



# Benevolent Childhood Experiences and Depressive Symptoms Among Chinese Undergraduates: A Moderated Mediation Model Examining the Roles of Uncertainty Stress and Family Relationship

## OPEN ACCESS

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**Background:** The evidence on the association between benevolent childhood experience (BCE) and depressive symptoms in students is complex. This study aims to explore the underlying mediation mechanism of BCE toward depressive symptoms and whether this link was moderated by the family relationship among Chinese undergraduates.

**Methods:** From March 2021 to May 2021, a cross-sectional study was conducted in China, and 1821 undergraduates were recruited in this study. Participants were asked to complete a self-reported electronic questionnaire. The software SPSS PROCESS macro was used to test the mediation and mediated moderated modeling analysis.

**Results:** Mediation analysis indicated that uncertainty stress (US) partly mediated the link between BCE and depressive symptoms (indirect effect =  $-0.47$ , 95% bootstrap CI =  $-0.55$ ,  $-0.39$ ). The indirect effect of the US accounted for 39.63% of the total variance in depression. Moderation analysis indicated that the association between the US and depressive symptoms was significantly modified by family relationships (interact effect =  $-0.019$ ,  $P < 0.001$ ). An integrative moderated mediation analysis indicated that the indirect effect from BCE to depressive symptoms through the US was also moderated by family relationships (interact effect =  $-0.012$ ,  $P = 0.014$ ).

**Conclusion:** Uncertainty stress plays a key role in bridging BCE and depressive symptoms while the family relationship can buffer the impact of the US on depressive symptoms among Chinese undergraduates. Enhancing tolerance of uncertainty and improving family relationships are needed to protect undergraduates from depressive symptoms.

**Keywords:** benevolent childhood experiences, depressive symptoms, uncertainty stress, family relationship, undergraduates

## INTRODUCTION

### The Depressive Symptoms of Undergraduate Students as a Growing Concern

Depressive disorder is a worldwide problem, as well as the most common mental health problem. The existing study indicated that depressive symptoms with a lifetime prevalence of 16.2% and a one-year prevalence of 6.6% among the general population (1). A systematic review showed that about 19.6–30.6% (2–4) of undergraduates suffered from depressive symptoms, which is higher than the prevalence in the general population (1). A meta-study indicated that all of the gender, family origin, academic grade, only-child, ethnic group, education of parents, left-behind experiences on childhood (3), and economic condition (5) are risk factors of Chinese college students. Students suffering from depressive symptoms may adversely affect their academic performance (6), quality of life (6) and even lead to suicidal ideation (7).

‘Adverse childhood experiences (ACE) have been defined as ‘potentially traumatic events or chronic stressors that occur before the age of 18 and are uncontrollable to the child’ (8), such as sexual abuse, emotional abuse, and so on, which has a positive association with depressive symptoms (9–11). However, ACE is not the only form of early experience that has long-term associations with mental health outcomes (12), the impact of benevolent childhood experiences (BCE) on depressive symptoms was also gradually focused on by many researchers (13).

### BCE and Depressive Symptoms: A Confirmed Link

Contrary to the early negative effects of ACE, BCE represents the positive early experiences under 18 years old (14), including growing up with at least one safe caregiver, having one or more close friends, and having a predictable home routine, etc. (13, 14). To date, most studies related to BCE were carried out in developed countries (15–17), while there are no studies conducted in Asia. Influenced by traditional Chinese cultural concepts and parents’ work pressure, Chinese children receive more intergenerational education (18), which makes their BCE worth watching. Findings suggested that BCE may have lifelong consequences for mental health (19) and physical health (15, 20). One cross-sectional study shows that the high level of BCE can buffer the negative effects on the mental health caused by ACE (21). Moreover, other studies indicated that BCE can also predict better adult mental health dependently (13, 14, 19, 21). Although these studies have confirmed the association between BCE and depressive symptoms, however, the underlying mechanisms underlying the association between childhood experiences and adult mental health are multifactorial and complex. So far, little empirical research has been done to explore the underlying mechanism of how BCE is related to depressive symptoms among undergraduates in China.

