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The Risk Role of Defeat on the Mental Health of College Students: A Moderated Mediation Effect of Academic Stress and Interpersonal Relationships

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ABSTRACT

Background: College students face significant academic and physiological changes, making them more susceptible to psychological issues such as depression, self-injury, and suicidal ideation. Feelings of defeat can exacerbate these risks by increasing academic stress. However, interpersonal relationships can moderate the impact of academic stress on students' mental health. Utilizing the presage–process–product model, this study aims to empirically investigate how feelings of defeat influence depression, self-injury, and suicidal ideation among college students. Additionally, it explores the mediating role of academic stress and the moderating role of various types of interpersonal relationships. **Methods:** A total of 1612 college students (750 females, 862 males, mean age = 19.64 ± 0.62 years) were recruited through cluster sampling. Data were collected via offline questionnaires administered by a trained psychology teacher and a postgraduate student, ensuring high reliability with two examiners per class. Latent profile analysis (LPA) was used to examine the impact of defeat on mental health outcomes, while mediation analysis was conducted to assess the roles of academic stress and interpersonal relationships. **Results:** 1. Defeat is identified as a significant risk factor for mental health issues among college students; 2. Four distinct patterns of interpersonal relationships were identified: the interpersonal-relationship risk group, the father–child-relationship high-risk group, the general interpersonal-relationship group, and the superior interpersonal-relationship group; 3. Academic stress partially mediates the relationship between defeat and mental health issues such as depression, self-injury, and suicidal ideation; 4. Different interpersonal relationship models moderate the impact of academic stress on depression and suicidal ideation. **Conclusion:** Defeat is a significant risk factor for mental health problems in college students. Academic stress partially mediates the negative impact of defeat on mental health, while patterns of interpersonal relationships moderate this impact. Effective early prevention and intervention should focus on monitoring students' stress levels and fostering warm, positive parent–child relationships.

KEYWORDS

Student mental health; defeat; academic stress; interpersonal relationships; mediation test

Introduction

An individual's college years constitute a critical period for their personal development [1]. However, the stress caused

by academic and physiological changes makes college students more susceptible to psychological problems and disorders such as depression, anxiety, and self-injury. This can have a serious impact on their social functioning,



additional burden of illness and economic stress [2]. Thus, it is imperative to explore the underlying factors and development mechanisms. In this study, tracking data was used to explore the mechanisms of defeat on the mental health of college students. This aimed to enrich the theory of the development of defeat and mental health in college students and also provide further insight for related interventions.

Defeat, originally derived from the evolutionary theories of depression, refers to a struggle of failure and powerlessness caused by the severe destruction or loss of social status, rank, or identity [3]. It has received increasing attention in recent years as a major factor affecting both physical and mental health [4]. A meta-analysis of the effects of defeat on depression, anxiety, and suicide [5], through a review of 51 empirical studies, found that defeat and entrapment were important risk factors for depression and suicide, in both clinical and non-clinical samples. In a study of the thoughts and ideas that arise during the occurrence of self-injury behavior [6], found that feelings of defeat, self-injury, and despair were most intense during the occurrence of an impulse to self-harm. Wei et al. highlighted that socially defeated individuals, due to self-perceived failure, use drugs, binge-eat, self-injure, and even commit suicide as means of achieving their individual goals, and that the consequences of these behaviors are more severe as the degree and frequency of defeat increases [7,8].

According to the report on national mental health development in China (2019~2020), the detection rate of depression and major depression in Chinese college students in 2020 was 18.5% and 4.2% [9], respectively, with depression as a college student increasing the risk of associated mental illnesses in adulthood [10]. Moreover, Chinese college students have a detection rate of 14%–32% for at least one self-injury [11,12], and international findings show that lifelong suicide detection rates are 17%–18% for this demographic [5]. Suicide has become the second leading cause of death among college students aged 18–21 [13,14]. Suicidal ideation is the most critical factor for predicting suicide as well as for control and intervention, and it has thus been the main focus of research. Furthermore, many studies have shown a high correlation and comorbidity between depression, self-injury, and suicidal ideation [15,16]. Scholars in the field of psychotherapy have also suggested that by identifying high-risk groups and potential protective and risk factors regarding the development of depression, self-injury, and suicidal ideation, researchers could establish more effective preventive intervention systems to reduce adverse outcomes in college students [17,18]. Therefore, the aim of this study is to explore the developmental mechanisms of depression, self-injury, and suicidal ideation in college students and provide empirical support for relevant theoretical and practical interventions.

Academic stress refers to psychological stress and nervousness caused by academic tasks, mainly due to learning outcomes such as exams, competition with classmates, and expectations from parents and teachers [19]. Studies have shown that high academic stress can lead to physiological problems such as high blood pressure and cardiovascular disease [20,21], and it also often leads to

psychological issues such as anxiety and depression [22], and in severe cases, suicidal tendencies [23]. The empirical models of the presage–process–product factors that constitute protection or risk factors in academic stress used to be built [24]. Two statistically acceptable models appeared: one with protection factors and another with risk factors in predicting and preventing academic stress at a university. These results support that focusses on an individual is insufficient, given that there are also contextual factors that predispose academic stress [24]. In a study that investigated physical injury, mental health, and subjective well-being, found that individuals who suffer physical injuries have a higher level of academic stress and a lower subjective well-being [25]. Moreover, Sturman explored two series of studies from an evolutionary perspective, finding that defeat can trigger academic stress and reduce life satisfaction, while victory results in the opposite [26].

Both the interpersonal theories of depression and the functional theory of self-injury indicate that individuals experience more negative interpersonal experiences such as rejection, exclusion, and conflict [27]. Stress can lead to the development of negative self-evaluation and cognitive patterns, resulting in higher psychological crisis behavior such as depression, self-injury, and suicidal ideation. As the degree and frequency of experiencing negative interaction increases, the degree of self-perceived deterioration will continue to increase, thereby increasing the risk of psychological problems and disorders. One study shows that parent–child relationships can buffer the impact of peer stress on the development of depressive symptoms from middle childhood to adolescence and that college students with worse parent–child relationships are more susceptible to peer stress, and thus, developing depression [28]. In a study that used cluster analysis to explore models of college students' self-injury behavior and interpersonal relationships, it was found that individuals in dangerous, hostile relationships exhibit higher levels of self-injury than college students in safe, harmonious relationships [29]. Furthermore, studies have found that warm, stable parent–child relationships act as a protective factor when college students are in the face of stress [30] and that negative life events have a greater impact on self-injury behavior in college students with worse parent–child relationships [31]. In a study exploring the harm to older people caused by policies related to the COVID-19 pandemic, Haley found that social alienation policies during the COVID-19 pandemic exacerbated social isolation, leading to a greater risk of suicide in the elderly [32]. Another study found that individuals with worse peer and student–teacher relationships are at greater risk of depression, self-injury, and suicide when faced with negative environments [33]. Overall, this study suggests that interpersonal relationships can moderate the impact of academic stress on the mental health of college students.

Previous studies have often explored the buffer effect of stress on self-injury in individual interpersonal relationships, either by simply adding multiple relationships or by adding them to a ratio weighting sum, in which there is no absolute standardized ratio between the relationships, and it is often difficult to find heterogeneity between groups [31]. Latent

profile analysis (LPA) explains the relationships between explicit indicators by using intermittent potential class variables [34], and it can also classify the overall interpersonal relationships by measuring multiple relationships. One study investigated the relationships between attachment, basic psychological needs, and type of interpersonal relationships in college students [35]. According to attachment theory and the self-determination theory the three basic psychological needs of relatedness, competence, and autonomy [36,37], Latent profile analysis was used to divide 469 undergraduate students' interpersonal relationships into three categories: Flexible-Adaptive, Exploitable-Subservient, and Hostile-Avoidant. Furthermore, studies have shown that the types of relationships in cancer patients can be divided into four categories: distressed, burdened, fearless about death, and non-distressed [38]. In view of this, this study is intended to use exploratory latent profile analysis to examine the interpersonal relationships of college students, and then to analyze the existence of group heterogeneity.

