the graduate students. Three investigators were recruited from each college of the sampled universities to conduct the survey. Unified training was conducted prior to the investigation. The training included mental health knowledge, basic

communication skills, survey content, standardized instructions, and rules on ethics.

Quality Control

The investigators were trained professionally prior to administering the survey to ensure that each investigator could conduct the surveys in accordance with uniform standards and ensure standardized survey procedures. Each investigator was required to use the same instructions for each respondent.

Data Analysis

First, descriptive statistical analysis, the χ^2 test and EFA were performed with SPSS 23.0 software. Amos 23.0 software was utilized to analyze the CFA of the LES-GS. Second, the associations between life events and negative emotions (depression, anxiety) among master's and PhD students were explored using SPSS23.0.

Results

Study I Characteristics of Samples

A total of 599 graduate students completed the survey, of which 382 were women and 217 were men (50 doctoral students and 549 master's students), with a collective response rate of 92.15%. Overall, 5.68% of the participants were older than 30 years. The mean and variance of each item was shown in [Table 1](#).

GLS Psychometrics

Item Analysis

Discriminating Power-Critical Value Comparison

The differences between item-scores for the high-score group (the highest 27%) and low-score group (the lowest 27%) were compared for each item ([Table 2](#)). If the differences were not statistically significant, the items were deleted. The distribution morphology of variables was tested. Each variable did not conform to a normal distribution and the Mann-Whitney *U*-Test was conducted to analyze the difference. The effect size was calculated by the square of the point-biserial correlation coefficient.

Item-Scale Correlation

Because the distributions were nonparametric, Spearman correlations between each item and the entire scale were calculated; the item was maintained if the correlation was above 0.4 (shown in [Table 3](#)).

Table 1 Mean and Variance of Each Item

Items of LES-GSI	Mean	Variance	Items of LES-GSII	Mean	Variance
b ₁	2.164	0.710	c ₁	0.497	2.296
b ₂	2.079	34.639	c ₂	0.450	4.524
b ₃	1.835	30.018	c ₃	0.828	7.252
b ₄	1.144	40.817	c ₄	0.569	5.749
b ₅	0.299	2.397	c ₅	0.288	0.238
b ₆	0.903	18.786	c ₆	0.069	0.206
b ₇	0.006	0.005	c ₇	0.512	10.284
b ₈	0.367	7.397	c ₈	0.515	4.794
b ₉	0.038	0.244	c ₉	0.156	0.374
b ₁₀	0.397	3.103	c ₁₀	0.488	0.959
b ₁₁	0.240	0.855	c ₁₁	0.414	2.613
b ₁₂	0.008	0.042	c ₁₂	0.976	14.835
b ₁₃	0.030	0.099	c ₁₃	0.117	0.321
b ₁₄	0.609	2.455	c ₁₄	0.392	0.981
b ₁₅	0.559	2.216			
b ₁₆	0.402	1.599			
b ₁₇	0.449	4.879			
b ₁₈	0.431	5.996			
b ₁₉	0.035	0.148			
b ₂₀	0.149	0.766			
b ₂₁	0.160	0.439			
b ₂₂	0.182	1.209			
b ₂₃	1.168	10.986			
b ₂₄	0.139	0.457			
b ₂₅	0.511	2.511			
b ₂₆	0.177	0.785			
b ₂₇	0.109	0.678			

Validity

Following the item analysis, six of the short-term stressors and eight of the long-term items were maintained ([Appendix 2](#)). The reserved data split randomly into two equal samples using the SPSS algorithm for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

The KMO test and sphericity test were conducted for EFA. The results from sample one showed that KMO = 0.694 and the Bartlett sphericity test value was significant ($P < 0.001$). Therefore the data was suitable for factor analysis. Items with factor loadings greater than others were considered to belong to a specific factor. Factor loading was shown in [Table 4](#). Five factors were extracted, and named as follows: short-term academic events, long-term academic events, personal relationships, economic situation, and loss factor. The contribution rate of the cumulative variance was 82.108%.

CFA was conducted in sample two to examine the replicability of the EFA identified by the 5-factor structure.