### BCE, US, and Depressive Symptoms: A Mediation Pathway

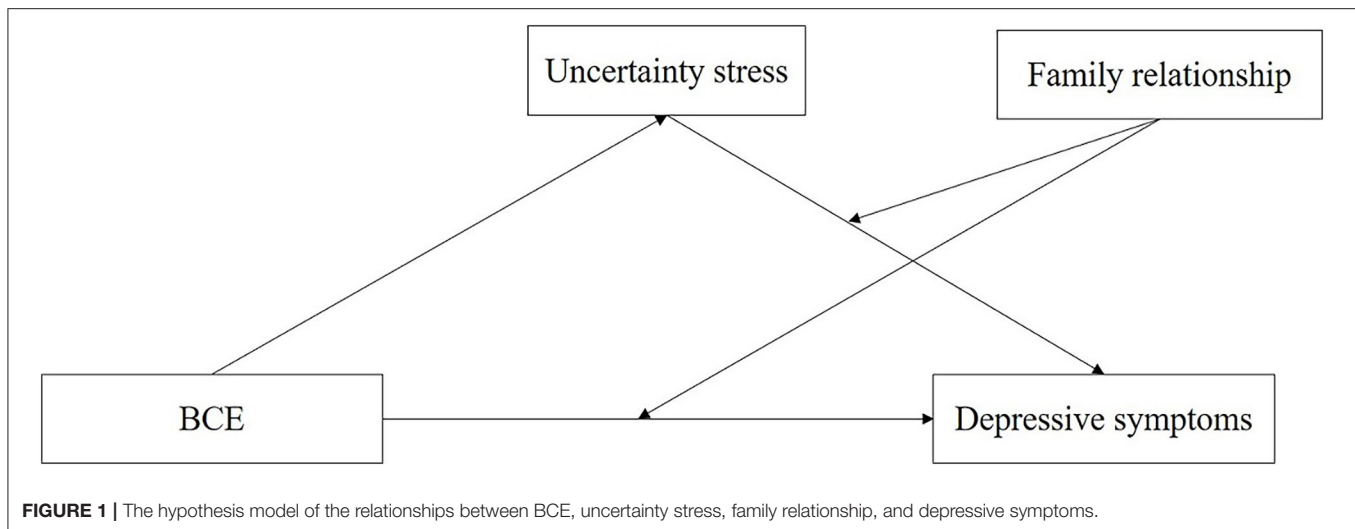
Uncertainty stress (US) refers to the stress caused by the condition of being unsure about someone or something (22). As we all know that university students are more prone to experience high levels of uncertainty stress (23), not only including future uncertainty but also current uncertainty, for example, rapid socio-economic transition, increased job competition, immature social values, and feelings of social anomie (24, 25), which are collectively known as uncertainty stress (US). China is now one of the world’s fastest-growing economies (26), many policies were also changed in recent years in China. For example, the one-child policy has been abolished by the Chinese government (27), China is still expanding enrollment at universities (28). All these changes not only reflect a dramatic change in the social environment but also may have an impact on the psychological characteristics of university students in China (3). The rapid change of the social environment and the fierce competition for jobs and the uncertainty of the future all lead to the Chinese and Chinese college students becoming the biggest victims of the pressure of uncertainty stress (29, 30).

Research indicated that uncertainty cues can arouse higher stress than certainty cues (31). Due to the traditional culture, Chinese college students are more intolerant of ambiguous states and regard uncertainty as a threatening and unacceptable presence (32, 33). A cross-sectional study found that Chinese university students who suffer from US (19.6%) are higher than life stress (11.5%) (25), and uncertainty stress had a more negative influence and adverse consequences on college students’ mental health than life stress (34), which might be a unique precursor to depressive symptoms (34). The association between US and mental problems has been well established in Chinese another study (35). Although the association between the US and depressive symptoms has been well established in these studies, however, there is currently not much evidence that uncertainty stress links BCE to depressive symptoms.

The stress sensitization model (36) proposed that stressful life events that occurred in the past year may serve as a trigger in the pathways from childhood experience to adulthood mental disorders (37, 38), and the stress sensitization effect was strong among people with multiple childhood adversities (37). We speculate that BCE could reduce the perception of stress events, and reduce the risk of the US turning into depressive symptoms. Doom et al. also made a point that the stressor will influence the relationship between childhood experiences and current mental health problems (13). To sum up, we hypothesis that BCE can affect depressive symptoms through a mediation pathway of US among undergraduates.

### Potential Role of Family Relationship in Moderating the Association Between BCE and Depressive Symptoms

Family relationship, including child-parent relationship, parent relationship, and family climate, which has been suggested as the main predictors of depressive symptoms among child



(39, 40). All of the less warmth, more inter-parental conflict, over-involvement in the family can cause a higher risk of depression (41). Attachment theory proposed that the close relationship between parents and child serves as affective support and a safe base, which could contribute to multiple aspects of psychosocial adaptations (42). This implies that better family relationships could shape a person's beliefs about the acceptability and expression of emotions when they encounter the US, preventing the US switch to depressive symptoms (42). In addition, the change of family and household could arouse the relapse into episodes of mental problems which recovered from stress events before (43). This suggests that the family relationship may have a protective effect prevent the US switch to mental problems. The family relationship can also provide a foundation for creating better BCE (44), which implies that family relationships could strengthen the protective effect for depressive symptoms. Therefore, we assumed that family relationship moderates the linkage between uncertainty stress and depressive symptoms which mediate the association between BCE and depressive symptoms.