Aims and hypotheses

Based on the conceptual synthesis presented, the aim of this research was to empirically explore how defeat affects college students' depression, self-injury, and suicidal ideation, and to reveal the mediating and moderating roles of academic stress and types of interpersonal relationships. This study proposes a mediating model that moderates the variable with posterior probability of latent profile analysis (Fig. 1), and will mainly examine four questions:

Hypothesis 1. Defeat is a risk factor for mental health issues in college students.

Hypothesis 2. Defeat is influenced by the mental health of college students through academic stress.

Hypothesis 3. College student interpersonal relationships exhibit group heterogeneity.

Hypothesis 4. Interpersonal relationships can moderate the impact of academic stress on the mental health of college students.

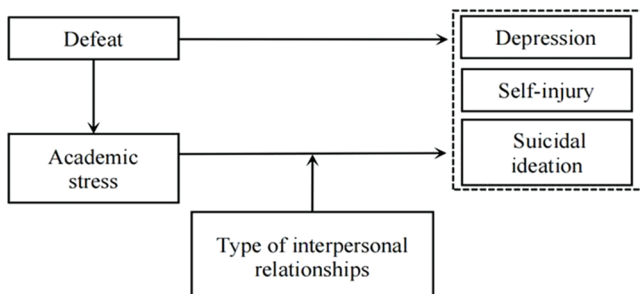


FIGURE 1. Theoretical hypothesis model.

Materials and Methods

Participants

The data for this study were collected via a large survey in China, with students from a city in Shandong province as the participants. A total of 1686 questionnaires

were distributed. Questionnaires were deemed invalid if participants did not answer all the questions if their handwriting was illegible, or if they interrupted the survey. Finally, 74 invalid questionnaires were excluded from analysis and a total of 1612 complete responses were obtained after matching, with a total effective recovery rate of 95.6%.

The average age of the final sample students was 19.64 (SD = 0.62), of which 750 were females (46.5%) and 862 were males (53.5%); 811 had no siblings (50.3%) and 801 (49.7%) had siblings; regarding their parents, 1325 (82.2%) were in their first marriage, 90 (5.6%) were divorced, 66 (4.1%) were remarried, 131 (8.1%) were classified otherwise; regarding economic status, according to the income and economic situation of residents of a city in Shandong Province, China, this study determined that the annual household income of more than RMB 150,000 as “good”, RMB 80,000 to 150,000 as “average”, RMB 50,000 to 80,000 as “not good”, and less than RMB 50,000 as “very bad”. 219 (13.6%) were classed as “good”, 940 (58.3%) as “average”, 21 (1.3%) as “not good”, and 26 (1.6%) as “very bad”.

Instruments

Depression

The short form of the Center for Epidemiological Studies Depression Scale, which is a one-dimensional table compiled by Andresen, has well reliability and validity among college students in China [39]. The SF-CES-D includes 10 items with responses given on a four-point scale from 0 “no or very few” to 3 “most or all”. Summed scores ranged from 0 to 30, with higher scores indicating increased depressive symptoms. The Cronbach’s α coefficient for this questionnaire is 0.78. The results of confirmatory factor analysis suggest strong structural validity with CFI = 0.969, TLI = 0.959, and RMSEA [90%CI] = 0.057 [0.051, 0.062].

Self-injury

The Deliberate Self-Harm Inventory was used to measure self-injury behavior among college students, with well reliability and validity among Chinese college students [40,41]. The DSHI includes nine items with responses given on a six-point scale from 0 “no” to 5 “five times or more”. Summed scores ranged from 0 to 45, with higher scores indicating increased self-injury behavior. The Guttman’s α coefficient for this questionnaire is 0.85. Results from confirmatory factor analysis indicates good structural validity with $\chi^2/df = 2.23$, CFI = 0.99, TLI = 0.96, RMSEA = 0.04, and SRMR = 0.02.

Suicidal ideation

The four-item Depressive Symptom Index-Suicidality Subscale was used to measure the frequency and intensity of suicidal ideation in college students over the past two weeks [42]. It includes four items, with responses given on a four-point scale from 0 “no” to 3 “always”, with higher scores indicating a higher level of suicidal ideation. The Guttman’s α coefficient for this questionnaire is 0.87. The results of confirmatory factor analysis indicate favorable structural validity, as evidenced by $\chi^2/df = 2.445$, RMSEA = 0.041, CFI = 0.89.

Defeat

The Defeat Scale developed by Gilbert et al. [3], and revised by Tang [43], includes 16 items, with responses given on a five-point scale from 1 “completely incompatible” to 5 “complete incompatibility”, assessing the individual’s perception of losing rank and failed struggle over the past seven days. The Guttman’s α coefficient for this questionnaire is 0.87. The results of confirmatory factor analysis indicate favorable structural validity, as evidenced by $\chi^2/df = 7.199$, RMSEA = 0.097, CFI = 0.92.

Academic stress

The academic stress questionnaire, developed by Misra et al. [44], was used to measure academic stress. This questionnaire comprises 42 questions, divided into seven dimensions: the stress of learning prospects, the stress of learning competition, the stress of learning effectiveness, the stress of learning atmosphere, the stress of academic burden, the stress of learning conditions, and the stress of family expectations. It uses a five-point scale, with higher scores indicating increased academic stress. Summed scores ranged from 42 to 210, and the theoretical median of 126 points was used to classify the stress. The Cronbach’s α coefficient for this questionnaire is 0.96. Results from confirmatory factor analysis indicate good structural validity with $\chi^2/df = 1.311$, CFI = 0.993, TLI = 0.992, RMSEA = 0.014, and SRMR = 0.01.

Parent-child relationship

The Parent-Child Intimacy Questionnaire, developed by Buchanan, was used to evaluate the father-child and mother-child relationships [45]. This questionnaire includes nine items, with responses given on a five-point scale from 1 “completely incompatible” to 5 “completely compatible”, with higher scores indicating a stronger relationship between college students and their father or mother. The Guttman’s α coefficient for this questionnaire is 0.86 for the father-child component and 0.85 for the mother-child component. The results of confirmatory factor analysis indicate favorable structural validity, as evidenced by $\chi^2/df = 1.802$, RMSEA = 0.064, CFI = 0.93.

Friendship

The Friendship Quality Questionnaire was compiled by Parker et al. [46]. The questionnaire includes 18 items in six dimensions, with responses given on a five-point scale from 1 “completely incompatible” to 5 “completely compatible”, with higher scores indicating a better friendship. The Guttman’s α coefficient for this questionnaire is 0.81. Results from confirmatory factor analysis indicates good structural validity with $\chi^2/df = 1.608$, CFI = 0.928, TLI = 0.955, RMSEA = 0.041, and SRMR = 0.021.

Teacher-student relationship

Due to the nature of the Chinese teacher-student relationship, the class director is the teacher who communicates with the students most, so this study evaluates the relationship between students and the director of the class to reflect teacher-student relationship [47]. The questionnaire includes eight items with responses given on a five-point scale from 1 “never” to 5 “always”. The Guttman’s α

coefficient for this questionnaire is 0.92. Confirmatory factor analysis was reported to assess the structural validity of the scale with satisfactory fit indices in China [48]: $\chi^2/df = 8.01$, CFI = 0.975, TLI = 0.957, RMSEA = 0.056, and SRMR = 0.034.

Procedure

Data were collected in two stages. In May 2023, the independent variable (defeat) was measured, which was followed by cluster sampling conducted for each class. Informed consent was obtained from the students, parents, and schools for all projects. The student questionnaire was administered by a highly trained psychology teacher and postgraduate student, guaranteeing the collaboration of two master examiners for each class. The same guidelines were used for collective testing, and by the class directors to assist in the investigation. Students were asked to read the questionnaire instructions carefully and answer as requested. After collecting the questionnaires and compensating each participant, a total of 1896 responses were collected. All participants were offered credits as compensation.

Initiated in November 2023, the second stage involved the measurement of mediation (academic stress), moderation (interpersonal relationships), and T2 dependent variables (college student depression, self-injury, and suicidal ideation); a total of 1686 student responses were collected via questionnaires. The study was approved by Academic Ethics Committee at the Shandong Second Medical University (IRB number: 2023YX136). All participants signed the informed consent in this study.

