



## Research paper

## Gender differences in the predictive effect of depression and aggression on suicide risk among first-year college students

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## ABSTRACT

**Background:** Depression and aggression are related to the risk of suicide. Previous studies have associated different characteristics with depression and aggression in separate gender groups. The main aim of this study was to investigate the gender differences in the predictive effect of depression and aggression on suicide risk among first-year college students.

**Methods:** A total of 2004 first-year undergraduates (80.5 % female, mean age =  $19.4 \pm 0.8$  years) were surveyed by a battery of questionnaires that contained the Chinese version of the Beck scale for Suicide Ideation, the Chinese version of the 12-item Aggression Questionnaire, and the Center for Epidemiologic Studies Depression scale.

**Results:** (1) Depression severity was significantly associated with the suicidality risk ( $r = 0.090$ ,  $p < 0.01$ ). (2) Suicide risk correlated positively with physical aggression, verbal aggression, anger, and hostility in the aggression questionnaire ( $r = 0.308, 0.227, 0.284, 0.277$ ,  $p < 0.01$ ). (3) A possible gender difference was noted for suicide risk in that depression degree was a significant risk factor for females but not males ( $R^2 = 0.095$ ,  $F = 41.554$ ,  $p < 0.01$ ), whereas anger was a significant predictor of suicide risk for males but not for females ( $R^2 = 0.21$ ,  $F = 25.75$ ,  $p < 0.01$ ).

**Conclusions:** Gender differences exist in the predictive effect of depression and aggression on suicide risk among first-year college students.

## 1. Introduction

Suicide is defined as self-intentioned, self-inflicted cessation of life (Nock et al., 2008). According to the World Health Organization, suicide is the second leading cause of death aged 15 to 29 years. Among adolescents aged 15–19, suicide is the third leading cause of death, following traffic accidents and violent injuries. Lifetime suicidal thoughts in college students were reported by 21.0 %, and 7.2 % reported having such thoughts within the past year, and there was a significant increase from 2010 (7.7 %) to 2018 (11.4 %), which was evident in both men and women. 4.2 % reported a suicide attempt, of whom 0.4 % reported attempting suicide within the past year. Suicidal behavior was more common among single students living alone, with a low annual income, and among immigrants (Sivertsen et al., 2019). The current study revealed that about 20 % of Chinese college students suffer from depression, which has increased sharply over the past decade (Gao

et al., 2020).

Depression, anxiety, and stress correlate with suicide among college students (Davis et al., 2020). Entrance into the college setting often presents interpersonal challenges for students as they leave home and enter new social situations. In contrast to adolescents, college students have reached sexual maturity and pursue more educational and occupational opportunities. On the other hand, compared to adults, students have not yet established a stable life structure, such as changes in romantic status, peer groups, course selection, and career choices (Auerbach et al., 2018). Those who recently transitioned from high school are particularly vulnerable among college students. In a large sample ( $N = 13,984$ ) of first-year college students, the lifetime prevalence of suicidal ideation, plans, and attempts was estimated at 32.7 %, 17.5 %, and 4.3 %, respectively. Furthermore, the 12-month prevalence of suicidal ideation was 17.2 %, suicide plans 8.8 %, and suicide attempts 1.0 % (Mortier et al., 2018). However, only 25 % of these

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students would seek professional help if they experienced a severe emotional or mental problem (Ebert et al., 2019).

