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Research article

The relationship between future time perspective and suicide ideation in college students: Multiple mediating effects of anxiety and depression

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ABSTRACT

Background: Suicide ideation has high prevalence in adolescents, better future time perspective is considered a protective role for anxiety, depression, and suicide ideation. However, the impact of future time perspective on suicide ideation remains unclear, especially when anxiety and depression as mediating roles.

Methods: A cross-sectional study of college students was performed in Chongqing, China. There are 851 students enrolled in this study and we distribute questionnaires through the WeChat platform to obtain data in 2023. We conducted Pearson correlation analysis and descriptive statistics. Model 6 in PROCESS 4.0 was used to test the multiple mediating effect.

Results: College students who have higher future time perspective are associated with a lower risk of anxiety, depression, and suicide ideation. Future time perspective not only affects suicide ideation directly, but also influence it by means of two mediating pathways: ①depression, the mediation effect is 37.41 %; ②the multiple mediating effects of anxiety and depression with a mediating effect of 29.68 %.

Conclusion: Higher future time perspective functions as a protective role in anxiety, depression, and suicide ideation; future time perspective can affect and predict the occurrence of suicide ideation by influencing anxiety and depression in college students. This conclusion will be a novel and insightful part of adolescent mental health research, and provide a new perspective to prevent college students from committing suicide in the future.

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1. Introduction

The World Health Organization (WHO) estimates that 800,000 people worldwide die due to suicide every year, which is the second major reason of death among people aged 15 to 29 around the world [1], and is also the most important cause of death among young adults aged 15–34 in China [2]. Suicide is one of the significant factors of death in adolescents and children, which is deemed as a serious global public health issue [3], and about 2.7 % adolescents attempted suicide in China [4]. Epidemiological researches have indicated that the incidence of suicide ideation (SI) in teenagers ranges from 19.8 % to 24.0 % [5], which increases rapidly between 12 and 17 years old, and suicide attempts' lifetime prevalence is between 3.1 % and 8.8 %, with an augment in early to late adolescence [6]. However, there exists few effective intervention measures for adolescents with SI, and even fewer interventions showed a repetitive effect [7,8].

Suicide behavior can be divided into three levels: SI, suicidal attempt, and suicide itself. The definition of SI is the emergence of any thoughts related to self-destructive behavior, which may include vague thoughts about ending life somewhere in the future, or it may be a very specific suicide plan [9]. In the USA, National Comorbidity Survey found about 34 % of individuals with SI have developed specific suicide plans, and 72 % of those who have suicide plans have extended the plan to actual suicide attempts [10]. These phenomena suggest that people with SI are more likely to attempt suicide subsequently. Studies have demonstrated that the most efficient form to intervene suicide is during the SI stage [11], and SI is particularly frequent, severe, and chronic, which is associated with suicidal attempts [12,13]. In addition, teenagers with SI are about 12 times more possibly to commit suicide before 30 years old than those without [14]. Although not all young people with SI continue to engage in suicidal behavior, over one-third of adolescents with SI still have suicidal attempts [15].

Future time perspective (FTP) refers to "the subjective perception of the remaining time before pass away", which was first put forward in socioemotional selectivity theory [16]. FTP is a personality trait that includes individual's behaviors, thoughts, and feelings associated with their future [17]. Although individual's perception of available time in the future usually decreases with actual age, there are still significant differences in the FTP among people of similar ages. Studies have shown that a broader FTP negatively affects mental health through more goals that related to future oriented life, while having a positive effect on mental health directly [18]. Teenagers with long-term objective and relevant plans, which are FTP's key component, report less emotional despair and distress. In addition, research has found that thinking about the future can alleviate the effect of depressive symptoms on suicide preparedness, and FTP can alleviate the worst-case impact of crucial suicide predictors in high-risk students [19].