Data analysis

An exploratory factor analysis of all eight questionnaires was conducted using Harman’s single-factor test. AMOS 24.0 was used to analyze the validation factor analysis of the single-factor model. At the same time, latent profile analysis was used to analyze the interpersonal relationships model. The SPSS 26.0 macro procedure PROCESS3.3, prepared by Hayes [49], was used to examine the moderated mediation effect of defeat on the mental health of college students. The $p < 0.05$ indicates significant difference.

Results

Common-method bias test

There is an inevitable problem with common-method bias, as the student data is derived from the subjects self-reporting. Firstly, an exploratory factor analysis of all eight questionnaires was conducted using Harman’s single-factor test, with a principal component analysis (PCA), which shows that the characteristic roots of a total of 16 factors were greater than 1 and the variance explanation rate of the first factor was 20.18% (less than 40% of the critical indicator). Secondly, packing the three -factor loads of the largest entries of each table as the corresponding latent variable indicator, the validation factor analysis of the single factor model using AMOS shows poor model matching: $\chi^2 = 14523.36$, $df = 327$, CFI = 0.36, TLI = 0.27, RMSEA = 0.17, SRMR = 0.13. Finally, the controllable method of latent error variables was used, and without correcting for common-method bias, the nine-factor (parent

TABLE 1

Descriptive statistics and correlative analysis results

Variable	Mean (\pm SD)	1	2	3	4	5	6	7	8	9	10	11	12	13
1-Age	19.64 \pm 0.62													
2-Gender	–	0.02												
3-Only-child status	–	0.05	0.03											
4-Marital status	–	0.03	0.05	0.02										
5-Economic status	–	0.04	0.02	0.01	–0.27**									
6-Defeat	33.04 \pm 11.27	0.04	0.27**	0.18**	–0.40**	–0.29**								
7-Academic stress	38.58 \pm 9.60	0.06	0.29**	–0.20**	–0.21**	–0.41**	0.31**							
8-Depression	18.09 \pm 6.07	0.05	0.31**	–0.23**	–0.31**	–0.19**	0.41**	0.61**						
9-Self injury	3.17 \pm 7.20	0.03	0.20**	–0.25**	–0.21**	–0.25**	0.18**	0.30**	0.48**					
10-Suicidal ideation	2.03 \pm 3.02	0.05	0.19**	–0.16**	–0.27**	–0.28**	0.30**	0.40**	0.61**	0.66**				
11-Father-child relationship	29.79 \pm 8.73	0.07	0.18**	–0.27**	0.21**	0.26**	–0.23**	–0.42**	–0.42**	–0.24**	–0.31**			
12-Mother-child relationship	32.48 \pm 8.42	0.06	0.20**	–0.31**	0.33**	0.19**	–0.25**	–0.41**	–0.40**	–0.23**	–0.31**	0.70**		
13-Friendship	66.34 \pm 13.78	0.08	0.16**	0.17*	0.21*	0.28**	–0.16**	–0.32**	–0.24**	–0.11**	–0.10**	0.34**	0.32**	
14-Teacher-student relationship	32.76 \pm 8.50	0.06	0.26**	0.21*	0.20*	0.31*	–0.27**	–0.26**	–0.27**	–0.23**	–0.25**	0.31**	0.31**	0.18**

Note: 1-Age, 2-Gender, 3-Only-child status, 4-Marital status, 5-Economic status, 6-Defeat, 7-Academic stress, 8-Depression, 9-Self-injury, 10-Suicidal ideation, 11-Father-child relationship, 12-Mother-child relationship, 13-Friendship, 14-Teacher-student relationship; * $r < 0.05$, ** $r < 0.01$.

double-factor) model has better results: $\chi^2 = 1835.61$, $df = 287$, CFI = 0.91, TLI = 0.93, RMSEA = 0.07, SRMR = 0.05. After correcting for common-method bias, the results are as follows: $\chi^2 = 1351.01$, $df = 263$, CFI = 0.94, TLI = 0.92, RMSEA = 0.03, SRMR = 0.02. Therefore, the results show that there were no serious problems caused by common-method bias.

Descriptive statistics and correlation analysis

Table 1 displays the means, standard deviations, and correlation matrix for the variables studied. The results show significant correlations between the core variables, with a better correlation coefficient between 0.1 and 0.7, and the detection rate of at least one self-injury behavior in college students in this study is 33.7%.

According to the results shown in Table 2, there are pairwise correlations between defeat, mental health, academic stress, and interpersonal relationship. Using Model 6 in the SPSS macro-procedure PROCESS, with gender, only-child status, marital status, and economic status as control variables, the mediation effects of academic stress and interpersonal relationship on defeat and mental health of college students were examined. The test results of the regression analysis are shown in Table 2. Defeat can significantly predict perceived stress ($\beta = 0.577$, $t = -24.11$, $p < 0.001$); defeat ($\beta = -0.252$, $t = -8.74$, $p < 0.001$) and perceived stress ($\beta = -0.455$, $t = -15.47$, $p < 0.001$) can significantly predict interpersonal relationship; defeat

($\beta = 0.288$, $t = 13.90$, $p < 0.001$), perceived stress ($\beta = 0.589$, $t = 26.47$, $p < 0.001$), and interpersonal relationship ($\beta = -0.073$, $t = -3.57$, $p < 0.001$) can significantly predict depression levels; defeat ($\beta = 0.365$, $t = 21.37$, $p < 0.001$), perceived stress ($\beta = 0.752$, $t = 41.32$, $p < 0.001$), and interpersonal relationship ($\beta = -0.073$, $t = -4.12$, $p < 0.001$) can significantly predict self-injury levels; defeat ($\beta = 0.427$, $t = 31.52$, $p < 0.001$), perceived stress ($\beta = 0.621$, $t = 37.42$, $p < 0.001$), and interpersonal relationship ($\beta = -0.063$, $t = -3.27$, $p < 0.001$) can significantly predict suicidal ideation.

Interpersonal relationships model: latent profile analysis

Because of the different entries and scales of different interpersonal relationship scales, each scale (50 ± 10) should first be uniformed, then latent profile analysis can be used to examine the interpersonal relationships model. The results (see Table 3) show that entropy in Categories 4, 5, and 6 is greater than 0.8, indicating a better classification effect. Additionally, Category 4 has the highest reduction in ΔAIC , ΔBIC , and $\Delta aBIC$, as well as the highest value of entropy among Categories 4, 5, and 6. Therefore, after a comprehensive consideration of a variety of fitting indicators, the model is best adapted when the interpersonal relationship model of college students is finally determined as four groups.

For further understanding of the relationship between the four group models, Table 4 is a comparison of the four

TABLE 2

Regression analysis among variables

Outcome variable	Predictor variable	R	R ²	F	β	t
Perceived stress	Gender	0.62	0.38	16.49***	-0.079	-3.33**
	Only-child status				0.037	1.55
	Marital status				-0.146	-6.08***
	Economic status				-0.068	-4.31**
	Defeat				0.577	24.11***
Interpersonal relationship	Gender	0.64	0.41	154.09***	0.067	2.86**
	Only-child status				0.007	0.30
	Marital status				0.032	1.33
	Economic status				0.042	3.16**
	Defeat				-0.252	-8.74***
Depression	Gender	0.85	0.73	280.44***	-0.056	-3.51***
	Only-child status				-0.010	-0.61
	Marital status				-0.008	-0.47
	Economic status				-0.047	-2.98***
	Defeat				0.288	13.90***
Self-injury	Gender	0.72	0.52	211.39***	-0.126	-9.23***
	Only-child status				-0.023	-0.97
	Marital status				-0.031	-0.57
	Economic status				-0.052	-3.29***
	Defeat				0.365	21.37***
Suicidal ideation	Gender	0.68	0.43	197.63***	-0.042	-3.29***
	Only-child status				-0.009	-0.51
	Marital status				-0.012	-0.53
	Economic status				-0.052	-3.42***
	Defeat				0.427	31.52***
	Perceived stress				0.621	37.42***
	Interpersonal relationship				-0.063	-3.27***

Note: ** $p < 0.01$, *** $p < 0.001$.