There are some apparent gender differences in suicidal behavior. Global prevalence estimates show that the suicide rate among men is 1.8 times higher than among women. Moreover, the rate in developed countries among men is more than three times higher than that of women (WHO, 2019). In Australia, France, and other European countries, males have higher suicide rates because of impulsivity, alcohol, and substance abuse (Schrijvers et al., 2012). In many low- and middle-income countries (LMICs), the male-to-female ratio of suicide rates was equal, whereas females kill themselves far more frequently than males in Bangladesh, China, Lesotho, Morocco, and Myanmar (WHO, 2019). In terms of suicide methods, men tend to use more lethal means (e.g., shooting or hanging themselves) and choose a suicide place that is not easily detected or predicted to reduce the likelihood of being rescued (Choo et al., 2019; Schrijvers et al., 2012); while women tend to choose more “moderate” methods such as swallowing pills or wrist cutting (Choo et al., 2019; Ho, 2016). In China, during the 20th and early 21st centuries, rural women accounted for the majority of suicides due to many factors, including low social status, lack of education, and poor economic conditions (Phillips et al., 2013). However, it has recently been shown that the suicide rate of females in Chinese rural areas has decreased thanks to economic development, rising social status, rapid urbanization, higher level of medical first aid conditions, more facilitated transportation, and controlled use of lethal insecticides (Page et al., 2017; Sun et al., 2013; Yin et al., 2016; Zhang et al., 2013). Since 2006, suicides began to be higher in males than females, observed in urban and rural areas (Jiang et al., 2018). It is also worth noting that suicide deaths are more likely to be underreported for males living in rural areas, with drowning, falls, drug use, and traffic accidents being more underreported. This phenomenon occurred more frequently in the age groups 15–24 years and >75 years (Li and Yip, 2020). We, therefore, infer that the number of male suicide deaths in China is higher than the available reported figures.

Depression is a strong predictor and independent risk factor for suicidal behavior. Major depression was significantly associated with suicidal ideation and attempt, and the incidence of suicide attempts was highest among patients with major depression after controlling for demographic factors (Omary, 2021). In adolescent and young adult students, depression was the most critical factor influencing anxiety, suicidal behavior, and well-being (Martínez-Nicolás et al., 2022). Previous studies also revealed that depression and suicidality share a common molecular basis and genetic links, and disordered dopaminergic, serotonergic, and immunologic pathways in neuronal projections are the leading shared deficient pathways (Bozorgmehr et al., 2018). In addition to directly causing suicide, depression also indirectly affects suicidal behavior through several specific variables. Increased tolerance for distress and decreased fear of suicide predict suicidal behavior due to depression (Conejero et al., 2018). Both behavioral inhibition disorders and depression increase the risk of suicide (Kalin, 2020). Higher impulsivity is associated with symptoms of depression, anxiety (Moustafa et al., 2017), and suicidal behavior is mainly characterized by impulsivity (Carballo et al., 2020; Liu et al., 2017).

In addition, there is an association between suicide and aggression. People who died by suicide were more violent in the last year of life than those who died accidentally, and there was an indirect association between aggression and lethal suicide planning (Conner et al., 2001). Individuals with aggression-related disorders (e.g., intermittent explosive disorder, borderline personality disorder, antisocial personality disorder, and conduct disorder) are at higher risk for suicidal behavior, and their suicidal behavior is more likely to be lethal (McCloskey and Ammerman, 2018). Individuals with suicide attempts had higher levels of aggression (especially recent aggression) and impulsivity than those without suicide attempts (Coryell et al., 2018). Aggressive behavior can be classified into proactive and reactive aggression based on the motivation of the behavior. Proactive aggression is purposeful and covert,

whereas reactive aggression is more impulsive and instinctive subconsciously. A Meta-analysis of aggression and suicide in adolescent children by Hartley et al. suggested that reactive aggression in children and adolescents was significantly correlated with suicidal behavior and suicidal ideation (Hartley et al., 2018). Besides, aggression is an unhealthy way to vent negative emotions, and depending on the target, it can be divided into direct and indirect aggression. The former takes out the anger-induced words and actions directly on the perpetrator, while the latter moves on to other objects. Self-torture and abuse belong to the latter, and individuals tend to direct their attacks on themselves, leading to depression, self-injury, and even suicidal behavior (Wang, 2007).