Depression usually refers to a depressed mood or disorder, which is a constant feeling of losing interest and sadness in things that can affect an individual's thoughts, behavior, feelings, and well-being, which occurs temporarily in almost everyone's lifetime [2]. At the same time, anxiety can also be explained as mood or disorders, and anxiety disorder is much more severe than anxiety mood. Depression and anxiety is not only highly correlated, but also disabling illnesses that affect people of all ages [20–22], which are the most significant mental illness in adolescents and children [23]. To be specific, anxiety disorders or symptoms typically occur before depressive disorders or symptoms [24,25], namely that anxiety have an impact on the occurrence of depression. A report from WHO claimed that anxiety has become a very common and serious mental health issue in college students all over the world [26], and many studies have shown that anxiety and depression are closely linked to suicide [27,28]. What's more, numerous researches have shown that young adulthood is a crucial period for the emergence of psychological internalization symptoms, including depression and anxiety, as well as the risk is constantly increasing [29,30]. Therefore, college students are in this stage, so their mental health has become an urgent problem that cannot be ignored [31].

There exist many studies found that nearly all mental disorders are related to increasing risk of suicide attempts and suicide [32,33]. According to Beck et al. (1989), individuals with hopeless often experience depression, which helps predict suicidal behavior [34]. Moreover, the suicide risk of depression patients is 30 times higher than that of normal individuals [35], and the comorbidity of anxiety disorder may have a comprehensive impact on the risk of suicide. Hirsch etc. found that even after intervening in the effects of depression and despair, college students who were more optimistic (comprising the evaluative component of FTP) reported lower SI [36].

In summary, we can infer that there exists certain association between FTP, anxiety, depression, and SI based on the above analysis. Nonetheless, the influential mechanism of FTP on SI remains unclear in previous study, so our aim is to explore the association between them and especially to confirm the multiple mediating effect of anxiety and depression between FTP and SI. Thus, we proposed four hypotheses in the following paragraphs:

Hypothesis 1. (H1).
FTP can affect SI.

Hypothesis 2. (H2).
FTP affects SI through the mediating role of anxiety independently.

Hypothesis 3. (H3).
FTP affects SI through the mediating role of depression independently.

Hypothesis 4. (H4).
FTP affects SI through the multiple mediating effect of anxiety and depression.

2. Materials and methods

2.1. Study population and process

We conducted a cross-sectional study in college students from Chongqing Medical University in 2023, 683 students with average age of 20.14 (S.D. = 2.05). We use convenient sampling methods to recruit participants and distribute questionnaires online to them. For the purpose of expanding the coverage of the sample and reducing potential biases, we selected college students of different grades in this study, and also covered the graduate student population. In regression analysis, the sample size is usually need to be at least 10 times the number of independent variables [37]. There exist 10 independent variables in this study, so the sample size ought to be at least 100, and we ultimately obtained 683 valid data, which is adequate for statistical analysis. The questionnaire consists of four parts: basic demographic variables, future time perspective (FTP) scale, depression–anxiety–stress scale (DASS-21), Beck Scale for Suicide Ideation in Chinese Version (BSI-CV) scale. Before the investigation begins, professional investigators introduce the content of questionnaire, the purpose of this study, and obtain all the students' informed consent. Questionnaire Star online platform was used to questionnaire filling, data collection and summary. We distributed a total of 900 questionnaires and collected 851, of which 168 had missing or abnormal values. Then remaining 683 copies are valid. The participants need to satisfy the following inclusion criteria: ① No history of mental illness, and did not take any psychotropic drugs, ② Voluntarily participated in this research, and sign informed consent; Exclusion criteria: ① Students who have graduated or are not in school, ② Refused to participate in the study, ③ Long-term sick leave or drop out, ④ Recent use of psychotropic drugs.

2.2. Measurement

2.2.1. Covariates

To reduce the bias of research results, we measured and controlled for some covariates, including age, gender, monthly family income, grade, whether is a one-child family and place of residence.

2.2.2. Future time perspective

FTP was assessed by Lang and Carstensen 's (1996, unpublished) original 10-item instrument, and its quality and effectiveness have been proven in other studies [38,39]. Participants use a Likert 7 points from 1 (very inconsistent) to 7 (very consistent) with each item to indicate their agreement on how each item described themselves 'truthfully'. An example item is, "(1) My future seems infinite". The Cronbach's alpha of this scale was 0.83. When this value is exceeding 0.8, it represents the scale has good validity and reliability.