To date, none of the studies constructed an integrative moderated mediation model to explore the underlying mechanism between BCE, US, and depressive symptoms, as well as the effects of family relationships. To bridge these knowledge gaps, our research investigated BCE, US, and depressive symptoms in a random sample of undergraduates in China, and tested whether: (1) US mediate the link between BCE and depressive symptoms; (2) Family relationship moderates the link between BCE and US, as well as the link between the US and depressive symptoms (See **Figure 1**). Basic characteristics and variables that may affect the outcome variables were used as control variables.

## METHODS

### Study Design and Data Collection

From March 2021 to May 2021, a cross-sectional study was conducted among undergraduate students in three cities

(Xuzhou, Nanjing, and Wuhan), China, by using an online survey platform ([www.wjx.com](http://www.wjx.com)). Undergraduate students were randomly selected from a total of 25 universities by using a stratified multistage cluster sampling method. First, a stratified sampling method was used to select schools by taking the school levels as the indicators. A total of 25 universities were selected. In each university, a stratified (according to the majors) random sampling method was used to select the classes, and cluster sampling was then used in each class. A questionnaire guider accepted train before the survey was set in every class. Completion of the questionnaire was voluntary, no incentive was provided, and anonymity was assured. Among 2022 undergraduate students who completed the questionnaire, 201 were excluded because of the not reliable answers or timeout answers (<100 s). Finally, a total of 1,821 participants were included in our study with an effective response rate of 90.06%.

The Ethics Committee of Xuzhou Medical University has reviewed and approved the study protocol.

## ASSESSMENT

### Basic Characteristics

Information regarding the participants' gender, age, grade, sibling, ethnicity and residence, parent's marriage and education, living expenses, sexual orientation, and academic performance were asked to understand the characteristics of the participants.

### Benevolent Childhood Experiences

Benevolent childhood experience (BCE) was measured by the BCEs scale (14) which includes 10 items of positive childhood experiences occurring before 18 years old. Items include (1) having at least one safe caregiver, (2) having at least one good friend, (3) having beliefs that gave comfort, (4) enjoying school, (5) having at least one teacher who cared, (6) having good neighbors, (7) having an adult (not a parent/caregiver) who could provide support or advice, (8) having opportunities to have a good time, (9) having a positive self-concept, and (10) having a predictable home routine. Each "Yes" response was scored as a

**TABLE 1 |** Sociodemographic characteristics of undergraduate students ( $n = 1,821$ ).

Characteristics	Frequency (Mean)	Percentage (SD)
Age <sup>a</sup>	20.07	1.24
Gender <sup>b</sup>		
Male	556	30.53
Female	1,265	69.47
Grade		
Freshman	279	15.32
Sophomore	831	45.63
Junior	668	36.68
Senior	43	2.36
Only-child		
Yes	910	49.97
No	911	50.03
Ethnicity		
Ethnic Han	1,768	97.09
Ethnic minorities	53	2.91
Residence		
Urban	1,031	56.62
Rural	790	43.38
Parents divorced		
Yes	1,668	91.60
No	153	8.40
Father education		
Junior high school or below	793	43.55
Senior high school	586	32.18
College	421	23.12
Master or doctor	21	1.15
Mother education		
Junior high school or below	954	52.39
Senior high school	532	29.21
College	319	17.52
Master or doctor	16	0.88
Sexual orientation		
Heterosexual	1,630	89.51
Homosexual	40	2.20
Bisexuality	108	5.93
Other	43	2.36
Fail in exam within a year		
Yes	325	17.85
No	1496	82.15
Living expenses (yuan)		
≤1000	92	5.05
1001–2000	1441	79.13
2001–3000	227	12.47
≥3000	61	3.35

<sup>a</sup>Below data are shown as mean (SD).

<sup>b</sup>Below data are shown as  $n$  (%).

one and a “No” response answer as a 0. A total score of BCEs was summed by 10 items (range = 0–10), and the higher score reflects more positive childhood experiences. The Cronbach's  $\alpha$  of the scale was 0.729 in the present study.

## Uncertainty Stress

The US Questionnaire is a measure of uncertainty stress and has shown good reliability and validity (34, 45). The scale consists of four subscales (10 items) including current status uncertainty, social change uncertainty, goal uncertainty, and social value uncertainty. The items were rated on a standard 5-point Linkert rating scale from 0 (no stress) and four (excessive stress). A total stress score was summed by every single item score. A higher score indicates a high level of stress. The Cronbach's  $\alpha$  of the scale was 0.951.

## Family Relationship

Family relationship was measured by four questions that individuals self-reported the relationship in family and the family atmosphere. Items include: (1) The relationship with father, (2) The relationship with mother, (3) The relationship between parents, (4) The atmosphere in the family. The scale was rated on a standard 4-point Linkert rating scale from one (very discordant) and four (very harmonious). The score of each four items was summed up to calculate the total score. A higher score indicated a better family relationship. In this current sample, the Cronbach's alpha for the Family relationship was 0.866.