It is evident that depression and aggression are directly or indirectly related to an individual's risk of suicide and that depression and aggression have their characteristics in different gender groups. Women are more likely than men to suffer from stress-related mental disorders like depression. Part of this stems from the genetic susceptibility of both sexes and differences in hormone levels such as cortisol; on the other hand, it may be related to social culture. Compared to independent and assertive masculinity, femininity is more emotional, compassionate, and sensitive to the needs of others (Gibson et al., 2016). It leads to gender differences in the internalizing and externalizing effects of emotions. For example, females are more likely to present with internalizing disorders such as depression and anxiety, whereas men have a higher prevalence of externalizing disorders, including aggression, substance abuse, or addiction (Rosenfield and Mouzon, 2013; Vu et al., 2019; Zhang et al., 2018). The previous studies show that externalizing behaviors among first-year college students were familiar (Lee et al., 2008).

This study provides theoretical guidance for preventing suicidal behavior among first-year college students by revealing gender differences in the predictive effects of depression and aggression on their suicidal risk. It also provides theoretical support for the targeted prevention of suicidal behavior among college students of different genders.

## 2. Methods

### 2.1. Participants

A sample of 2292 randomly selected first-year university students at a normal university completed the questionnaire survey. All questionnaires were collected, including 2004 valid questionnaires, yielding an efficiency rate of 87.4 %. The average age was 19.4 years (SD = 0.8 years).

### 2.2. Measures

#### 2.2.1. Chinese version of Beck scale for Suicide Ideation (BSI-CV)

Suicidal ideation was assessed using the Chinese version of the Beck Scale for Suicidal Ideation (BSI-CV) (Xian-Yun et al., 2010), a 19-item self-report scale that assesses thought, feeling, and plan regarding suicide. The items are rated on a 3-point scale from 0 to 2 (score range, 0–38), with higher scores indicating severe suicide ideation. Items 4 and 5 are used as a screener to assess the presence of suicidal ideation. In this study, the Cronbach's  $\alpha$  for the BSI-CV was 0.91.

#### 2.2.2. Chinese version of 12-item Aggression Questionnaire (12-AQ)

The severity of aggression was measured using the Chinese version of the 12-item Aggression Questionnaire (12-AQ) (Zhang et al., 2009). The 12-AQ is a better-fitting, shortened version of Buss and Perry's (1992) 29-item measure developed by Bryant and Smith (2001). It assesses four domains of aggression: physical aggression, verbal aggression, anger, and hostility, with each rated on a 5-point Likert scale of 1 ‘extremely uncharacteristic of me’ to 5 ‘extremely characteristic of me’. The score of each sub-scale was the sum of the items' scores, then mathematically transformed to a centesimal score, with higher scores reflecting higher aggression. In this study, the Cronbach's  $\alpha$  for the 12-AQ was 0.85, and the Cronbach's  $\alpha$  values for the four sub-scales were 0.66 for verbal

aggression, 0.75 for physical aggression, and 0.76 for anger.

### 2.2.3. Center for Epidemiologic Studies Depression scale (CES–D)

Depression was assessed with the Center for Epidemiologic Studies Depression scale (CES–D), a 20-item self-report depression scale designed to measure the presence and severity of depressive symptomatology in the general population (Radloff, 1977). The major components of depressive symptomatology include depressed mood, guilt and worthlessness, helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. The scale consists of 20 statements and asked to indicate how they have been feeling in the past week using four response options from “rarely or none of the time” to “most or all of the time”. Responses are scored from 0 to 3, where higher scores indicate a higher frequency (score ranges from 0 to 60). A higher overall score indicates more severe depression. The Cronbach's  $\alpha$  of the scale from the present study was 0.90.

### 2.3. Data analyses

Data analyses were performed using the statistical analysis software package SPSS 24.0. Outcome variables were analyzed with *t*-tests, Pearson correlation coefficient, and multiple linear regression analysis.