2.2.3. Anxiety and depression

The condition of participants' depression and anxiety is measured by the DASS-21, which is widely used for measuring the psychological aspects of self-report, and has been identified to have good convergence, discriminant and nomological validity [40]. DASS-21 is a 21-question rating scale composed of 3 factors: stress, anxiety, and depression. The subjects selected the option closest to their current situation last week as their response. Each question is assigned a score of 0–3, then calculate the total score of each section to assess stress, anxiety, and depression. The symptoms are more severe when the score is higher. The Cronbach's alpha of anxiety and depression part of this scale was 0.82 and 0.87 respectively.

2.2.4. Suicide ideation

Whether SI exists and its severity during last week were evaluated by the BSI-CV scale, which was measured by 5 items: 1) To what extent do you want to live? 2) To what extent do you want to die? 3) Is the reason you want to live better than the reason you want to die? 4) How is your willingness to attempt suicide actively? 5) To what extent do you have a 'passive suicide wish' and wish for an external force to end your life? (For instance, hoping to sleep forever without waking up, unexpectedly dying, etc.). The scoring method is defined as follows: 1) Each item is Likert 3 points and has three options: no (0 point), weak (1 point), moderate to strong (2 points), then the total score is obtained by adding up each item's scores. 2) There is no SI when the answer of both item 4 and item 5 is "No", otherwise, it is considered to have SI. 3) For those college students with SI, we also proceed to calculate their SI intensity, which is the total score of the 5 items. The SI is stronger when the score is higher. If there is no SI, the total score of SI is 0. The Cronbach's alpha of this scale was 0.80. The BSI-CV has been proven to have significant effectiveness and reliability, which is also widely used to predict future suicide attempts and deaths in university students [41].

2.3. Statistical analysis

Mean ± standard deviation (SD) is used to express continuous variables that follow a normal distribution. Frequency and percentage are used to express categorical variables. SPSS 26.0 was used to test the normality and test of variance for the scores of FTP, anxiety, depression, and SI under every covariate. Besides, further one-way analysis of variance (ANOVA) or *t*-test with two independent samples was conducted to identify whether there are differences between different variables, and Pearson correlation analysis also performed between these variables. What's more, the independent variable (X) makes impact on the dependent variable (Y) through a series of mediation variables (M1, M2, …, Mn) in the multiple mediation model. The principle of using the PROCESS plugin for multiple mediation is to construct multiple regression equations and use statistical methods to test whether the significant multiple mediation effect exists. PROCESS macro 4.0 software for SPSS provided by Hayes (2013) was used to establish the mediation model,

Multiple mediation (Model 6) analysis based on bootstrap using 95 % confidence intervals (CI) (5000 bootstrap samples) [42]. The effect will be significant if the mediating effect's 95 % CI does not include 0 [43]. $P < 0.05$ is deemed as significant in this research.

3. Results

3.1. Basic characteristics of research participants

There exists more female than male students in this study, accounting for 70.1 % (479) and 29.9 % (204) respectively. There is a significant gender difference between FTP and depression ($t = 3.008$, $p = 0.003$; $t = -2.397$, $p = 0.017$). In addition, SI differed significantly by age, grade, and place of residence ($t = 3.709$, $p < 0.001$; $t = 6.374$, $p < 0.001$; $t = -2.474$, $p = 0.014$). More information is exhibited in Table 1.

3.2. Pearson correlation analysis

The result of Pearson correlation analysis is demonstrated in Table 2. It's indicated that FTP has negative correlation with anxiety ($r = -0.274$, $p < 0.01$), depression ($r = -0.456$, $p < 0.01$), and SI ($r = -0.302$, $p < 0.01$). Anxiety associated with depression positively ($r = 0.794$, $p < 0.01$) and SI ($r = 0.373$, $p < 0.01$). Moreover, depression has positively association with SI ($r = 0.486$, $p < 0.01$) in college students.