## Depressive Symptoms

Depressive symptoms in the past week were measured by a 10-items questionnaire (Center for Epidemiologic Studies Depression [CESD]-10), which is a short version of the CESD-20. The scale was rated on a Linkert rating scale from 0 (rarely or none of the time, < 1 day) and three (all the time, 5 to 7 days). Item five and Item eight are scored inversely. The total score of 10-items is calculated to assess the depressed mood, the higher score represents the higher depressive symptoms (46, 47). The Cronbach's  $\alpha$  of the scale was 0.869 in the current study.

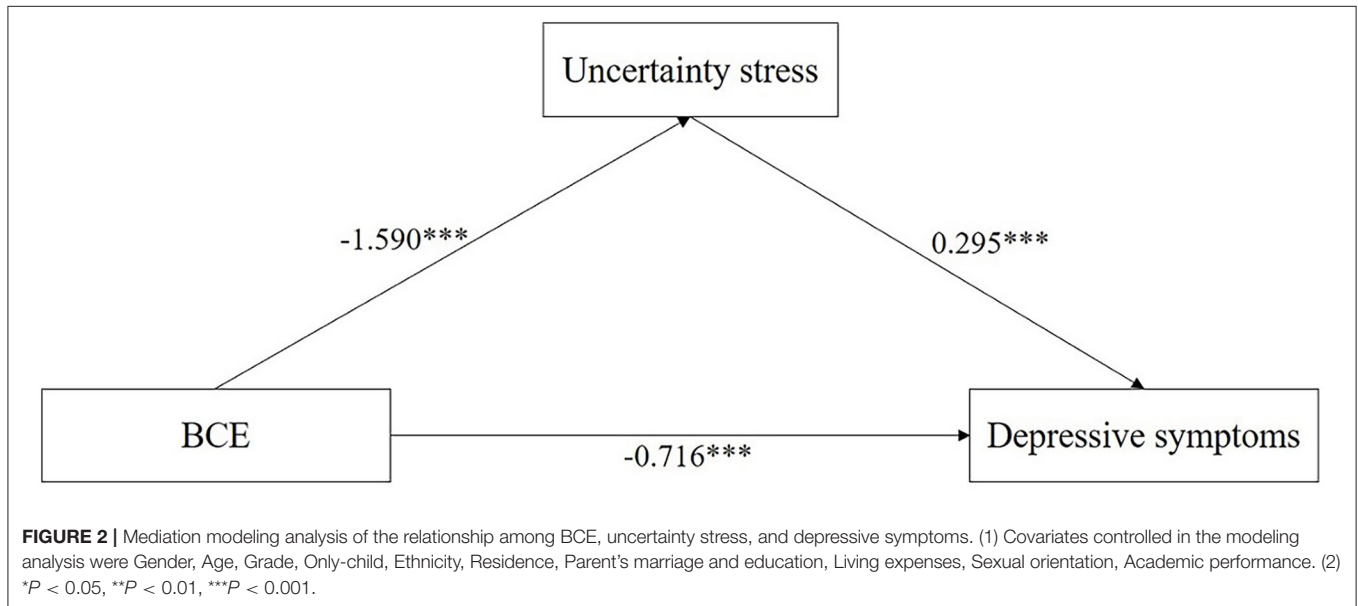
## Data Analyses

Descriptive analyses of the participants' demographic characteristics and Spearman's correlation analysis of BCE, US, Family relationship, and depressive symptoms were calculated by using SPSS 25. We used Process version 3.5 (48, 49) based on SPSS 25 (IBM Corporation, Armonk, NY, USA) to test the mediation model, moderation model, and moderated mediation model. We conducted a mediation analysis following Baron and Kenny's approach (50). Bootstrapping method (48) based on 5,000 bootstrap samples was used to estimate the confidence interval (CI) for the indirect effect and assess the significance of estimated indirect effects. A moderation analysis was conducted to test the moderation effect of the family relationships on the link between BCE and depressive symptoms, as well as the link between the US and depressive symptoms. Finally, we performed an integrative moderated mediation analysis to test the role of family relationships in moderating the purported mediation model. Significant at  $P \leq 0.05$  (two-sided) were included as controls in all statistical analyses. In addition, covariates were controlled in all main analyses, such as gender, age, grade, only-child, nation, residence, parent's marriage, and education, living expenses, sexual orientation, and academic performance.

**TABLE 2** | Correlation between BCE, uncertainty stress, family relationship, and depressive symptoms among adolescents.

Variables	Mean	SD	1	2	3	4
1. BCE	18.67	1.78	1.000			
2. Uncertainty stress	23.19	9.03	-0.388**	1.000		
3. Family relationship	13.94	2.21	0.307**	-0.260**	1.000	
4. Depressive symptoms	17.57	5.93	-0.461**	0.612**	-0.316**	1.000

(1) Date (*r*) is correlation coefficient: \*\* $P < 0.01$ .