Table 2 Discriminating Power of Each Item

Item	The Highest 27%	The Lowest 27%	Mann–Whitney U	P	Effect Size
	Mean Rank	Mean Rank			
b ₁	190.000	0.000	Can not be performed		
b ₂	241.000	84.000	405.000	0.000	0.100
b ₃	243.500	81.500	0.000	0.000	0.100
b ₄	226.000	81.500	0.000	0.000	0.082
b ₅	265.330	250.120	6248.500	0.243	0.001
b ₆	470.590	237.510	476.000	0.000	0.091
b ₇	258.140	250.560	6637.00	0.041	0.002
b ₈	256.640	250.650	6680.500	0.649	0.022
b ₉	251.250	247.000	6728.000	0.480	0.037
b ₁₀	299.760	248.000	5430.000	0.002	0.000
b ₁₁	273.570	249.610	6189.500	0.133	0.001
b ₁₂	251.030	250.500	6829.500	0.804	0.002
b ₁₃	256.660	250.650	6680.000	0.250	0.028
b ₁₄	240.610	84.390	468.000	0.000	0.000
b ₁₅	189.50	135.50	8748.000	0.000	0.080
b ₁₆	171.930	153.070	11,594.000	0.003	0.000
b ₁₇	243.000	81.500	0.000	0.000	0.000
b ₁₈	473.42	242.23	353.000	0.000	0.109
b ₁₉	274.370	250.080	4135.000	0.000	0.000
b ₂₀	287.890	249.550	3878.000	0.000	0.000
b ₂₁	270.740	250.220	4204.000	0.207	0.000
b ₂₂	287.130	249.580	3892.500	0.013	0.000
b ₂₃	344.180	247.330	2808.500	0.003	0.000
b ₂₄	289.290	249.490	3851.500	0.004	0.000
b ₂₅	368.610	246.360	2344.500	0.000	0.000
b ₂₆	260.760	250.620	4393.500	0.486	0.028
b ₂₇	266.240	250.440	4289.500	0.188	0.001
c ₁	243.500	81.500	0.000	0.000	0.060
c ₂	243.500	81.500	0.000	0.000	0.074
c ₃	226.560	98.440	2743.500	0.000	0.051
c ₄	240.80	84.200	438.000	0.000	0.100
c ₅	241.94	83.060	253.5000	0.000	0.002
c ₆	167.49	157.510	12,313.000	0.000	0.002
c ₇	239.26	85.740	686.500	0.000	0.071
c ₈	243.500	81.500	0.000	0.000	0.048
c ₉	166.790	158.210	12,427.000	0.106	0.002
c ₁₀	171.350	153.650	11,688.000	0.017	0.001
c ₁₁	240.600	223.630	470.000	0.000	0.063
c ₁₂	84.400	101.370	3219.500	0.000	0.053
c ₁₃	163.000	162.000	13,040.500	0.776	0.018
c ₁₄	163.430	160.570	12,809.500	0.582	0.007

The 5-factor model fit the data from in the sample. The results show that: $\chi^2/df=3.03$, which is close to 3. CFI=0.874, GFI=0.853, NFI=0.859, and IFI=0.875. The structural validity was acceptable.

Table 3 Spearman Correlation Analysis of the Item-Scale

Item of LES-GSI	r ₁	Item of LES-GSII	r ₂
b ₁	−0.56	c ₁	0.456
b ₂	0.403	c ₂	0.458
b ₃	0.442	c ₃	0.425
b ₄	0.443	c ₄	0.402
b ₅	0.089	c ₅	0.334
b ₆	0.449	c ₆	−0.009
b ₇	0.076	c ₇	0.488
b ₈	0.236	c ₈	0.445
b ₉	0.068	c ₉	0.356
b ₁₀	0.293	c ₁₀	0.428
b ₁₁	0.226	c ₁₁	0.445
b ₁₂	0.021	c ₁₂	0.467
b ₁₃	0.104	c ₁₃	0.218
b ₁₄	0.366	c ₁₄	0.285
b ₁₅	0.456		
b ₁₆	0.377		
b ₁₇	0.258		
b ₁₈	0.492		
b ₁₉	0.150		
b ₂₀	0.206		
b ₂₁	0.256		
b ₂₂	0.198		
b ₂₃	0.365		
b ₂₄	0.234		
b ₂₅	0.387		
b ₂₆	0.249		
b ₂₇	0.211		

Empirical Validity

The correlation coefficients between the LES-GS I and the PHQ-9 and GAD-7 scores were 0.41 and 0.47, respectively. The correlation coefficients between the LES-GS II and the scores of PHQ-9 and GAD-7 were 0.39 and 0.42 respectively; these correlations also were statistically significant.