## 3. Results

### 3.1. Depression and aggression in different gender

As shown in Table 1, it was found that boys had higher mean scores than girls for depression, physical aggression, verbal aggression, anger, and hostility. However, significant differences were found only for depression ( $t = 2.24$ ,  $p < 0.05$ ) and physical aggression ( $t = 7.22$ ,  $p < 0.01$ ).

### 3.2. Depression, aggression, and suicidality risk

Pearson correlation coefficients among the various measurement scales are shown in Table 2. We found that depression severity ( $r = 0.090$ ), physical aggression ( $r = 0.308$ ), verbal aggression ( $r = 0.227$ ), anger ( $r = 0.284$ ), and hostility ( $r = 0.277$ ) were significantly correlated with the suicide risk score (all  $p < 0.01$ ).

### 3.3. Predictive factors of suicidality risk in different gender

As presented in Table 3, multiple linear regression analysis was performed using depression, physical aggression, verbal aggression, anger, and hostility as independent variables and suicidality risk as a dependent variable. A stepwise model was adapted for the variable selection procedure.

For male students, physical aggression, verbal aggression, anger, and hostility were predictive of suicidality risk ( $R^2 = 0.21$ ,  $F = 25.750$ ,  $p < 0.001$ ). Depression was excluded after the stepwise regressions. The

**Table 1**  
Depression and aggression in different gender ( $n = 2004$ ).

Variable	Male ( $n = 391$ )	Female ( $n = 1613$ )	<i>t</i>
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	
Depression severity	9.42 (4.70)	8.84 (4.54)	2.24*
Aggression severity			
Physical aggression	7.56 (3.10)	6.35 (2.39)	7.22**
Verbal aggression	6.53 (2.31)	6.40 (2.16)	1.09
Anger	3.78 (1.76)	3.68 (1.69)	1.06
Hostility	6.61 (2.49)	6.56 (2.27)	0.36

Note. *SD* = standard deviation.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

**Table 2**

Pearson correlation coefficients among measurements.

	BSI-CV	CES-D	PA	VA	Ang
BSI-CV	1	0.090			
CES-D	0.090	1			
PA	0.308**	–	1		
VA	0.227**	–	0.551**	1	
Ang	0.284**	–	0.660**	0.594**	1
H	0.277**	–	0.505**	0.595**	0.621**

Note. BSI-CV = Chinese version of the Beck Scale for Suicidal Ideation; CES-D = Center for Epidemiologic Studies Depression scale; PA = physical aggression; VA = verbal aggression; Ang = anger; H = hostility. Pearson correlation coefficients are based on the following scores: BSI-CV total score, CES-D total score, and four factors (PA, VA, Ang, and H) scores for the 12-AQ (Chinese version of the 12-item Aggression Questionnaire).

\*\*  $p < 0.01$ .

**Table 3**

Multiple linear regression analysis for suicidality risk factors.

	PV	B	SE	$\beta$	<i>t</i>
Male ( $n = 391$ )	PA	0.724	0.218	0.257	3.326**
	VA	–0.848	0.246	–0.222	–3.444**
	Ang	0.972	0.384	0.196	2.529*
	H	0.731	0.243	0.209	3.010**
Female ( $n = 1613$ )	CES-D	0.099	0.040	0.060	2.480*
	PA	0.483	0.093	0.154	5.200**
	VA	0.262	0.112	0.075	2.340*
	H	0.465	0.101	0.140	4.595**

Note. PV = predictor variable; SE = standard error; CES-D = Center for Epidemiologic Studies Depression scale; PA = physical aggression; VA = verbal aggression; Ang = anger; H = hostility.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

overall regression equation was highly significant, and the 21 % of the variance in suicide risk was explained by the combined effect of physical aggression, verbal aggression, anger, and hostility.

For female students, depression, physical aggression, verbal aggression, and hostility were predictive of suicidality risk ( $R^2 = 0.095$ ,  $F = 41.554$ ,  $p < 0.001$ ). Anger was excluded after the stepwise regressions. The overall regression equation was highly significant, and the 9.5 % of the variance in suicide risk was explained by the combined effect of depression, physical aggression, verbal aggression, and hostility.