3.3. Multiple mediation effect test and regression analysis

We use multiple mediation analysis to identify the mediating effect of anxiety and depression in college students based on the correlation between FTP, anxiety, depression, and SI. A multiple mediation model was established with FTP as the independent variable (X), anxiety and depression as mediating variables (M), and SI as the dependent variable (Y). The results manifested that FTP and anxiety were negatively associated ($a1 = -0.1095$, $p < 0.001$), FTP also related to depression negatively ($b1 = -0.1081$, $p < 0.001$), while anxiety and SI have negative correlation ($a2 = -0.0152$, $p = 0.5249$), but it was not a significant effect. Furthermore,

Table 1
Differences in FTP, anxiety, depression, and SI under different covariates.

Variable	N (%)	FTP (M ± SD)	t/F(p)	Anxiety (M ± SD)	t/F(p)	Depression (M ± SD)	t/F(p)	SI (M ± SD)	t/F(p)
Gender									
Male	204 (29.9 %)	43.59 ± 9.94	3.008 (0.003)	5.09 ± 3.96	−1.920 (0.055)	4.92 ± 4.13	−2.397 (0.017)	0.85 ± 1.61	−1.185 (0.237)
Female	479 (70.1)	45.94 ± 9.06		4.49 ± 3.66		4.11 ± 4.00		1.01 ± 1.64	
Age									
≤20	484 (70.9)	45.36 ± 9.15	0.526 (0.599)	4.84 ± 3.82	1.827 (0.068)	4.39 ± 3.94	0.343 (0.732)	1.10 ± 1.72	3.709 (<0.001)
>20	199 (29.1 %)	44.94 ± 9.95		4.26 ± 3.59		4.27 ± 4.32		0.64 ± 1.34	
Grade									
Freshmen	121 (17.7 %)	45.93 ± 9.89		4.78 ± 4.09		3.88 ± 4.05		1.11 ± 1.69	
Sophomore	274 (40.1 %)	45.90 ± 8.32	2.022 (0.110)	4.97 ± 3.86	1.542 (0.202)	4.46 ± 3.85	1.207 (0.036)	1.00 ± 1.71	6.374 (<0.001)
Junior year	125 (18.3 %)	43.62 ± 10.31		4.53 ± 3.80		4.80 ± 4.55		1.32 ± 1.81	
Senior year and above	163 (23.9 %)	44.83 ± 9.86		4.20 ± 3.25		4.18 ± 3.97		0.53 ± 1.18	
Monthly family income									
≤5000	396 (58.0 %)	44.80 ± 9.39	−1.436 (0.151)	4.68 ± 3.81	0.051 (0.960)	4.48 ± 4.18	0.932 (0.352)	0.91 ± 1.60	−1.076 (0.282)
>5000	287 (42.0 %)	45.84 ± 9.37		4.66 ± 3.70		4.18 ± 3.86		1.05 ± 1.68	
One-child family									
Yes	251 (36.7 %)	45.86 ± 9.65	1.330 (0.184)	4.52 ± 3.62	−0.787 (0.431)	4.32 ± 4.06	−0.155 (0.877)	0.92 ± 1.48	−0.610 (0.542)
No	432 (63.3 %)	44.87 ± 9.22		4.76 ± 3.84		4.37 ± 4.05		1.00 ± 1.72	
Place of residence									
Rural	208 (30.5 %)	44.94 ± 9.91	−0.546 (0.585)	4.88 ± 3.92	0.984 (0.325)	4.61 ± 4.27	1.074 (0.283)	0.74 ± 1.54	−2.474 (0.014)
Urban	475 (69.5 %)	45.36 ± 9.16		4.58 ± 3.69		4.24 ± 3.95		1.07 ± 1.66	

Note: FTP, future time perspective; SI, suicide ideation; M, mean; SD, standard deviation.

Table 2
Pearson correlation analysis of FTP, anxiety, depression, and SI.