Reliability

The internal consistency of the scale was calculated and the Cronbach's alpha coefficient was 0.769. A total of 100 participants were selected to perform test-retest reliability after 2 weeks (the response rate was 77%) and the test-retest reliability was 0.761.

Study 2 Sociodemographic Characteristics of the Participants

The target population consisted of 1970 graduate students, and 1625 students (1360 master's students and 265 PhD students) completed the survey. The response rate was

Table 4 Factor Loading in Pattern Matrix

Items	Factor				
	Short-Term Academic Events	Long-Term Academic Events	Personal Relationships	Economic Situation	Loss Factor
b ₂	0.881	0.097	0.034	0.035	0.120
b ₃	0.913	0.146	-0.018	0.038	0.085
b ₄	0.865	0.164	-0.027	0.191	-0.101
b ₆	0.861	0.141	-0.002	0.111	-0.012
b ₁₅	-0.095	0.150	-0.043	0.273	0.644
b ₁₈	0.155	-0.087	0.042	-0.122	0.822
c ₁	-0.187	0.845	0.001	-0.122	0.136
c ₂	0.455	0.810	-0.013	0.173	-0.060
c ₃	0.445	0.797	-0.001	0.224	-0.005
c ₄	0.515	0.719	-0.008	0.233	-0.049
c ₇	0.187	0.112	-0.082	0.939	0.061
c ₈	-0.025	-0.049	0.928	0.094	0.005
c ₁₁	-0.009	0.023	0.905	0.009	-0.010
c ₁₂	0.146	0.105	0.508	0.809	0.072

82.49%. Table 5 illustrated the socio-demographic characteristics of the participants.

Distribution of Depression and Anxiety Symptoms in Graduates

Table 6 illustrated that 13.24% of master's students, and 16.60% of PhD students reported moderate to severe depression symptoms on the PHQ-9 scale. Furthermore, 9.04% of the master's students and 15.47% of the PhD students reported moderate to severe anxiety symptoms on the GAD-7 scale. A cut-off score of 10 was used to classify participants as positive or negative. The GAD-7 positive rate was significantly higher for the PhD students than for the master's students.

The Associated Life Events of Emotional Disorders

The life events associated with emotional disorders among graduate students were examined. The PHQ-9 or GAD-7 scores equal to or greater than 10 were presented by $y=1$; and less than 10 was presented by $y=0$. All life events were included in model 1 as independent variables. Model 2 presented the adjusted associations between life events and emotional disorders (adjusted for psychosocial factors). The Enter method was adopted for multivariate logistic regression analysis (Tables 7 and 8). Six life events (five long-term events and one short-term event) were associated with an increased likelihood of emotional disorders among

the master's students in the adjusted model. These included the following: "tension with family members" (OR = 3.177, 95% CI: 1.877–5.375), "the graduation project is not going well" (OR = 1.720, 95% CI: 1.428–2.072), "not interested in the major" (OR = 1.645, 95% CI: 1.348–2.008), "poor relationship with the partner or spouse" (OR = 1.557, 95% CI: 1.076–2.253), "long-term financial stress" (OR = 1.521, 95% CI: 1.273–1.818) and "dispute with the mentor" (OR = 1.317, 95% CI: 1.023–1.697).

For the PhD students, two life events were associated with an increased likelihood of emotional disorders that also were found among the master's students in the adjusted model. "Death of a close family member" (OR = 7.767, 95% CI: 1.353–44.581) and "the publication of academic papers fails to meet the graduation requirements" (OR = 1.797, 95% CI: 1.080–2.989) represented significant risk factors for emotional disorders.