## RESULTS

### Sociodemographic Characteristics

As is shown in **Table 1**, a total of 1,821 undergraduates completed the surveys. Of all the participants, most of them are female (69.47%) and ethnic Han (97.09%). The average age was 20.07 and about 82.31% of respondents are in the sophomore year and junior year. About half (50.03%) of participants have a sibling and 56.62% of participants come from urban, while 43.38% come from rural areas. Only 153 (8.4%) participants' parents divorced and a majority of participants' parents have a junior high school or below degree (43.55 and 52.39%, respectively). Most of the participants are heterosexual (89.51%). Regarding academic performance, 82.15% of participants didn't fail the exam within a year while 17.85% of participants failed the exam within a year. Finally, 1,441 (79.13%) respondents spent 1,001–2,000 yuan within a month.

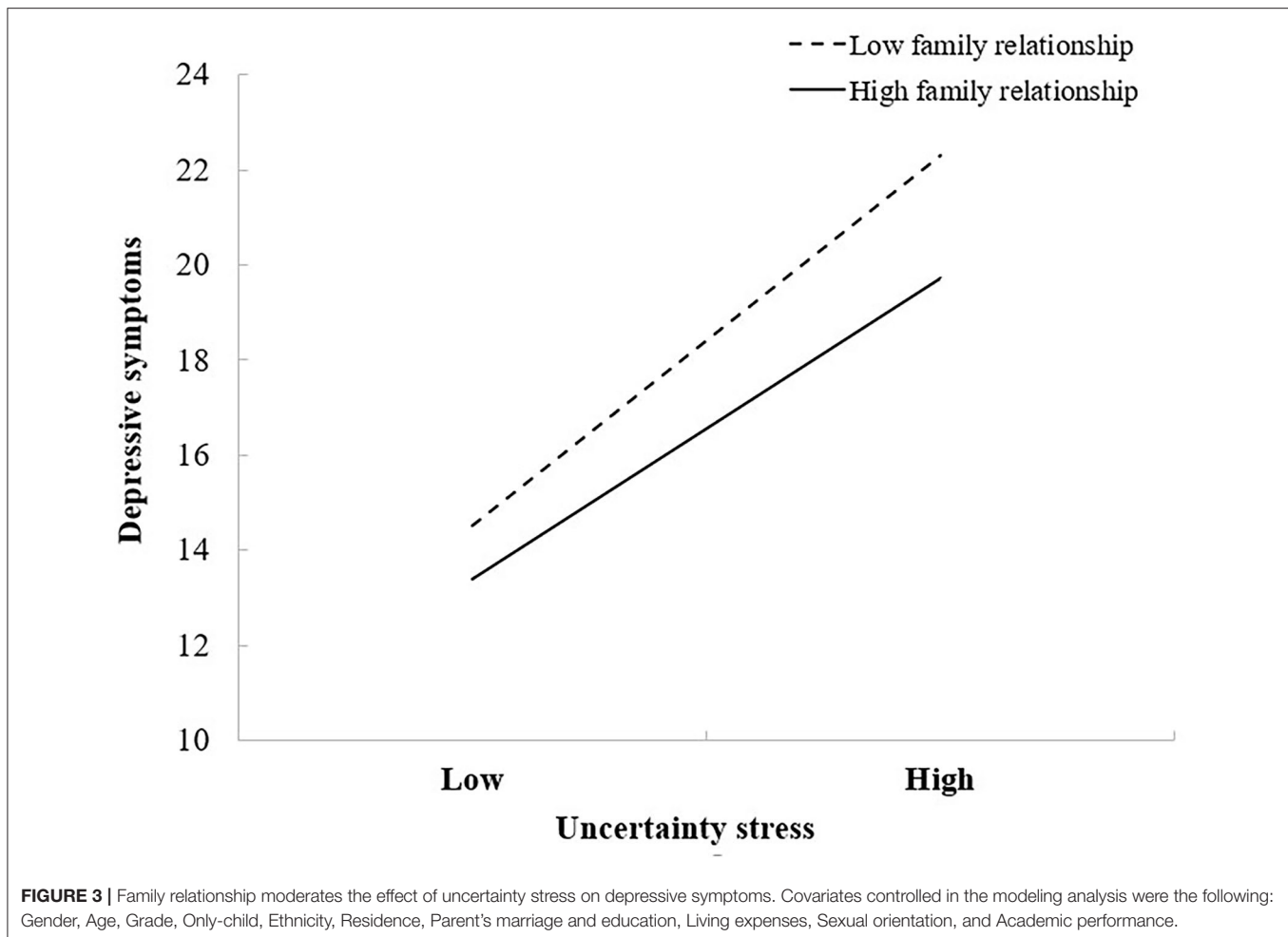
### Preliminary Correlation Analyses

**Table 2** shows the results of Spearman's correlational analyses, which indicate that BCE was negatively associated with US ( $r = -0.388$ ,  $P < 0.01$ ) and depressive symptoms ( $r = -0.461$ ,  $P < 0.01$ ). While the US was positively associated with depressive symptoms ( $r = 0.621$ ,  $P < 0.01$ ) and negatively associated with family relationships ( $r = -0.26$ ,  $P < 0.01$ ). Moreover, the

family relationships were negatively associated with depressive symptoms ( $r = -0.316$ ,  $P < 0.01$ ) and positively associated with BCE ( $r = 0.307$ ,  $P < 0.01$ ). These results support further test of mediation and moderated mediation models while controlling for covariates.