## 4. Discussion and conclusions

Previous study results indicate that women more frequently attempted suicide rather than committed it, whereas men were more likely to complete suicides (Tsirigotis et al., 2011). In 2014, the age-adjusted suicide rate for males (20.7) was more than three times that for females (5.8), according to the National Center for Health Statistics and the Centers for Disease Control and Prevention (Curtin et al., 2016). Males perceived nonfatal suicidal behavior as more “feminine” and less potent than killing oneself (Canetto, 1997). Concerning suicide attempts and suicide death, men in various cultures have characteristics in both concept and behavior. Male college students in Asian culture expressed that “suicide is a viable and perhaps honorable solution if the battle against depression emerges as unwinnable” (Oliffe et al., 2010a, 2010b). In other studies, men expressed similar views that suicide was a potential means of establishing control against depression (Emslie et al., 2006). Rather than displaying “humiliating behaviors” such as depression, men are more inclined to problem-solving.

Depression is an independent risk factor and a strong predictor of suicidal behavior. Men may experience atypical depressive symptoms, including irritability, aggression, hostility, substance abuse, and risky behavior (Kilmartin, 2005; Leimkühler et al., 2007; Sigmon et al., 2005;

Study, 2002). Traditional masculine ideals include expectations such as being strong, successful, self-reliant and an emphasis on avoiding emotions (Krumm et al., 2017). Because of social expectations and desire for success, men regard depression as a result of over-commitment to work, and the desire to be filled with success may cause them to break down eventually (Valkonen and Hänninen, 2013). Working stress led to burnout, hospitalization, divorce, or suicidality for some men (Grove, 2012).

Depressive disorder was often described as weakness, loss of control, and vulnerability, as contravening traditional masculinity qualities such as strength, success, and the capabilities expected of men (Rochlen et al., 2010). Males were found to label depression as a force that left them with feelings of “failed to resist” (Heifner, 1997) and “uncontrollable misery” (Emslie et al., 2006). Some men assessed depression as a “female’s disease” (Danielsson and Johansson, 2005) and considered it a threat to men’s roles as family providers or in the work context (Liang and George, 2012), and many reported feelings of inadequacy, incapability, and “otherness” compared to else or the person they used to be (O’Brien et al., 2005). As a result, they refuse to acknowledge vulnerability and enter the role of a patient for treatment. Alternatively, they use the term “doing something” or “making their own decisions” rather than the passive “accepting help”.

Men are assumed to hide depression and express aggression-related emotions such as anger (Seidel et al., 2010). “An angry man” or “a bad boy” is a concrete expression of masculinity, implying a struggle against depression, like a hero in a battle. According to the study of Sierra Hernandez et al. (2014), men were more afraid of being ostracized by partners than failing to “have a good fight with depression”; however, their aggressive behaviors are not revered or at least approved by their peers. The failure mode suggests that aggressive or antisocial behavior increases the likelihood of failure in peers (Martínez-Ferrer and Stattin, 2017). Men with aggressive behavior control disorder experience more interpersonal difficulties, contributing to more anxiety and depression and a lower sense of self-worth (Coie et al., 1995), causing a vicious circle that puts them in a problematic situation. Recent studies indicate that targeted suicide prevention activities are needed for the male group with high aggression levels whose suicidal behavior is more lethal (Brokke et al., 2022; Peng et al., 2022). The results above are consistent with our findings that aggression was a significant predictor of suicide risk among male first-year college students, whereas the effect of depression was non-significant.