Discussion

Emotional problems among graduates cause severe disruptions to academic and daily life. Recognition of negative life events that predispose graduate students to emotional disorders could inform administrative efforts designed to provide effective mental-health care to prevent emotional disorders among graduates. The LES-GS was developed to assess the negative life events for graduate as well as distinguish between short-term and long-term events. The LES-GS demonstrated good test-retest reliability, and the validity was acceptable. Each life event was assessed both

Table 5 Sociodemographic Characteristics of the Participants

	Graduate Type		Number	Proportion (%)
Gender	Master's students	Male Female	603 757	44.34 55.66
	PhD students	Male Female	142 123	53.58 46.42
Age	Master's students	≤30 31–50	1293 67	95.07 4.93
	PhD students	≤30 31–50	173 92	65.28 34.72
Ethnicity	Master's students	Han Minority	1266 94	93.09 6.91
	PhD students	Han Minority	234 31	88.30 11.70
Religion	Master's students	Have religion No religion	74 1286	5.44 94.56
	PhD students	Have religion No religion	9 256	3.40 96.60
Grade	Master's students	1st grade 2nd grade 3rd grade Delaying graduation	750 337 267 6	55.15 24.78 19.63 0.44
	PhD students	1st grade 2nd grade 3rd grade Delaying graduation	123 78 39 25	46.42 29.43 14.72 9.43
Major	Master's students*	Humanities/social sciences Natural sciences	574 776	42.21 57.06
	PhD students	Humanities/social sciences Natural sciences	38 227	14.34 85.66
Amount of money spent/each month	Master's students*	≤1000 Rmb/month 1001–2000 Rmb/month ≥2000 Rmb/month	460 777 113	33.82 57.13 8.31
	PhD students	≤1000 Rmb/month 1001–2000 Rmb/month ≥2000 Rmb/month	39 137 89	14.72 51.70 33.58

Note: *Data missing.

for its occurrence and for its level of stress. Previous animal-experiments have revealed that short-term stressors promote neuropsychological function, such as nerve regeneration,²² while long-term stressors may result in cognitive dysfunction.^{23,24} The two types of stressors may have different effects on human mental conditions and brain functions deserve further research.

Graduate students have contributed to scientific output worldwide and the status of their emotional disorders

deserves attention and concern from their mentors, academic officials, and clinicians. This study established the regional prevalence of depression and, anxiety among graduates in Changsha, Hunan, China. A total of 13.24% of master's students, and 16.60% of PhD students reported moderate to severe depression. Moreover, 9.04% of the master's students and 15.47% of the PhD students reported moderate to severe anxiety in Changsha, China. Emotional disorders among Chinese

Table 6 Distribution of PHQ-9 and GAD-7 Scores

Variables		≤9	≥10	Positive Rate	χ^2	P
PHQ-9	Master's students PhD students	1180 221	180 44	13.24% 16.60%	2.12	0.15
GAD-7	Master's students PhD students	1237 224	123 41	9.04% 15.47%	10.10	0.00

Table 7 Associations Between Negative Life Events and Emotional Disorders in Master's Students

Model 1					Model 2				
Variable	OR	95% C.I. for EXP(B)		p	Variable	OR	95% C.I. for EXP(B)		p
		Lower	Upper				Lower	Upper	
Constant	0.130			0.000	Constant	2.227			
b ₂	1.053	0.986	1.125	0.127	b ₂	1.037	0.967	1.113	0.307
b ₃	0.962	0.896	1.032	0.281	b ₃	0.963	0.889	1.043	0.355
b ₄	1.406	1.093	1.810	0.008	b ₄	1.317	1.023	1.697	0.033
b ₆	0.690	0.478	0.997	0.048	b ₆	0.699	0.484	1.008	0.055
b ₁₅	0.908	0.746	1.106	0.339	b ₁₅	0.911	0.738	1.125	0.387
b ₁₈	0.748	0.443	1.265	0.279	b ₁₈	0.723	0.411	1.271	0.260
c ₁	1.697	1.408	2.046	0.000	c ₁	1.645	1.348	2.008	0.000
c ₂	1.308	0.926	1.849	0.128	c ₂	1.350	0.951	1.915	0.093
c ₃	1.629	1.366	1.942	0.000	c ₃	1.720	1.428	2.072	0.000
c ₄	1.275	1.001	1.623	0.049	c ₄	1.272	0.992	1.631	0.058
c ₇	1.182	0.964	1.449	0.108	c ₇	1.242	0.998	1.547	0.052
c ₈	1.512	1.048	2.182	0.027	c ₈	1.557	1.076	2.253	0.019
c ₁₁	3.262	1.944	5.475	0.000	c ₁₁	3.177	1.877	5.375	0.000
c ₁₂	1.534	1.298	1.812	0.000	c ₁₂	1.521	1.273	1.818	0.000
					gender	0.912	0.657	1.266	0.583
					age	1.061	0.072	15.542	0.966
					ethnicity	0.455	0.220	0.943	0.034
					religion	0.481	0.253	0.915	0.026
					grade	0.920	0.738	1.147	0.459
					major	0.747	0.530	1.053	0.096
					Cost of living per month	1.027	0.787	1.341	0.842