	FTP	Anxiety	Depression	SI
FTP	1	−0.274[a]	−0.456[a]	−0.302[a]
Anxiety	−0.274[a]	1	0.794[a]	0.373[a]
Depression	−0.456[a]	0.794[a]	1	0.486[a]
SI	−0.302[a]	0.373[a]	0.486[a]	1

Note:
[a] $p < 0.01$, FTP, future time perspective; SI, suicide ideation.

depression and SI were positive correlated (b2 = 0.1922, $p < 0.001$). The regression model of FTP, anxiety, and depression as independent variables explained 28.28 % of the variance in SI ($R^2 = 0.2828$). More specific information can be found in Table 3.

Fig. 1 is a diagram of the multiple mediation model. The positive and negative relationship between variables can be determined by the path coefficient. FTP affects SI through two mediations indirectly: anxiety and depression.

The direct, indirect, and total effects were exhibited in Table 4. Determine whether the mediating effect is significant by observing that the 95 % CI of the path coefficient does not contain 0. FTP has a direct effect on SI significantly (B = 0.0065, 95%CI = −0.0328, −0.0072), occupied 35.97 % of the total effect. In addition, we found that FTP affect SI through two significant mediating pathways indirectly: 1) Depression (B = 0.0047, 95%CI = −0.0307, −0.0123), taking up 37.41 % of the total effect; 2) Anxiety-Depression (B = 0.0038, 95%CI = −0.0249, −0.0098), occupied 29.68 %. However, there exists no significant mediating effect of anxiety between FTP and SI.

4. Discussion

Despite numerous studies have explored the relationship between anxiety, depression, and SI, there is relatively little research about the impact of FTP on SI, especially when anxiety and depression serve as mediators that have not been studied in previous studies. In this research, we constructed a multiple mediation model to explore how FTP directly affects SI and how it indirectly affects SI through anxiety and depression. First and foremost, we compared the difference in FTP, anxiety, depression, and SI under different demographic characteristics. What's more, we constructed three major pathways: anxiety as an independent mediating role, depression as an independent mediating role, and anxiety and depression as multiple mediating roles. We found that there is significant direct effect of FTP on SI. The separate mediating effect of depression on SI is also significant in college students, the multiple mediating effects of anxiety and depression is significant as well. However, the independent mediating effect of anxiety on SI is not significant in this research.

Our research results indicate that there is a gender difference between FTP and depression. Previous research findings on success showed that male and female have different achievement goals [44], and the achievement goals is affected by FTP, which is consistent with our results. Besides, according to the results of other studies, compared to men, women are more prone to depression, whether it is a unipolar depressive episode or depressive symptoms [45,46]. Studies also found difference caused by gender in depression appear between ages of 11 and 15 [47], this also fully explains why there exist a gender difference in depression among college students in our study. What's more, SI varies by age and grade, different grades have different adolescent age stages, which in accordance with previous researches on the association between suicide and age [48,49]. Furthermore, there also exists difference in SI between place of residence significantly. P S Yip etc. discovered that the incidence of suicide in both rural male and female are higher than those of urban in Beijing [50], which interprets the phenomenon in this study.

We observed that the FTP was related to anxiety, depression, and SI negatively in college students ($\beta = -0.1095$, $p < 0.001$; $\beta = -0.1081$, $p < 0.001$; $\beta = -0.0200$, $p < 0.01$), which manifest the higher the level of FTP, the less possible to suffer from anxiety, depression, and SI. Another definition of FTP is a personal inclination to plan and achieve future goals to reach their long-term

Table 3
Regression analysis of FTP, anxiety, depression, and SI.