### Mediation Modeling Analysis

A mediation model analysis was established to examine the association between BCE, US, and depressive symptoms followed by the results of correlation analyses. **Figure 2** illustrated the mediation model, along with standardized path coefficients which indicates that BCE was significantly associated with the US ( $\beta = -1.59$ ,  $P < 0.001$ ), and depressive symptoms ( $\beta = -0.72$ ,  $P < 0.001$ ) when controlled for covariates. In addition, the results of the non-parametric bootstrapping method suggested that the US has a significant indirect effect in mediating the association between BCE and depressive symptoms (effect =  $-0.47$ , 95% bootstrap CI =  $-0.55$ ,  $-0.39$ ). The direct effect of BCE on depressive symptoms was also significant (effect =  $-0.71$ , 95% bootstrap CI =  $-0.83$ ,  $-0.6$ ), indicating a partial mediation of the depressive symptoms when controlled for covariates. The indirect effect of the US accounted for 39.63% of the total variance in depression. These findings are consistent with our hypothesis that the US may play a mediator role in the association between BCE and depressive symptoms.



## Moderation Analysis

Only a significant interaction between US and family relationship in predicting depressive symptoms was found in results of moderation analysis ( $\beta = -0.019$ ,  $P < 0.001$ ), while the interaction between BCE and family relationship in predicting depressive symptoms was insignificant ( $\beta = 0.008$ ,  $P = 0.773$ ). We calculated the simple slopes using the “pick-a-point” approach (51) to examine the changes in the relationship between the US and depressive symptoms with the increase of family relationships. We used the one standard deviation below and above mean to represent the “Low” and “High” levels of family relationships and the US, respectively. Results in **Figure 3** illustrates the different slopes associated with different levels of family relationship, as family relationships increased, the effect of US on depressive symptoms decreased: the simple slopes were 0.351 and 0.432 ( $P$ s  $< 0.001$ ) at low and high levels of family relationship.

## Moderated Mediation Analysis

**Table 3** and **Figure 4** suggested a significant moderated mediation model:  $R^2 = 0.577$ ,  $F = 128.927$ ,  $P < 0.001$ . The results indicate that the interaction term (BCE\*Family relationship) was not significant ( $\beta = 0.011$ ,  $P = 0.659$ ) while the interaction

term (US\*Family relationship) was significant ( $\beta = -0.012$ ,  $P = 0.014$ ), which means Family relationship significantly moderated the association between the US and depressive symptoms while the moderation effect of Family relationship on the link between BCE and depressive symptoms was not statistically significant. In addition, the conditional indirect effect of family relationship range low (1 SD below the mean) to the high level (1 SD above the mean) indicated that the indirect effects of BCE on depressive symptoms through the US were significant across the levels of family relationship. When the family relationship increased from  $-0.255$  (1 SD below the mean) to  $2.055$  (1 SD above the mean), the indirect effect of US on depressive symptoms changed from  $-0.504$  to  $-0.423$ . Moreover, all of low ( $\beta = -0.504$ , 95% CI  $-0.603$ ,  $-0.414$ ), moderate ( $\beta = -0.462$ , 95% CI  $-0.544$ ,  $-0.387$ ), and high ( $\beta = -0.423$ , 95% CI  $-0.513$ ,  $-0.343$ ) level of family relationship significantly moderated the association between BCE and depressive symptoms.