graduates in Changsha proved less prevalent than among their European² and American counterparts.²⁵ Nor did gender prove to be associated with emotional disorders among Chinese graduates, which contradicts their counterparts in Europe.² This could be due to the Doctrine of the Mean in China, a Confucian principle which upholds moderation and impugns excess. Adherence to the doctrine could limit students' willingness to report a higher level of depression or anxiety symptoms.

To the authors' knowledge, this is the first study of the association between negative life events and emotional disorders among graduates in central south China. The finding of this research is consistent with previous

results on this association³⁻⁷ and adds new evidence from master's candidates and doctoral candidates. The research results could inform both academia and education policy regarding approaches that could alleviate emotional disorders among graduate students. LES-GS could be useful for teachers and administrative officials to assess negative life events, in order to provide appropriate support and prevent negative outcomes, such as suicide.

Implications

According to the bio-psycho-social medical model,^{26,27} the treatment of psychosomatic disorders is concerned not only

Table 8 Associations Between Negative Life Events and Emotional Problems Among PhD Students

Model 1					Model 2				
Variables	OR	95% C.I. for EXP(B)		p	Variable	OR	95% C.I. for EXP(B)		p
		Lower	Upper				Lower	Upper	
Constant	0.108				Constant	0.000			
b ₂	0.991	0.870	1.129	0.893	b ₂	1.029	0.860	1.232	0.756
b ₃	1.155	0.992	1.345	0.064	b ₃	1.164	0.942	1.438	0.160
b ₄	1.003	0.658	1.531	0.987	b ₄	1.055	0.376	2.961	0.919
b ₆	0.265	0.110	0.638	0.053	b ₆	0.191	0.066	0.554	0.052
b ₁₅	6.624	1.849	23.732	0.004	b ₁₅	7.767	1.353	44.581	0.021
b ₁₈	1.131	0.380	3.372	0.825	b ₁₈	1.172	0.247	5.549	0.842
c ₁	1.917	1.171	3.138	0.010	c ₁	2.541	1.336	4.832	0.004
c ₂	1.205	0.744	1.950	0.448	c ₂	0.941	0.492	1.801	0.855
c ₃	0.933	0.623	1.399	0.738	c ₃	0.992	0.575	1.712	0.978
c ₄	1.442	0.995	2.091	0.053	c ₄	1.797	1.080	2.989	0.024
c ₇	0.960	0.550	1.675	0.886	c ₇	0.854	0.420	1.739	0.664
c ₈	2.237	0.861	5.815	0.099	c ₈	2.370	0.584	9.624	0.228
c ₁₁	1.785	0.566	5.626	0.323	c ₁₁	2.001	0.498	8.040	0.328
c ₁₂	1.072	0.667	1.723	0.773	c ₁₂	1.224	0.641	2.334	0.540
					gender	2.612	1.005	6.785	0.049
					age	0.074	0.012	0.453	0.005
					ethnicity	0.000	0.000		0.999
					religion	0.481	0.253	0.915	0.999
					grade	1.349	0.838	2.171	0.218
					major	3.020	0.582	15.677	0.188
					Cost of living per month	1.598	0.749	3.408	0.225

with biological factors, but also with the influence of psychological and social factors. To prevent suicide and address the negative emotions of graduates, the negative life events that impact their emotional problems merit attention.