TABLE 3

Fit index of the LPA model

Category	AIC	BIC	Δ aBIC	Entropy	LMR	BLMR	Category probability
1	38477.03	38523.19	38490.87				
2	37647.18	37714.23	37675.79	0.73	817.12***	839.82***	0.35, 0.64
3	37227.36	37315.98	37260.24	0.78	419.69***	431.49***	0.37, 0.11, 0.50
4	37008.62	37129.19	37053.52	0.84	223.56***	229.79***	0.10, 0.05, 0.43, 0.39
5	36809.62	36950.31	36867.25	0.82	204.31***	209.89***	0.11, 0.35, 0.28, 0.22, 0.05
6	36656.37	36828.25	36718.19	0.83	158.30***	162.69***	0.06, 0.03, 0.08, 0.34, 0.21, 0.28

Note: *** $p < 0.001$.

TABLE 4

Comparison of different latent categories in each interpersonal relationship

Items	Father-child relationship	Mother-child relationship	Friendship	Teacher-student relationship	Total average score after merging
Total	50.00 ± 10.00	50.00 ± 10.00	50.00 ± 10.00	50.00 ± 10.00	50.00 ± 7.21
Group 1	34.08 ± 5.25	32.19 ± 5.80	42.80 ± 11.38	43.57 ± 12.03	36.91 ± 5.07
Group 2	35.06 ± 4.47	55.30 ± 5.48	47.11 ± 9.78	47.63 ± 11.09	46.96 ± 4.89
Group 3	48.02 ± 4.59	46.39 ± 5.28	46.21 ± 9.18	48.62 ± 10.13	46.49 ± 3.89
Group 4	59.27 ± 4.68	57.53 ± 4.23	54.42 ± 8.41	53.20 ± 6.89	56.56 ± 3.64
F	1522.48***	1316.42***	77.56***	64.27***	969.58***
Multiple comparison	1, 2 < 3 < 4	1 < 3 < 2 < 4	1 < 2, 3 < 4	1 < 2, 3 < 4	1 < 2, 3 < 4

Note: *** $p < 0.001$.

TABLE 5

Moderated mediating effect test (dependent variable Y1: depression)

Variable	Eq. (1): Depression				Eq. (2): Academic stress				Eq. (3): Depression			
	β	t	p	95%CI	β	t	p	95%CI	β	t	p	95%CI
Gender	0.17	3.49***	<0.001	[0.07, 0.29]	0.22	4.15***	<0.001	[0.13, 0.35]	0.07	1.71	0.09	[-0.01, -0.15]
Only-child status	0.05	0.84	0.34	[-0.07, 0.16]	0.14	2.59**	0.01	[0.03, 0.26]	-0.02	-0.82	0.42	[-0.11, 0.05]
Marital status	0.14	4.07***	<0.001	[0.06, 0.19]	0.09	2.75**	0.01	[0.03, 0.17]	0.06	2.16*	0.03	[0.01, 0.13]
Economic status	0.16	4.19***	<0.001	[0.08, 0.24]	0.12	3.13**	0.002	[0.04, 0.17]	0.07	2.35*	0.02	[0.01, 0.12]
Defeat	0.37	14.58***	<0.001	[0.30, 0.45]	0.27	10.16***	<0.001	[0.24, 0.35]	0.20	9.36***	<0.001	[0.17, 0.26]
Academic Stress									0.63	8.53***	<0.01	[0.46, 0.73]
W1									-0.02	-0.14	0.87	[-0.26, 0.25]
W2									-0.33	-3.84***	<0.001	[-0.48, -0.16]
W3									-0.28	-3.62***	<0.01	[-0.47, -0.13]
M*W1									0.11	0.83	0.42	[-0.13, 0.34]
M*W2									-0.02	-0.25	0.78	[-0.19, 0.14]
M*W3									-0.28	-3.62***	<0.001	[-0.44, -0.13]
R ²			0.19				0.12				0.45	
F			58.96***				33.06***				88.37***	

Note: 1 is "male", 2 is "female"; M is the intermediate variable academic stress; W is the category of interpersonal relationships after virtualization—gender 1, which represents Flexible-Adaptive, Exploitable-Subservient, and Hostile-Avoidant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

groups' latent categories in interpersonal relationships, derived from a single-factor ANOVA analysis. The father-child relationship scores are as follows: Group 1 < Group 2 < Group 3 < Group 4. The mother-child relationship scores are as follows: Group 1 < Group 3 < Group 2 < Group 4. The friendship scores are as follows: Group 1 < Group 2 < Group 3 < Group 4. The teacher-student relationship scores are as follows: Group 1 < Group 2 < Group 3 < Group 4. The combined total score is as follows: Group 1 < Group 2 < Group 3 < Group 4.

Thus, the four categories were named, respectively, as Group 1: the interpersonal-relationship risk group (Group IRR) ($n = 177$, 11%), Group 2: the father-child-relationship high-risk group (Group FCRHR) ($n = 80$, 5%), Group 3: the interpersonal-relationship general group (Group IRG) ($n =$

725, 45%), and Group 4: the inter-personal-relationship dominance group (Group IRD) ($n = 630$, 39%); see Fig. 2.

The impact of defeat on the mental health of college students: a test of mediated effect with moderation

Referring to the test of mediated effect with moderation proposed by Wen et al., all continuous variables were standardized and analyzed by the SPSS macro-procedure PROCESS3.3 [49,50]. Studies have shown that gender, only-child status, parental marital status, and economic status have a significant impact on the mental health of college students, which is why this study incorporates them as a controlled variable in the equation [51]. The dependent variables were depression (Y1), self-injury (Y2), and suicidal ideation (Y3).

TABLE 6

Moderated mediating effect test (dependent variable Y2: self-injury)

Variable	Eq. (1): Self-injury				Eq. (2): Academic stress				Eq. (3): Self-injury			
	β	t	p	95%CI	β	t	p	95%CI	β	t	p	95%CI
Gender	0.32	6.68***	<0.001	[0.12, 0.27]	0.22	4.14***	<0.001	[0.12, 0.35]	0.26	5.13***	<0.001	[-0.07, -0.37]
Only-child status	0.05	0.69	0.47	[-0.06, 0.13]	0.13	2.67**	0.01	[0.03, 0.26]	-0.003	-0.07	0.97	[-0.11, 0.12]
Marital status	0.10	3.21***	<0.001	[0.04, 0.17]	0.09	2.78**	0.01	[0.03, 0.17]	0.06	1.89	0.05	[-0.01, 0.10]
Economic status	0.03	0.41***	0.69	[-0.07, 0.12]	0.13	3.13**	0.002	[0.04, 0.17]	-0.03	-0.88	0.39	[-0.13, 0.04]
Defeat	0.19	6.68***	<0.001	[0.12, 0.25]	0.29	10.11***	<0.001	[0.24, 0.35]	0.09	3.11***	0.001	[0.04, 0.16]
Academic stress									0.42	4.69***	<0.001	[0.24, 0.59]
W1									0.11	0.90	0.37	[-0.16, 0.46]
W2									-0.25	-2.24*	0.03	[-0.46, -0.03]
W3									-0.36	-3.15**	0.002	[-0.56, -0.13]
M*W1									-0.02	-0.15	0.89	[-0.31, 0.26]
M*W2									-0.06	-0.57	0.57	[-0.28, 0.14]
M*W3									-0.36	-3.58**	<0.001	[-0.57, -0.16]
R ²			0.17				0.12				0.16	
F			58.95***				33.03***				20.47***	

Note: 1 is “male”, 2 is “female”; M is the intermediate variable academic stress; W is the category of interpersonal relationships after virtualization—gender 1, which represents Flexible-Adaptive, Exploitable-Subservient, and Hostile-Avoidant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 7

Moderated mediating effect test (dependent variable Y3: suicidal ideation)