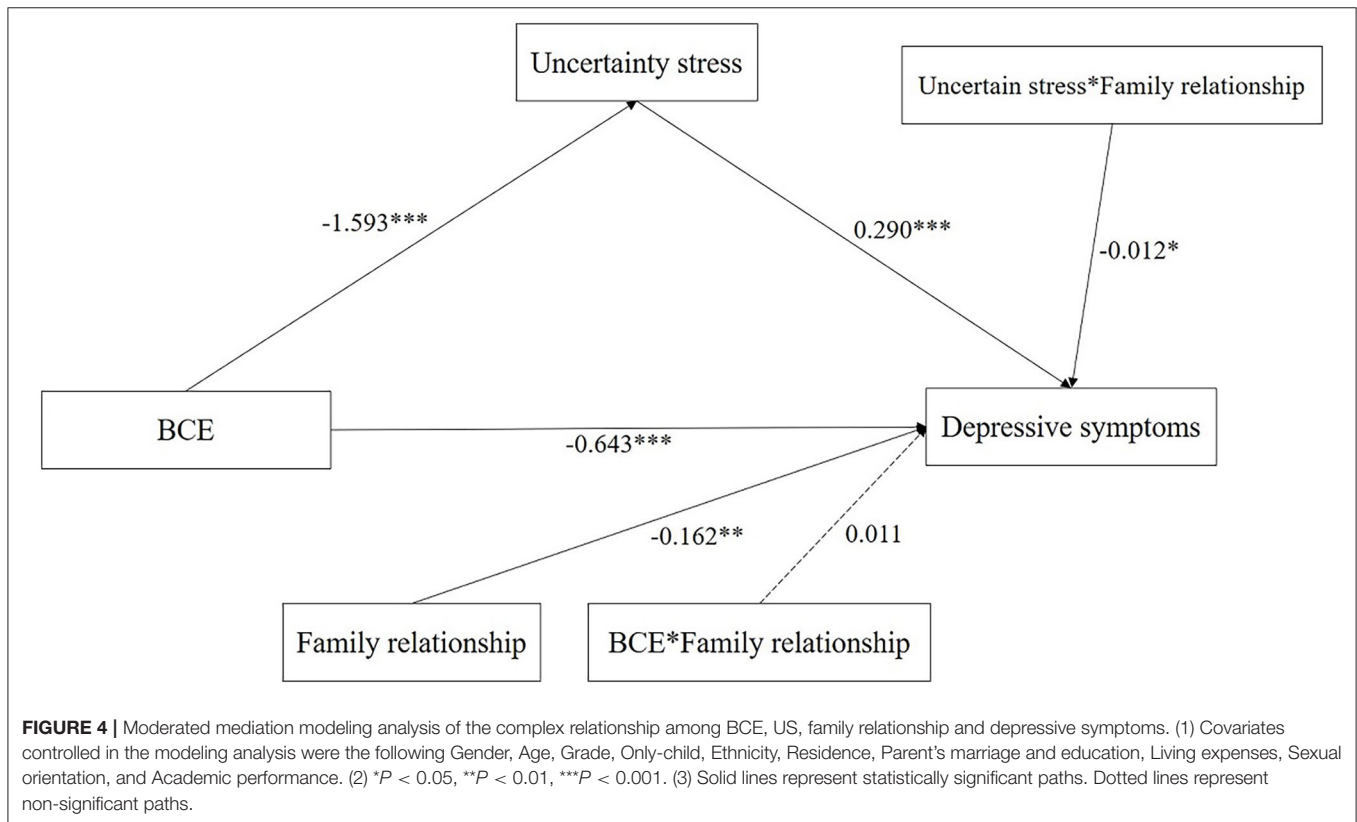
## DISCUSSION

To our knowledge, our research is the first study focusing on the underlying mechanisms of BCE, US, and depressive

**TABLE 3 |** Regression coefficients predicting depressive symptoms, family relationship as moderator (moderated mediation model).

Explanatory variables	Uncertainty stress				Depressive symptoms			
	$\beta$	SE	<i>t</i>	<i>P</i>	$\beta$	SE	<i>t</i>	<i>P</i>
BCE	-1.593	0.114	-13.939	<0.001	-0.643	0.064	-10.030	<0.001
Family relationship					-0.162	0.048	-3.390	<0.001
Uncertainty stress					0.290	0.012	25.272	<0.001
BCE*Family relationship					0.011	0.025	0.441	0.659
Uncertainty stress *Family relationship					-0.012	0.005	-2.469	0.014
Model summary	$R^2 = 0.222, F = 34.310, P < 0.001$				$R^2 = 0.577, F = 128.927, P < 0.001$			
Conditional indirect effect of BCE on depressive symptoms								
Mediator	Family relationship	$\beta$	Boot SE	Boot LLCI	Boot ULCI			
US	-2.055	-0.504	0.049	-0.603	-0.414			
	0.000	-0.462	0.040	-0.544	-0.387			
	2.055	-0.423	0.044	-0.513	-0.343			

(1) Covariates controlled in the modeling analysis were the following: Gender, Age, Grade, Only-child, Ethnicity, Residence, Parent's marriage and education, Living expenses, Sexual orientation, and Academic performance. (2) SE, standard error; LLCI, lower levels for confidence interval; ULCI, upper levels for confidence interval.



symptoms. Our study finds that BCE has a negative effect on depressive symptoms, which is consistent with the previous study (19, 21, 52). Besides, our research indicates a partial mediation effect of US from BCE to depressive symptoms. Moreover, the family relationship has a significant moderated mediation effect on the indirect relationship from BCE toward depressive symptoms, while the moderated mediation effect of the family relationship on

the direct relationship from BCE toward depressive symptoms is insignificant.