Regression model	Predictive variable	Model fit index			Beta	Significance of Regression Coefficients	LLCI	ULCI
Outcome variable		R	R^2	F		t		
Anxiety	FTP	0.2953	0.0872	9.209	−0.1095[b]	−7.3224	−0.1389	−0.0801
Depression	FTP	0.8345	0.6963	193.184	−0.1081[b]	−11.1919	−0.1271	−0.0891
	Anxiety				0.7843[b]	32.7773	0.7373	0.8313
SI	Anxiety				−0.0152	−0.6362	−0.0621	0.0317
	FTP	0.5318	0.2828	29.488	−0.0200[a]	−3.0638	−0.0328	−0.0072
	Depression				0.1922[b]	8.0464	0.1453	0.2391
SI	FTP	0.3534	0.1249	13.764	−0.0556[b]	−8.7441	−0.0681	−0.0431

Note:
FTP, future time perspective; SI, suicide ideation.
[a] $p < 0.01$.
[b] $p < 0.001$.

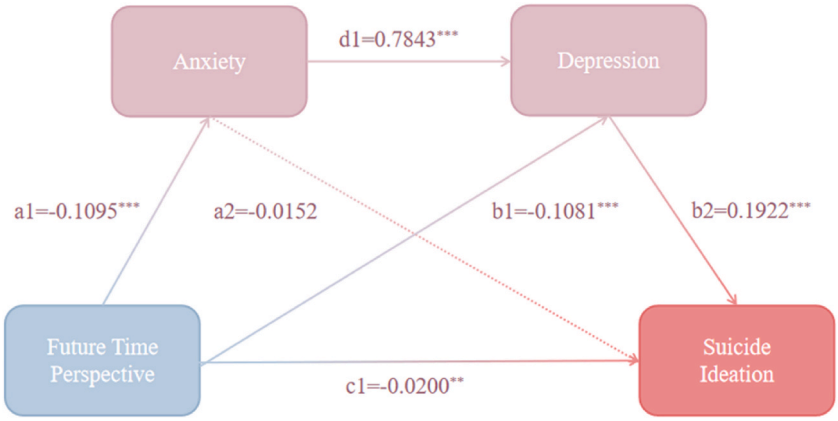

Fig. 1. A multiple mediation model of the association between future time perspective, anxiety, depression, and suicide ideation. Path coefficients are shown. Note: **p < 0.01, and ***p < 0.001.

Table 4
Significance test for mediating effect of FTP, anxiety, depression, and SI.

	Effect	Boot SE	Boot LLCI	Boot ULCI	Ratio of indirect of total effect
Total effect	−0.0556	0.0064	−0.0681	−0.0431	100 %
Direct effect	−0.0200	0.0065	−0.0328	−0.0072	35.97 %
Total indirect effect	−0.0356	0.0062	−0.0486	−0.0244	64.03 %
FTP-Anxiety- SI	0.0017	0.0035	−0.0053	0.0086	–
FTP-Depression- SI	−0.0208	0.0047	−0.0307	−0.0123	37.41 %
FTP-Anxiety-Depression- SI	−0.0165	0.0038	−0.0249	−0.0098	29.68 %

Note: FTP, future time perspective; SI, suicide ideation.

concerns [51], which is a key factor in motivating students to achieve good grades in their studies [52]. Students who have higher FTP score tend to think seriously about the future and are more possibly to invest more energy in learning and get higher grades, prepare for career, and make better career choices [53]. Thus, if they have clearer plans and choices, it helps them reduce confusion and anxiety or even depression. Additionally, research regard FTP as one protective characteristic for suicidal outcome, and the advantages of FTP components have an effective impact on the widespread safety and health protection of adolescents and young people [54]. Lennings concluded that juvenile offenders at risk of suicide had lower predictions of future time than those who were not [55]. Scholars have found that individuals with higher FTP levels experience less worst-case and current SI in the patients with depression aged 50 and above [56], and FTP can independently regulate the relation between functional status and SI in patients with depression [57]. Based on our research findings and the above analysis, we can predict and intervene the occurrence of SI through FTP in the future. Therefore, we can add more courses on time management and future career planning in the education of college students, which can help improve their FTP and better intervene in psychological health issues such as anxiety, depression, and SI.