Variable	Eq. (1): Suicidal ideation				Eq. (2): Academic stress				Eq. (3): Suicidal ideation			
	β	t	p	95%CI	β	t	p	95%CI	β	t	p	95%CI
Gender	0.27	5.30***	<0.001	[0.18, 0.40]	0.22	4.12***	<0.001	[0.12, 0.34]	0.20	4.36***	<0.001	[-0.12, -0.32]
Only-child status	0.05	0.91	0.37	[-0.06, 0.17]	0.15	2.6**	0.01	[0.03, 0.29]	-0.001	-0.03	0.97	[-0.10, 0.10]
Marital status	0.07	2.89***	0.004	[0.03, 0.18]	0.09	2.73**	0.01	[0.03, 0.18]	0.04	1.39	0.19	[-0.02, 0.10]
Economic status	0.08	2.065***	0.04	[-0.01, 0.15]	0.11	3.15**	0.002	[0.04, 0.17]	0.02	0.56	0.59	[-0.05, 0.07]
Defeat	0.30	11.34***	<0.001	[0.20, 0.39]	0.26	10.13***	<0.001	[0.23, 0.34]	0.17	7.31***	<0.001	[0.14, 0.25]
Academic Stress									0.47	5.37***	<0.001	[0.28, 0.63]
W1									0.12	0.80	0.42	[-0.17, 0.42]
W2									-0.21	-2.17*	0.03	[-0.41, -0.02]
W3									-0.31	-3.39**	0.001	[-0.53, -0.13]
M*W1									-0.03	-0.18	0.84	[-0.32, 0.25]
M*W2									-0.07	-0.79	0.41	[-0.23, 0.11]
M*W3									-0.31	-3.41**	0.001	[-0.50, -0.14]
R ²			0.13				0.12				0.25	
F			37.47***				33.06***				34.09***	

Note: 1 is “male”, 2 is “female”; M is the intermediate variable academic stress; W is the category of interpersonal relationships after virtualization—gender 1, which represents Flexible-Adaptive, Exploitable-Subservient, and Hostile-Avoidant. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In conclusion, as shown in Tables 5–7: Defeat can significantly predict depression, self-injury, and suicidal ideation in college students ($r < 0.001$); Defeat may positively predict academic stress ($r < 0.001$); Defeat, academic stress, interpersonal relationship categories, and interactive terms can dramatically predict depression, self-injury, and suicidal ideation in college students ($r < 0.05$).

The above results indicate that defeat, academic stress, mental health, and interpersonal relationship patterns constitute a moderated mediation model, with academic stress playing a partial mediating effect role in the impact of defeat on mental health, and the interpersonal relationships pattern moderating the latter half of the mediation model. Table 8 lists the mediation effect values, direct effect values,

TABLE 8
Mediating effect of academic stress in different interpersonal relationship types [52]

Dependent variable	Depression				Self-injury				Suicidal ideation			
	Group IRR	Group FCRHR	Group IRG	Group IRD	Group IRR	Group FCRHR	Group IRG	Group IRD	Group IRR	Group FCRHR	Group IRG	Group IRD
Mediating effect value	0.16	0.23	0.16	0.08	0.11	0.12	0.1	0.01	0.12	0.13	0.11	0.03
BootstrapSE	0.03	0.05	0.02	0.02	0.06	0.05	0.02	0.01	0.04	0.03	0.02	0.01
95%CI	[0.11, 0.023]	[0.13, 0.27]	[0.11, 0.20]	[0.07, 0.11]	[0.01, 0.21]	[0.02, 0.21]	[0.06, 0.13]	[0.003, 0.04]	[0.05, 0.20]	[0.004, 0.19]	[0.07, 0.13]	[0.02, 0.06]
Direct effect	0.2				0.09				0.18			
BootstrapSE	0.02				0.04				0.03			
95%CI	[0.16, 0.25]				[0.04, 0.16]				[0.15, 0.25]			
Proportion of mediating effect	44%	47%	42%	31%	58%	54%	53%	19%	41%	38%	33%	18%

and mediation effect ratios for various interpersonal relationship patterns. As the interpersonal relationship score increases (the higher the group, the higher the score), the mediation effect values, and mediation effect ratios decrease.

To better explain the moderating effect, a simple slope test examines the impact of interpersonal relationship

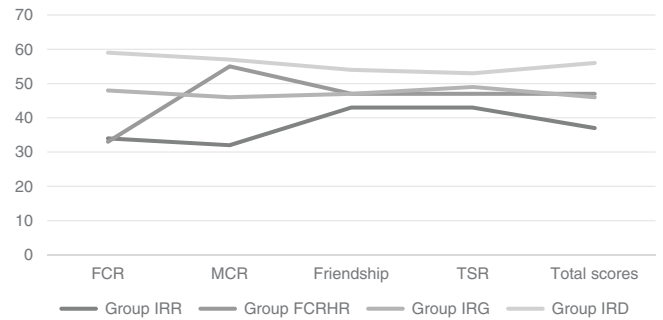
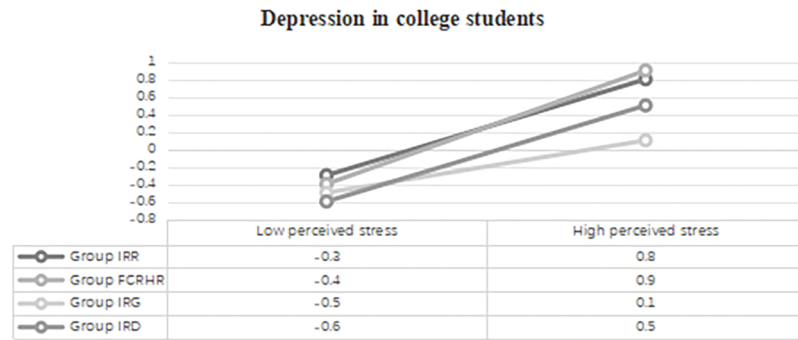


FIGURE 2. Mediating effect of response probability of four latent categories on interpersonal relationships. Note: FCR stands for father-child relationship; MCR stands for mother-child relationship; TSR stands for teacher-student relationship.

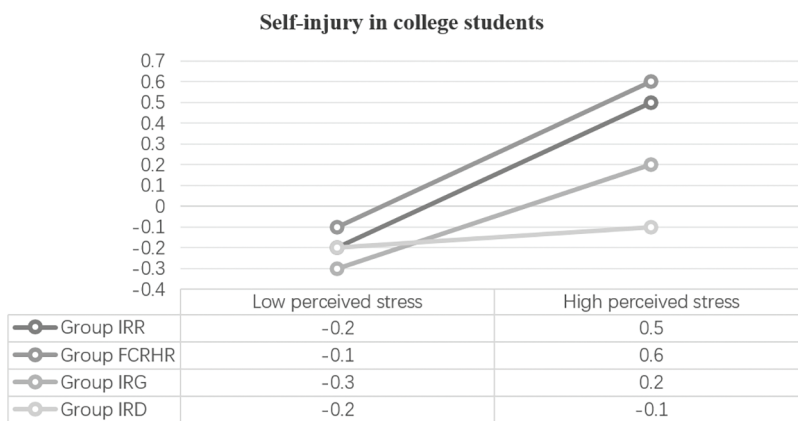
patterns on the rear radius of the mediation model (Fig. 3). The results for depression are as follows: $\beta_{\text{Group IRR}} = 0.61$, $r_{\text{Group IRR}} < 0.001$; $\beta_{\text{Group FCRHR}} = 0.73$, $r_{\text{Group FCRHR}} < 0.001$, $\beta_{\text{Group IRG}} = 0.59$, $r_{\text{Group IRG}} < 0.002$, $\beta_{\text{Group IRD}} = 0.32$, $r_{\text{Group IRD}} < 0.001$. The results for self-injury are as follows: $\beta_{\text{Group IRR}} = 0.41$, $r_{\text{Group IRR}} < 0.001$; $\beta_{\text{Group FCRHR}} = 0.41$, $r_{\text{Group FCRHR}} < 0.001$; $\beta_{\text{Group IRG}} = 0.37$, $r_{\text{Group IRG}} < 0.001$; $\beta_{\text{Group IRD}} = 0.07$, $r_{\text{Group IRD}} = 0.10$; The results for suicidal ideation are as follows: $\beta_{\text{Group IRR}} = 0.45$, $r_{\text{Group IRR}} < 0.001$; $\beta_{\text{Group FCRHR}} = 0.45$, $r_{\text{Group FCRHR}} < 0.001$; $\beta_{\text{Group IRG}} = 0.37$, $r_{\text{Group IRG}} < 0.001$; $\beta_{\text{Group IRD}} = 0.13$, $r_{\text{Group IRD}} = 0.001$. There are differences in the influence of academic stress on depression, self-injury, and suicidal ideation of college students in each group. The overall trend is that as interpersonal relationship scores (total scores) increase, academic stress on college students decreases. In Group IRD, however, academic stress did not predict self-injury in college students.