For master's students, it appears to be necessary to focus primarily on relationship problems (relationships with family members, lovers and spouses), and to actively address the difficulties they encountered in their graduation projects and with finances. For master's candidates, poor relationships with family members or a spouse significantly provoked negative emotion. How students may manage relationships deserves greater attention on the part of the administration. Academic problems and financial stress also had significant impacts on students' emotional problems. Some master's candidates hoped to find a good job with a master's degree, but they were not interested in their majors and this made them upset. Chinese undergraduates have been allowed to switch majors after entrance to the university, but graduate students did not have such permission. The graduate administration office at the national level should consider a policy that would permit graduate students to change their major once they have initiated their

studies to help relieve their negative emotions. Long-term financial stress also proved to be a significant impact factor in students' negative emotions. Chinese universities have had a scholarship system. Graduate students who obtained full scholarships from the university are not required to pay tuition fees and enjoy a monthly living allowance. Graduate students who did not receive a full scholarship are required to pay tuition, and their families have to pay for their living expenses.

Multivariate analysis showed that the short-term stressor "death of a close family member", and the long-term stressor "the publication of academic papers fails to meet the graduation requirements" significantly impacted the emotional disorders of PhD students. The death of a family member cannot be changed. However specific targeted interventions could be adopted to boost paper publication in order to relieve the emotional disorders experienced by PhD students. First, academic information should be provided to help students be able to achieve paper publication. Attendance at national or international academic conferences could be promoted and information about academic trends in their field could be provided to help the publication

of academic papers. Another possible step would be to establish a reward system for scientific output that could be granted to both the mentor, and the doctoral student.

Limitations

This study had some limitations. First, the item pool for the scale demands improvement. Some items were controversial and could have benefitted from greater scrutiny. For example, the item “difficult to find a spouse” proved controversial. Second, whether the event occurs or not is a dichotomous variable and a new distribution model to test its psychometrics could be further studied. It should be noted that, major natural or social disasters that may cause PTSD, such as sexual violence, tsunamis, and earthquakes were not included in this study. This work primarily addressed everyday life events that graduate students typically encounter. Finally, the survey samples were from Changsha, Hunan province, which may not be representative of all graduate students in China.

Suggestions for Further Research

This is the first step to promote the attention of the association between negative life events and emotional disorders among graduates in China. Further studies based on graduate students from other areas are needed to replicate the factor structure of LES-GS and the risk factors of emotional problems. The study was a cross-sectional survey, in order to further determine the causal relationship between life events and emotional disorders, further prospective longitudinal studies should be pursued. Clinical samples would be needed in the future to establish the cutoff point and diagnostic criteria of the LES-GS.

Disclosure

The authors report no conflicts of interest in this work.