Several studies showed that physical violence and verbal abuse might lead to depression and mental illness, eventually leading to suicide (Azúa Fuentes et al., 2020; La Rosa et al., 2022), and lifetime suicidal behavior in males was correlated with total aggression and subscales of physical aggression, verbal aggression, anger, and hostility (McGlade et al., 2021). Suicidal ideation severity was associated with lower uric acid serum levels, while verbal aggression and a history of violence were associated with higher serum uric acid levels (Bartoli et al., 2018). Verbal aggression also mediated the relationship between the myoinositol (mI)/H<sub>2</sub>O ratio in the anterior cingulate cortex and suicidal behavior (Sheth et al., 2018). However, another study indicated that verbal aggression and hostility do not directly or indirectly affect suicide (Martin et al., 2021). In general, the effect of verbal aggression on suicidal behavior has been inconsistently studied, and the hidden mechanisms still need to be explored. The present study found verbal aggression as a protective factor for suicidal behavior in a model of suicide risk among male first-year college students. Verbal aggression may be a softer form of externally directed aggression than physical aggression. Using verbal aggression to express anger indicates that it is not too strong or can be released slowly without a sudden outburst of serious violence directed at others or oneself. In the suicide risk model for female first-year college students, verbal aggression is a risk factor for suicidal behavior. Interpersonal relationships have a more significant impact on females than males, and verbal aggression can potentially threaten their interpersonal relationships and subsequently negatively

affect their emotions, leading to suicidal behavior. The mechanisms behind the phenomenon of gender differences in the predictive effect of verbal aggression on suicidal behavior also need to be further investigated.

Compared to independent and courageous masculinity, femininity is more emotional, compassionate, and sensitive to the needs of others, and interpersonal difficulties have a more significant impact on women (Gibson et al., 2016). Therefore, females are less likely to be aggressive than males (Sun et al., 2017). The study of Chiebuka et al. (2022) showed that females scored higher in aggression to self. Depressed females are more likely to develop suicidal ideation than depressed males (Fukai et al., 2020). Depressive symptoms in women are more likely to lead to repeated suicide attempts, and higher aggression and hostility scores among women with mood disorders indicate more risk of repeated suicide attempts (Papadopoulou et al., 2020). The above findings conform with our research, and in addition to the predictive role of depression on female suicide, aggression and hostility also have their contributing role.

In summary, this study concludes that gender differences exist in the predictive effect of depression and aggression on suicide risk among first-year college students. Consistent with this conclusion, in addition to depression and anxiety, male students who display externalizing problems such as aggression and addiction should not be overlooked as well. Besides, in the male college student population, depression is a common disorder associated with poor academic performance, abrupt debt relationships, and poor career prospects (Olliffe et al., 2010a, 2010b). Therefore, we should pay great attention to male college students facing these dilemmas, and there is also an urgent need to screen for depression and anxiety among female students.

The suicide mortality rate is significantly higher in males than in females, so it should be given more attention in clinical work. In men with masculine ideals, interventions guided by the idea of regaining strength or taking back control may increase stress. It is better to lead to a flexible reconciliation with depression and a gradual change in their solidified masculine ideals (Krumm et al., 2017).

## 5. Limitations and future directions

In the female suicide risk model, the introduced aggression and depression factors explained <10 % of the suicide risk. Previous research has found that impulsivity is more prominent in low lethal suicidal behavior for women (Brokke et al., 2022). Genetic etiologies of suicidal behavior are more common in young women (Edwards et al., 2021). Exposure to suicidal behavior contributed to the higher attempt risk among girls (Yildiz et al., 2019), and the presence of underlying psychiatric disorders was a risk factor for women who attempted suicide through acute poisoning (Eizadi-Mood et al., 2018). Future research might consider introducing more influencing factors into the model to analyze their complex interactions.

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## CRediT authorship contribution statement

Study design: Li Xuan, Shao Hua, Lin Lin.  
 Data collection, analysis and interpretation: Li Xuan, Shao Hua, Lin Lin, Yang Jianli.  
 Drafting the manuscript: Li Xuan, Shao Hua.  
 Critical revision of the manuscript: Yang Jianli.  
 Approval of the final version for publication: all co-authors.



## Conflict of interest

The authors have no conflicts of interest to declare.

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