Discussion

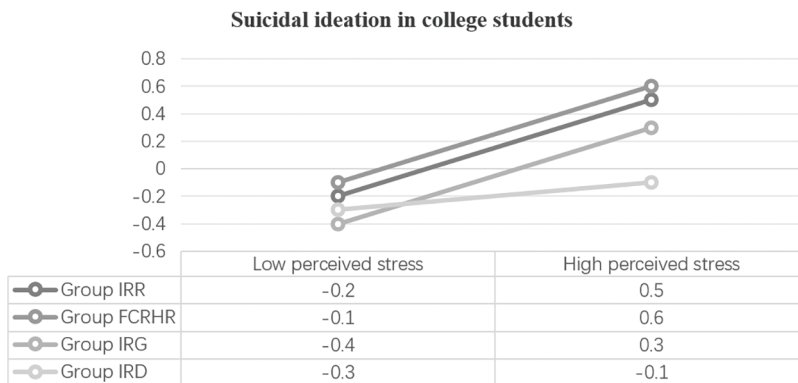
College represents a critical period of personal growth for students. When mental development lags behind physical development, paired with the increasingly brutal competition brought about by social change, college students have a higher risk of developing depression, self-injuring, and experiencing suicidal ideation due to their poor mental tolerance and self-adaptation capabilities [51]. In this article, the results found that (1) defeat is a risk factor affecting the mental health of college students; (2) there are four patterns of student relationships—the interpersonal-relationship risk group, the father-child-relationship high-risk group, the interpersonal-relationship general group and the interpersonal-relationship dominance group; (3) academic stress is a partial intermediary between defeat and depression, self-injury, and suicide



(a) Simple slope plot of the effect of interpersonal categories on academic stress in college students: defeat



(b) Simple slope plot of the effect of interpersonal categories on academic stress in college students: self-injury



(c) Simple slope plot of the effect of interpersonal categories on academic stress in college students: suicidal ideation

FIGURE 3. Simple slope plot of the effect of interpersonal categories on academic stress in college students: defeat (a), self-injury (b), and suicidal ideation (c).

thoughts in college students; and (4) interpersonal relationship models can moderate the latter part of the mediating model—namely the impact of academic stress on depression and suicidal ideation in college students. Specifically, as the interpersonal relationship score increases, the impact of academic stress on the mental health of college students decreases. Early cross-sectional studies have consistently found a high correlation and co-morbidity between depression, self-injury, and suicidal ideation [53,54]. The relationship between depression and self-injury was also tested in a tracking study, and it was found that depression significantly predicts self-injury [55]. Moreover,

studies by Rotenstein et al. have shown that self-injury can also significantly predict depression. A meta-analysis of depression and suicidal ideation rates in 172,016 medical students found that depression is highly correlated and synchronized with suicidal ideation, with similar etiologic factors and consequences [56]. The incidence of at least one self-injury in college students in this study was 33.7%, which was consistent with previous studies [57]. In addition, this study used tracking data to introduce critical risk factors—defeat and academic stress—and used latent profile analysis to explore the group heterogeneity of interpersonal relationships and the developmental mechanisms of

depression, self-injury, and suicidal ideation in college students. Supplementing evidence for related development theory, it has informed the revision of related psychological crisis behavior interventions. In general, the results support the established hypotheses in various aspects.

Firstly, defeat is a risk factor for mental health issues in college student. O'Connor summarized several theoretical and empirical studies of self-injury and suicide and proposed an integrated motivational-volitional model (IMV) [58]. Our results suggested defeat as a factor that seriously affects the development of an individual's physical and mental health and can lead to severe psychological crises such as self-injury and suicidal ideation. A meta-analysis of 10,072 samples from 40 studies found that defeat was strongly associated with depression, anxiety, post-traumatic stress disorder, and suicidal ideation ($r = 0.6$) [59].

Secondly, academic stress, as a process variable, plays a partial mediating effect role in the impact of defeat on the mental health of college students. The results of this study show that defeat can also influence depression, self-injury, and suicidal ideation through academic stress. The cognitive-relational theory of emotion and coping suggests that individual factors have a co-influence on the cognitive assessment of stress, thereby generating subjective stress feelings and physical and psychological stress responses, which leads to psychological problems such as depression, anxiety, self-injury, and suicide [60]. A study that investigated the impact of victory and failure on academic stress and self-regulation in professional esports athletes showed that winners had better heart rate variation responses (greater side-sympathetic neurostimulation) and lower levels of academic stress, while losers showed worse physiological responses and higher stress [61]. In a study examining the impact of smoking rates and mental health factors among female veterans, academic stress was found to mediate the relationship between military trauma and nicotine dependence and significantly predict their quality of mental health [62]. These findings also support those of the above study—that academic stress influences the mental health of college students and can provide guidance for relevant theory and practice. In a real-world situation, a student's experience of defeat, academically or otherwise, can trigger psychological problems; however, it is more important to monitor the stress levels of students, as this is conducive to more-accurate and more-effective early prevention and intervention.

Thirdly, college student interpersonal relationships exhibit group heterogeneity. Interpersonal relationships are directly psychologically linked with interpersonal interaction and are key process factors affecting the physical and mental development of an individual. Positive and healthy interpersonal relationships can significantly improve the social adaptability and health of an individual. On the contrary, negative and dangerous interactions can hinder the normal development of an individual and even lead to serious psychological problems and disabilities [63]. Furthermore, studies have shown that as the opportunity to meet and communicate with people decreased during the COVID-19 pandemic, associated social alienation measures

also reduced individual social exposure and the quality of social relationships and increased the sense of loneliness, thereby leading to more serious mental health problems [64]. Many studies have shown that interpersonal relationships can regulate the level of individual psychological health, but previous studies have often used single-personal or simple-interpersonal relationship scores together, ignoring the characteristics of different types of interpersonal relationships. This study examined the three major relationship types in the lives of college students (parents, peers, and teachers) using latent profile analysis. The group heterogeneity was measured for the following relationship groups: the interpersonal-relationship risk group, the father-child-relationship high-risk group, the interpersonal-relationship general group, and the interpersonal-relationship dominance group. Significant variances were found in the four types of relationships. In the father-child relationship high-risk group, the relationship between the father and his child scores extremely lower than his child with other relationships (mother, peers, and teachers). One possible reason for this is that in a family, the father often plays a strong, authoritative role in raising the child, and that the father is more focused on work, which leads to less communication between father and child, resulting in poorer father-child relationships [65]. Some families believe that "One plays the good guy and the other plays the bad guy in education, while fathers tend to play the bad guy"; however, this mindset can lead to serious consequences. This study suggests that warm, positive parent-child relationships greatly improve the mental health of college students.

Finally, this study used latent profile posterior probability as a moderating variable to investigate its moderating effect in the latter half of the mediation pathway—namely the impact of academic stress on the depression, self-injury, and suicidal ideation of college students. The results show that as the interpersonal relationship scores increase, the impact on the mental health of college students decreases. In the interpersonal relationship dominance group, academic stress could not predict self-injury in college students, suggesting that interpersonal relationships can mitigate the negative impact of stress. Moreover, although the father-child relationship ratio in the father-child relationship high-risk group is higher than that of the interpersonal risk group, the results of the simple slope chart show that the group has a higher risk of psychological crisis, suggesting that the father's impact on the child's mental health may be greater.

In this study, tracking data was used to explore the mechanisms of defeat on the mental health of college students. Latent profile analysis was used to explore the heterogeneity of interpersonal relationship groups in addition to the mediation and moderation of academic stress and type of interpersonal relationship. This aimed to enrich the theory of the development of depression, self-injury, and suicidal ideation in college students and also provide further insight for related interventions. However, it must be noted that the samples in this study, although >1000, are all students at the same college. There is insufficient representation of the sample; therefore, more representative samples using tracking data of multiple time

points should be used in subsequent studies. In addition, while using latent profile analysis to explore group heterogeneity, the specific moderating effect of single-personal relationships was ignored, and the depression interpersonal-relationship model also indicates that interpersonal relationships of individuals suffering from depression also decrease; therefore, the interaction between interpersonal relationships and the psychological health of college students also warrants exploring. And also, with the discovery and advancement of molecular genetics, increasing attention has been given to the impact of the interactions of genes and environmental factors on the mental health of college students, which may be explored using the methodology and psychological methods of research in molecular genetics [51].