References

- Levecquea K, Anseel F, Beuckelaer AD, Heyden J, Gisle L. Work organization and mental health problems in Phd students. *Res Policy*. 2017;46:868–879. doi:10.1016/j.respol.2017.02.008
- Evans TM, Bira L, Gastelum JB, Weiss LT, Vanderford NL. Evidence for a mental health crisis in graduate education. *Nat Biotechnol*. 2018;36:282–284. doi:10.1038/nbt.4089
- Zuo B, Zhang X, Wen FF, Zhao Y. The influence of stressful life events on depression among Chinese university students: multiple mediating roles of fatalism and core self-evaluations. *J Affect Disord*. 2020;260:84–90. doi:10.1016/j.jad.2019.08.083
- Flouri E, Francesconi M, Midouhas E, Lewis G. Prenatal and childhood adverse life events, inflammation and depressive symptoms across adolescence. *J Affect Disord*. 2020;260:577–582. doi:10.1016/j.jad.2019.09.024
- Asselmann E, Wittchen HU, Lieb R, Hofler M, Beesdo-Baum K. Danger and loss events and the incidence of anxiety and depressive disorders: a prospective-longitudinal community study of adolescents and young adults. *Psychol Med*. 2015;45:153–163. doi:10.1017/S0033291714001160
- Carter JS, Garber J. Predictors of the first onset of a major depressive episode and changes in depressive symptoms across adolescence: stress and negative cognitions. *J Abnorm Psychol*. 2011;120:779–796. doi:10.1037/a0025441
- Braet C, Van Vlierberghe L, Vandevivere E, Theuwis L, Bosmans G. Depression in early, middle and late adolescence: differential evidence for the cognitive diathesis-stress model. *Clin Psychol Psychother*. 2013;20:369–383. doi:10.1002/cpp.1789
- Holmes TH, Rahe RH; Holmes & Rahe. The social readjustment rating scale. *J Psychosom Res*. 1967;11:213–218. doi:10.1016/0022-3999(67)90010-4
- Maier-Diewald W, Wittchen HU, Hecht H, et al. *The Munich Event List (MEL) – Manual [In German]*. Munich: Max Planck Institute of Psychiatry; 1983.
- Liu XC. Adolescent self-rating life events checklist. *Chin Ment Health Publ*. 1987;106–108.
- Zheng Y, Wen Y, Li G, Ma C, Li Y. The survey of stressful life events among Chinese. *Chin Ment Health J*. 1990;4:272–288.
- Hammen C. Stress and depression. *Annu Rev Clin Psychol*. 2005;1:293–319. doi:10.1146/annurev.clinpsy.1.102803.143938
- Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16:606–613. doi:10.1046/j.1525-1497.2001.016009606.x
- Zimmerman M, Walsh E, Friedman M, Boerescu DA, Attiullah N. Are self-report scales as effective as clinician rating scales in measuring treatment response in routine clinical practice? *J Affect Disord*. 2018;225:449–452. doi:10.1016/j.jad.2017.08.024
- Wang W, Bian Q, Zhao Y, et al. Reliability and validity of the Chinese version of the Patient Health Questionnaire (PHQ-9) in the general population. *Gen Hosp Psychiatr*. 2014;36:539–544. doi:10.1016/j.genhosppsych.2014.05.021
- Chen S, Chiu H, Xu B, et al. Reliability and validity of the PHQ-9 for screening late-life depression in Chinese primary care. *Int J Geriatr Psychiatr*. 2010;25:1127–1133. doi:10.1002/gps.2442
- Spitzer RL, Kroenke K, Williams JBW, Löwe B, Brief A. Measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166:1092–1097. doi:10.1001/archinte.166.10.1092
- Ying DG, Jiang S, Yang H, Zhu S. Frequency of generalized anxiety disorder in Chinese primary care. *Postgrad Med*. 2010;122:32–38. doi:10.3810/pgm.2010.07.2173
- Gao Z. Research on depression of postgraduates in a certain famous university in Shanghai. *Chin J Health Psychol*. 2009;17:961–962.
- Zhang Y, Shi Y, Wang Z, Xi M. Moderator effect of social support and coping style on relationship between stress and depression. *Chin Ment Health J*. 2005;19:655–658.
- Yu D. The investigation of the graduate demands on the extent of depression in Ph.D. Post-graduate students: a psychosocial study. *Chin J Health Psychol*. 2008;16:243–244.
- Sannino G, Pasqualini L, Ricciardelli E, et al. Acute stress enhances the expression of neuroprotection- and neurogenesis-associated genes in the hippocampus of a mouse restraint model. *Oncotarget*. 2016;7:8455–8465. doi:10.18632/oncotarget.7225
- Czeh B, Vardya I, Varga Z, et al. Long-term stress disrupts the structural and functional integrity of GABAergic neuronal networks in the medial prefrontal cortex of rats. *Front Cell Neurosci*. 2018;12:148. doi:10.3389/fncel.2018.00148

24. Papadopoulou A, Siamatras T, Delgado-Morales R, et al. Acute and chronic stress differentially regulate cyclin-dependent kinase 5 in mouse brain: implications to glucocorticoid actions and major depression. *Transl Psychiatr*. 2015;5:e578. doi:10.1038/tp.2015.72
25. Assembly, U. B. G. Graduate Student Happiness and Well-being Report. <http://ga.berkeley.edu/wellbeingreport>. 2014.
26. Nakao M. Bio-psycho-social medicine is a comprehensive form of medicine bridging clinical medicine and public health. *Biopsychosoc Med*. 2010;4:1–3. doi:10.1186/1751-0759-4-19
27. Deter HC, Kruse J, Zipfel S. History, aims and present structure of psychosomatic medicine in Germany. *Biopsychosoc Med*. 2018;12:1. doi:10.1186/s13030-017-0120-x

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