### The US as the Underlying Mechanism for the BCE-Depressive Symptom's Link

As hypothesized, we found BCE was negatively associated with the US, which in turn buffer the depressive symptoms. The mediating effect of the US might be attributed to

the following reasons. Coping resources theory proposes that coping with stress must be based on good resources, either individual resources (self-esteem, self-efficacy, etc.) or social resources (social support) (30, 53). BCE can increase the acceptance of adult psychosocial resources (54) and social support (13) and then enhance the ability to manage stress, thus reducing the risk of uncertainty stress (55). Secondly, BCE may promote life meaning and strengthen the ability of self-mastery (56), which can help individuals cope with stress and strain (57–59). What's more, our findings indicate that the increase of US can deteriorate the extent of depressive symptoms (60), which is consistent with the previous study (60). In certain situations, the US may become be an obstacle in school study (61), and arouse irrational action in other situations among undergraduates (62). Both situations can contribute to depressive symptoms of undergraduates (63).

Because the future is inherently uncertain, so human beings are always faced with uncertainty. There is no need to treat all uncertainty as a monster. It is severe uncertainty that needs to be prevented and managed. Individuals should develop confidence, give hope, need information, develop skills to cope with uncertainty, etc. (30). Enhance tolerance of uncertainty has been proved effective in the previous study (64, 65). Therefore, Reflective writing (66), Mindfulness-based interventions (67) are needed to raise the level of tolerance of uncertainty.

## Increase Family Relationship as a Potential Intervention Component

One of the most important findings in our study is that family relationships play a moderator in the mediation pathway from BCE to depressive symptoms, which suggests a new way to intervene and reduce the risk of depressive symptoms. Firstly, the better family relationships play as a foundation of BCE (44), which can promote the development of family-related BCE, increasing the protective effect of BCE on the US (55). Secondly, family is one of the most important resources of social support (68) and family resilience (60), the better relationship in the family often represents the higher family social support and family resilience, which can both enhance their BCE and enable them to flourish with warmth, support, and cohesion by successfully coping with the US (60). The attachment theory indicated that one's emotional needs can be satisfied by warm and supportive parenting and a positive family atmosphere, leading to less preoccupation with one's negative mild mental problems (69). Less preoccupation with the US can avoid the US switching to more serious psychological problems (depression, suicidal ideation) effectively (69).

In addition, a better family context is helpful to improve the adjustment of the individual (internalizing, externalizing, social competence) and develop emotion regulation (70), which can enable students to make friends, develop good community and school relations, thus developing good BCE. The ability emotion regulation developed by a good family

relationship can help students respond to the US and other emotional experiences in a socially appropriate, adaptive, and flexible manner (71–73). Moreover, adolescents are tending to study the emotion regulation from parents' emotional displays and interactions. The parents' emotional profiles implicitly teach children which emotions are acceptable (74). For example, if parents often display negative emotions in the family, children may perform inappropriate emotional responses when confront with stressful events, which may contribute to depressive symptoms (75). This also highlights the good family relationship can help to ease depressive symptoms for college students.

Although undergraduates mostly leave their families and live with their classmates, however, attachment theory also pointed out that the security, adaptations, and maturity fostered by their parents are more dependent on the role of their parents "competent allies" role and less on their actual presence (76, 77). In other words, the ability of environment adaption fostered by positive family relationships continues to exist when they leave their parents.

With the family structures becoming increasingly complex, at present, less than half of children lived in the family units which used to be the norm in the past, such as two-parent, married, biological parents (78, 79). This suggests that parents should provide a complete family to children. Moreover, positive engagement in family interactions (80) and improving family communication (81) are also helpful to create a positive family relationship.

## LIMITATIONS

Some limitations should be noted in our study. Firstly, we can't judge the causality between variables because of the cross-section study. Secondly, the samples were collected from three provinces, China, thus the representativeness of samples is questionable. Also, the self-report questionnaire could exist the bias in this study. Finally, our study only explored the effect of family factors and personal level factors toward depressive symptoms whereas the sociocultural factors may also influence the depressive symptoms of undergraduates. In the future study, we would consider sociocultural factors such as school-related factors and social support in predicting depressive symptoms.

## CONCLUSIONS

In summary, the findings of our study provide information not only on the mediate mechanism of how BCE eases depressive symptoms through the US but also the protective mechanism of how the family relationship can buffer the impact of the US on depressive symptoms among undergraduates. Our findings suggest that enhance tolerance of uncertainty and improving family relationships to protect undergraduates from depressive symptoms.



## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Xuzhou medical University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

## AUTHOR CONTRIBUTIONS

WW and HH: conceptualization, methodology. CZ, HH, and YZ: data curation, writing-original draft preparation. HH, CH, YP,

and JW: supervision, validation. WW and XG: writing-reviewing and editing. WW: revising. All authors contributed to the article and approved the submitted version.

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