The present study provides empirical evidence to the moderated mediation model between defeat, academic stress, interpersonal relationships and mental health of college students, which can be inherent to the global conceptual utility model and to the specific theoretical models hypothesized. It is noteworthy that the state of defeat would be a combined deregulatory behavioral state, including both personal and contextual dysregulation, as a risk factor, associated with psychopathological behavioral dysfunctions such as depression, anxiety, self-injury and thoughts of suicide in future research.

Conclusions

In summary, this study finds that defeat, academic stress, mental health, and interpersonal relationship patterns constitute a moderated mediation model, with academic stress playing a partial mediating effect role in the impact of defeat on mental, health, and interpersonal relationships pattern moderating the latter half of the mediation model. Specifically, as the interpersonal relationship score increases, the impact of academic stress on the mental health of college students decreases. However, in the interpersonal-relationship dominance group, academic stress could not predict self-injury in college students. Interpersonal relationships can buffer the negative impact of academic stress. Efforts should be made to boost interpersonal relationships and educators should pay attention to the defeat and academic stress of college students, as these are crucial factors in the educational and socialization context. The study provides a novel insight for the primary, secondary, and tertiary prevention at the university and enriches the theory of the development of defeat and mental health in college students.

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Availability of Data and Materials: The data presented in this study are available on request from the corresponding author.

Ethics Approval: The study was approved by Academic Ethics Committee at the Shandong Second Medical University (IRB number: 2023YX136). All participants signed the informed consent in this study.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

References

- Hartung PJ. The life-span, life-space theory of careers. *Career Devel Couns.* 2013;2:83–113.
- Judge B, Billick SB. Suicidality in adolescence: review and legal considerations. *Beh Sci Law.* 2004;22(5):681–95. doi:10.1002/bsl.615.
- Gilbert P, Allan S. The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychol Med.* 1998;28(3):585–98. doi:10.1017/S0033291798006710.
- Venzala E, García-García AL, Elizalde N, Delagrangé P, Tordera RM. Chronic social defeat stress model: behavioral features, antidepressant action, and interaction with biological risk factors. *Psychopharmacology.* 2012;224(2):313–25. doi:10.1007/s00213-012-2754-5.
- Taylor PJ, Jomar K, Dhingra K, Forrester R, Shahmalak U, Dickson JM. A meta-analysis of the prevalence of different functions of non-suicidal self-injury. *Journal Affect Disorders.* 2018;227(1):759–69. doi:10.1016/j.jad.2017.11.073.
- Peckham AD, Jordan H, Silverman A, Jarvi Steele S, Björgvinsson T, Beard C. From urges to action: negative urgency and nonsuicidal self-injury in an acute transdiagnostic sample. *Arch Suicide Res.* 2020;24(3):367–83. doi:10.1080/13811118.2019.1625831.
- Wei M, Ku T-Y. Testing a conceptual model of working through self-defeating patterns. *J Couns Psychol.* 2007;54(3):295–305. doi:10.1037/0022-0167.54.3.295.
- Çoban AE. Interpersonal cognitive distortions and stress coping strategies of laate adolescents. *EJER.* 2013;51:65–83.
- Wang YX, Liu YN, Zhai JY. Mental health status and needs of chinese college students. Beijing, China: Social Sciences Academic Press; 2020. p. 94–121.

10. Weersing VR, Jeffreys M, Do MT, Schwartz KT, Bolano C. Evidence base update of psychosocial treatments for child and adolescent depression. *J Clin Child Adolesc.* 2017;46(1):11–43. doi:10.1080/15374416.2016.1220310.
11. Tian X, Yang G, Jiang L, Yang R, Ran H, Xie F, et al. Resilience is inversely associated with self-harm behaviors among Chinese adolescents with childhood maltreatment. *PeerJ.* 2020;8(5):80–3. doi:10.7717/peerj.9800.
12. Yeh MY, Chiang IC, Huang SY. Gender differences in predictors of drinking behavior in adolescents. *Addic Behav.* 2006;31(10):1929–38. doi:10.1016/j.addbeh.2005.12.019.
13. Sherbayevna JN. Adolescent suicide and its prevention. *J Progr Res.* 2024;2(2):5–7.
14. Moorehouse NR. Supporting the emotional wellbeing and mental health of looked after children and young people: multiple perspectives within one London borough (Doctoral Dissertation). University College London: UK; 2022.
15. Tyssen R, Vaglum P, Grønvold NT, Ekeberg O. Suicidal ideation among medical students and young physicians: a nationwide and prospective study of prevalence and predictors. *Journal Affect Disorders.* 2001;64(1):69–79. doi:10.1016/S0165-0327(00)00205-6.
16. Sobowale K, Zhou N, Fan J, Liu N, Sherer R. Depression and suicidal ideation in medical students in China: a call for wellness curricula. *Int J Med Educ.* 2014;5:31–6. doi:10.5116/ijme.52e3.a465.
17. Lau W, Chisholm K, Gallagher MW, Felmingham, Felmingham K, Murray K, et al. Comparing the unified protocol for transdiagnostic treatment of emotional disorders to prolonged exposure for the treatment of PTSD: design of a non-inferiority randomized controlled trial. *CCT.* 2023;33:101–34.
18. Hou H, Liu I, Kong F, Ni S. Computational positive psychology: advancing the science of wellbeing in the digital era. *J Posit Psychol.* 2024;23:1–14.
19. Misra R, Castillo LG. Academic stress among college students: comparison of American and international students. *Int J Stress Manage.* 2004;11(2):132. doi:10.1037/1072-5245.11.2.132.
20. Ahaneku JE, Nwosu CM, Ahaneku GI. Academic stress and cardiovascular health. *Acad Med.* 2000;75(6):567–8. doi:10.1097/00001888-200006000-00002.
21. Chen YH, Liu X, Yan N, Jia WR, Fan Y, Yan H, et al. Higher academic stress was associated with increased risk of overweight and obesity among college students in China. *Int J Env Res Pub He.* 2020;17(15):55–9.
22. Zhang C, Shi L, Tian T, Zhou Z, Peng X, Shen Y, et al. Associations between academic stress and depressive symptoms mediated by anxiety symptoms and hopelessness among Chinese college students. *Psychol Res Behav Ma.* 2022;15:547–56. doi:10.2147/PRBM.S353778.
23. Jiang S, Ren Q, Jiang C, Wang L. Academic stress and depression of Chinese adolescents in junior high schools: moderated mediation model of school burnout and self-esteem. *J Affect Dis.* 2021;29(5):384–9.
24. de la Fuente J. A path analysis model of protection and risk factors for university academic stress: analysis and psychoeducational implications for the COVID-19 emergency. *Front Psycho.* 2021;12:562372. doi:10.3389/fpsyg.2021.562372.
25. Liu S, Lithopoulos A, Zhang CQ, Garcia-Barrera MA, Rhodes RE. Personality and perceived stress during COVID-19 pandemic: testing the mediating role of perceived threat and efficacy. *Pers Individ Differ.* 2021;168:110351. doi:10.1016/j.paid.2020.110351.
26. Sturman ED. An evolutionary perspective on winning, losing, and acceptance: the development of the defeat, victory, and acceptance scale (DVAS). *Pers Individ Differ.* 2019;146:9–19. doi:10.1016/j.paid.2019.03.035.
27. Hepp J, Carpenter RW, Störkel LM, Schmitz SE, Schmahl C, Niedtfeld I. A systematic review of daily life studies on non-suicidal self-injury based on the four-function model. *Clin Psychol Rev.* 2020;82:101888. doi:10.1016/j.cpr.2020.101888.
28. Huang X, Hu N, Yao Z, Peng B. Family functioning and adolescent depression: a moderated mediation model of self-esteem and peer relationships. *Front Psychol.* 2022;13:962147. doi:10.3389/fpsyg.2022.962147.
29. Martinsone B, Stokenberga I, Damberga I, Supe I, Simões C, Lebre P, et al. Adolescent social emotional skills, resilience and behavioral problems during the COVID-19 pandemic: a longitudinal study in three European countries. *Front Psychi.* 2022;13:942692. doi:10.3389/fpsyg.2022.942692.
30. Liu J, Gao Y, Liang C, Liu X. The potential addictive mechanism involved in repetitive nonsuicidal self-injury: the roles of emotion dysregulation and impulsivity in adolescents. *J Behav Addict.* 2022;11(4):953–62. doi:10.1556/2006.2022.00077.
31. van Eldik WM, de Haan AD, Parry LQ, Davies PT, Luijk MPCM, Arends LR, et al. The interparental relationship: meta-analytic associations with children's maladjustment and responses to interparental conflict. *Psychol Bull.* 2020;146(7):553–94. doi:10.1037/bul0000233.
32. Haley C, Mcdaid R. Sudden death of mental health service users during a pandemic; a follow up study of consecutive unexpected deaths during the current pandemic compared to a previous consecutive cohort of persons who took their own lives. *Eur Psychiat.* 2022;65(S1):S838–9. doi:10.1192/j.eurpsy.2022.2171.
33. Van Geel M, Vedder P, Tanilon J. Relationship between peer victimization, cyberbullying, and suicide in children and adolescents: a meta-analysis. *JAMA Pediatr.* 2014;168(5):435–42. doi:10.1001/jamapediatrics.2013.4143.
34. Leena R, Metsäpelto, Pulkkinen L. Personality traits and parenting: neuroticism, extraversion, and openness to experience as discriminative factors. *Eur J Pers.* 2003;17(1):59–78. doi:10.1002/per.468.
35. Wei M, Mallinckrodt B, Arterberry BJ, Liu S, Wang KT. Latent profile analysis of interpersonal problems: attachment, basic psychological need frustration, and psychological outcomes. *J Couns Psychol.* 2021;68(4):467–88. doi:10.1037/cou0000551.
36. Bowlby J, Ainsworth M, Bretherton I. The origins of attachment theory. *Devel Psychol.* 1992;28(5):759–75. doi:10.1037/0012-1649.28.5.759.
37. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *AM Psychol.* 2000;55:68–78. doi:10.1037/0003-066X.55.1.68.
38. Fadoir NA, Marie L, Basu N, Schuler K, Granato S, Smith PN. Exploring interpersonal theory of suicide typologies in patients with cancer: a latent profile analysis. *Death Stud.* 2021;34:1–10.
39. Yang W, Xiong G, Garrido LE, Zhang JX, Wang MC, Wang C. Factor structure and criterion validity across the full scale and ten short forms of the CES-D among Chinese adolescents. *Psychol Assessm.* 2018;30(9):1186–98. doi:10.1037/pas0000559.
40. Gratz KL. Measurement of deliberate self-harm: preliminary data on the deliberate self-harm inventory. *J Psychopathol Behav.* 2001;23:253–63. doi:10.1023/A:1012779403943.
41. Lan T, Jia X, Lin D, Liu X. Stressful life events, depression, and non-suicidal self-injury among Chinese left-behind children:

- moderating effects of self-esteem. *Front Psych.* 2019;10:244. doi:10.3389/fpsy.2019.00244.
42. Joiner Jr TE, Pfaff JJ, Acres JG. A brief screening tool for suicidal symptoms in adolescents and young adults in general health settings: reliability and validity data from the Australian national general practice youth suicide prevention project. *Behav Res Ther.* 2002;40(4):471–81. doi:10.1016/S0005-7967(01)00017-1.
 43. Tang H. Reliability and validity of defeat scale on anxiety and depression in medical students. *J Shanghai Jiao Tong Univ.* 2019;32:84–8.
 44. Misra R, McKean M. College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *Am J Health Stud.* 2000;16(1):41.
 45. Buchanan CM, Maccoby EE, Dornbusch SM. Caught between parents: adolescents' experience in divorced homes. *Child Devel.* 1991;62(5):1008–29. doi:10.2307/1131149.
 46. Parker JG, Asher SR. Friendship and friendship quality in middle childhood: links with peer group acceptance and feelings of loneliness and social dissatisfaction. *Devel Psychol.* 1993;29(4):611–21. doi:10.1037/0012-1649.29.4.611.
 47. Jiang G. Elementary and middle school class environment: structure and measurement. *Psychol Sci.* 2004;27(4):839–43.
 48. Wang SY, Ding W, Song SC, Sun ZX, Xie RB, Li WJ. The effect of peer and teacher-student relationship on academic burnout of vocational high school students: the chain mediating roles of perceived discrimination and self-compassion. *Stud Psychol Beh.* 2023;21(5):691–7.
 49. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. New York: Guilford Press; 2017.
 50. Wen Z, Ye BJ. Moderated mediation model testing: competition or replacement? *Acta Psychol Sin.* 2014;46(5):714–26. doi:10.3724/SP.J.1041.2014.00714.
 51. Hou YF, Xiao R, Yang XL, Chen Y, Peng F, Zhou SG, et al. Parenting style and emotional distress among Chinese college students: a potential mediating role of the Zhongyong thinking style. *Front Psychol.* 2020;11:1774. doi:10.3389/fpsyg.2020.01774.
 52. Bi Y, Ma L, Yuan F, Zhang B. Self-esteem, perceived stress, and gender during adolescence: interactive links to different types of interpersonal relationships. *J Psychol.* 2016;150(1):36–57. doi:10.1080/00223980.2014.996512.
 53. Zubrick SR, Hafekost J, Johnson SE, Sawyer MG, Patton G, Lawrence D. The continuity and duration of depression and its relationship to non-suicidal self-harm and suicidal ideation and behavior in adolescents 12–17. *J Affect Dis.* 2017;220:49–56. doi:10.1016/j.jad.2017.05.050.
 54. Tuisku V, Kiviruusu O, Pelkonen M, Karlsson L, Strandholm T, Marttunen M. Depressed adolescents as young adults-predictors of suicide attempt and non-suicidal self-injury during an 8-year follow-up. *J Affect Disor.* 2014;152:313–9.
 55. Marshall SK, Tilton-Weaver LC, Stattin H. Non-suicidal self-injury and depressive symptoms during middle adolescence: a longitudinal analysis. *J Youth Adolesc.* 2013;42(8):1234–42. doi:10.1007/s10964-013-9919-3.
 56. Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. *JAMA.* 2016;316(21):2214–36. doi:10.1001/jama.2016.17324.
 57. Li CQ, Zhang JS, Ma S, Lv RR, Duan JL, Luo DM, et al. Gender differences in self-harm and drinking behaviors among high school students in Beijing, China. *BMC Public Health.* 2020;20(1):1892. doi:10.1186/s12889-020-09979-6.
 58. O'Connor RC. Towards an integrated motivational-volitional model of suicidal behavior. Hoboken: John Wiley & Sons Ltd.; 2011.
 59. Siddaway AP, Taylor PJ, Wood AM, Schulz J. A meta-analysis of perceptions of defeat and entrapment in depression, anxiety problems, posttraumatic stress disorder, and suicidality. *J Affect Disord.* 2015;184:149–59. doi:10.1016/j.jad.2015.05.046.
 60. Lazarus RS. Progress on a cognitive-motivational-relational theory of emotion. *AM Psychol.* 1991;46(8):819–34. doi:10.1037/0003-066X.46.8.819.
 61. Larsen JT, Peter McGraw A, Mellers BA, Cacioppo JT. The agony of victory and thrill of defeat: mixed emotional reactions to disappointing wins and relieving losses. *Psychol Sci.* 2004;15(5):325–30. doi:10.1111/j.0956-7976.2004.00677.x.
 62. Gross GM, Colon R, Bastian LA, Hoff R. Perceived stress mediates the association between deployment sexual trauma and nicotine dependence in women veterans. *Women Health Iss.* 2020;30(3):214–20. doi:10.1016/j.whi.2020.03.001.
 63. Naslund JA, Aschbrenner KA, Marsch LA, Bartels SJ. The future of mental health care: peer-to-peer support and social media. *Epidemiol Psych Sci.* 2016;25(2):113–22. doi:10.1017/S2045796015001067.
 64. Richardson T, Elliott P, Roberts R. Relationship between loneliness and mental health in students. *J Publ Ment Health.* 2017;16(2):48–54. doi:10.1108/JPMH-03-2016-0013.
 65. Lamb ME, Lewis C. The development and significance of father-child relationships in two-parent families. *Role Fath Child Devel.* 2010;5(94):153.