More importantly, we confirmed that FTP can affect SI from other pathways indirectly (this indirect effect accounts for 64.03 % of the total effect). We explored the principle by which FTP influences SI from the aspect of anxiety and depression. The result showed that depression also acted as a mediating role in the association between FTP and SI, whose mediating effect is 37.41 %. Besides, FTP can affect SI through the multiple mediation model of anxiety and depression, which account for 29.68 % of mediating effect. People with higher FTP suffer from less anxiety, depression, and SI, so there is a negative correlation between FTP and them. Approximately 90 % of people who have attempted or committed suicide suffer from mental illness [58]. In particular, emotional regulation problems have been variously linked to suicide, with depressive symptoms considered as the most possibly risk factor causing suicidal behavior, and anxiety symptoms significantly related to SI and suicide attempts [59,60].

Anxiety and depression are the main psychological predictors of SI and attempt in adolescents [61]. Nevertheless, the independent mediating effect of anxiety between FTP and SI is not significant in this study. Studies have found that depression is a major predictive factor of SI and attempts in adolescents in South Korea and the United States [62], instead of anxiety. There are 78.3 % of adolescents with SI experienced depression in Korea [63]. Furthermore, over 90.0 % of teenagers who commit suicide suffer from depression symptoms [64]. These studies fully demonstrate that depression has a greater impact on suicide than anxiety, so this may be one of the reasons why this pathway is not significant in this study. It may also because we collected data through questionnaires, compared with self-assessment and diagnostic interview methods, questionnaire research is more prone to bias. This is a consideration that we can make improvements in the future.

To sum up, higher FTP plays a protective role in anxiety, depression, and SI, FTP can control and predict the occurrence of SI by influencing anxiety and depression in college students. This provides a new way to prevent college students from committing suicide in the future, namely that by adding some courses on time perception and management to improve the FTP of college students, and

thereby reducing the risk of anxiety, depression, and even SI. Not only can this inspiring measure implement conveniently and effectively, but also makes a huge contribution to college students' mental health.

5. Conclusion

Our research has found that FTP can not only have a direct effect on SI, but also influence the occurrence of SI through the mediating effect of anxiety and depression. The research conclusion indicate that college students can reduce anxiety and depression by increasing their own FTP, thereby reducing the incidence of SI.

6. Limitations

In addition to an unproven hypothesis, our study also has some shortcomings. First and foremost, our study participants were all from Chongqing Medical University, hence the conclusion of the study possibly vary in college students from different countries and population. In the future, the generalization of the research results needs to be further verified by using larger and more representative sample studies. What's more, the data for this study comes from questionnaires, compared with self-assessment and diagnostic interview methods, the accuracy is relatively low and the error is large, so we can make improvement on the methods in the future research. Last but not least, since we have simultaneously considered variables in the cross-sectional design, we did not take temporal precedence into consideration specifically, so we are not capable of inferring causal relationships between them. Thus, in the following cohort study, we should consider the independent and dependent variables at baseline, and then determine the mediating variables during follow-up to infer whether there is a causal relationship between them.

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Ethics approval and consent to participate

This study was reviewed and approved by the Ethics Committee of Chongqing Medical University, with the approval number:2023001, dated: February 20, 2023. All participants implied consent on completion of a questionnaire.

Data availability statement

Data will be made available on request from the corresponding author: Prof. Mengliang Ye (yemengliang@cqmu.edu.cn). Data associated with this study has not been deposited into a publicly available repository, because data included in article/supp. material/referenced in article.

CRediT authorship contribution statement

Liang Wang: Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Data curation. **Xiaobing Xian:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Jingjie Hu:** Validation, Formal analysis, Data curation. **Meiling Liu:** Methodology, Formal analysis, Data curation. **Yulin Cao:** Visualization, Investigation, Data curation. **Weizhi Dai:** Visualization, Investigation, Data curation. **Qiwei Tang:** Visualization, Investigation, Data curation. **Wenbei Han:** Visualization, Investigation, Data curation. **Zhen Qin:** Visualization, Investigation, Data curation. **Zhe Wang:** Visualization, Investigation, Data curation. **Xinting Huang:** Visualization, Investigation, Data curation. **Mengliang Ye:** Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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