Open Access Full Text Article

ORIGINAL RESEARCH

The Mediated Moderation of Conscientiousness and Active Involution on Zhongyong Practical Thinking and Depression

Ling Liu [1],*, Da Yi [2],*, Ting Li[3]

[1]Mental Health Teaching and Research Office, Guangzhou Xinhua University, Guangzhou, People's Republic of China; [2]Law School of Criminal Justice, China University of Political Science and Law, Beijing, People's Republic of China; [3]Counseling and Education Center, Xiamen University, Xiamen, People's Republic of China

*These authors contributed equally to this work

Correspondence: Da Yi, Law School of Criminal Justice, China University of Political Science and Law, Beijing, People's Republic of China, Email 513491675@qq.com

Purpose: This study integrates traditional Chinese culture, precisely the philosophy of Zhongyong (中庸) thinking, with the prevention and treatment of depression.

Samples and Methods: It involved a study with 700 undergraduate students from a college in Guangzhou, using the Negative Zhongyong Scale, the Patient Health Questionnaire-9, and the NEO Five-Factor Inventory for assessments.

Results: The findings demonstrated that negative Zhongyong thinking predicts depression inversely. Additionally, conscientiousness indirectly and positively influences this relationship through active involution, thereby enhancing its overall effect. The analysis used the 2-mediated moderation (2meMO) model, which effectively handles error heterogeneous variances and provides a detailed assessment of the interactions between these variables. The specific findings are as follows: (1) There are correlations among negative Zhongyong thinking, depression, conscientiousness, and active involution; (2) Conscientiousness can directly and positively regulate the association between negative Zhongyong thinking and depression, and it can also indirectly regulate this relationship through active involution; (3) The higher the conscientiousness, the more actively individuals engage in active involution, thereby strengthening the negative predictive effect of negative Zhongyong thinking on depression.

Conclusion: These research findings contribute to the enrichment of theoretical research on the prevention and treatment of depressive symptoms and offer a fresh perspective on the utilization of traditional Chinese culture in depression prevention and treatment.

Keywords: Zhongyong, depression, conscientiousness, involution

Introduction

Depression has emerged as a severe public health concern, with statistics from the World Health Organization indicating that it is now the leading global cause of disability, affecting over 300 million people. [1] Depression is a prevalent mood disorder characterized by persistent low mood, feelings of sadness, and diminished interest and engagement in daily activities. [2] Individuals with depression often experience feelings of sadness, hopelessness, guilt, anxiety, difficulty concentrating, and decision-making problems. [3] In recent years, research on depression has garnered increased attention due to its impact not only on individual health and quality of life but also on the substantial economic burden it imposes on society. [4]

Simultaneously, depression is becoming increasingly prevalent among the college student population. Research suggests that depression is one of the most common mental health issues among college students, with approximately 10–15% of students worldwide experiencing clinically significant depression, which is significantly higher than the general population. [5,6]

This is mainly attributed to the unique pressures faced by college students. Firstly, students must cope with frequent exams and the pressures related to employment and further education.[7] Additionally, college students face challenges in establishing social relationships, unlike high school students, which leads to social anxiety.[8] Furthermore, college students are in a critical developmental stage where their cognitive and emotional abilities are not yet fully matured and stable, making them relatively vulnerable to stress.[9] In summary, the combination of academic, employment, and interpersonal pressures faced by college students, along with their ongoing cognitive and emotional development, contributes to the high prevalence of depression among this population. Depression can significantly impact students' academic performance, quality of life, and overall well-being.[10] Therefore, conducting in-depth research on the prevention and treatment mechanisms of depression in college students, and reducing the negative effects of depression on individuals and their academic pursuits, is crucial in helping students navigate this critical developmental stage and transition successfully from the college environment to society.

According to cognitive-behavioral therapy theory, an individual's emotions and behaviors are influenced by their cognitive processes.[2] When facing negative emotions, negative Zhongyong, as a practical thinking strategy, can help individuals maintain balanced and moderate cognition, thereby negatively predicting the occurrence of depressive symptoms.[11,12] In this process, the personality trait of conscientiousness plays an important role. Individuals with high conscientiousness are more likely to effectively use negative Zhongyong thinking to regulate their emotions.[13,14] At the same time, highly conscientious individuals tend to use proactive involution behavior strategies to enhance their abilities and acquire resources. This proactive coping approach further supports their ability to use Zhongyong practical thinking when facing challenges, thereby helping to reduce the risk of depression.[15–21] Therefore, cognitive-behavioral therapy theory closely links the variables of negative Zhongyong, conscientiousness, proactive involution, and depression, revealing their mechanism of action in individual mental health.

Negative Zhongyong and Depression

The Doctrine of the Mean, Zhongyong, is an essential philosophical concept in Chinese Confucian culture. Its core principle lies in the pursuit of balance and moderation, avoiding both extremism and radicalism. Zhongyong emphasizes adopting a calm and open-minded attitude towards things and strives to maintain a harmonious approach in one's actions and interactions, considering both oneself, others, and the environment. Yang regards Zhongyong as a dialectical practical thinking system that assists individuals in achieving balance and moderation in their behavior and actions, thus promoting their psychological well-being and development.[22] Negative Zhongyong is one of the subscales within the Zhongyong Behavior Self-Assessment Scale developed by Yang. It refers to an individual's ability to employ Zhongyong thinking when facing negative emotions. Therefore, negative Zhongyong can be seen as an indicator of an individual's proficiency in utilizing Zhongyong practical thinking. The higher the negative Zhongyong scale score, the greater the individual's capacity to practice Zhongyong thinking in real-life situations. In traditional Chinese culture, Zhongyong is often associated with qualities conducive to psychological well-being, such as a calm mindset and a lack of impetuosity. Previous studies have also indicated a positive correlation between Zhongyong practical thinking and psychological well-being. Cognitive-behavioral therapy theory posits that individuals with poor negative emotion regulation abilities may struggle to effectively release negative emotions in response to daily life stressors or negative events, potentially leading to the development of depression.[2] However, Chen found that Zhongyong thinking can reduce negative cognitive emotions and alleviate depressive symptoms.[11] Through experimental methods, Guo discovered that individuals with a higher degree of Zhongyong thinking, despite exhibiting lower physiological reactivity, were more capable of perceiving positive emotional experiences.[12] Therefore, individuals with higher levels of negative Zhongyong in real-life scenarios demonstrate more excellent proficiency in utilizing Zhongyong practical thinking to regulate negative emotions when confronted with setbacks, thereby reducing the likelihood of experiencing depressive symptoms. Based on these findings, this study proposes Hypothesis 1: Negative Zhongyong negatively predicts depression.

The Mediating and Moderating Role of Conscientiousness and Active Involution

Conscientiousness is one of the five major personality traits, characterized by an individual's self-discipline, reliability, and diligence in goal setting, planning execution, and task completion. Individuals with high conscientiousness are typically proactive in planning, systematically organizing their work, and completing tasks with meticulous attention to

detail.[13] High conscientiousness enables individuals to maintain efficient functioning in complex and high-pressure environments by employing proactive planning and effective management techniques, thereby reducing uncertainty and potential anxiety. This personality trait fosters a rigorous attitude towards work and life and enhances individuals' adaptive capabilities when confronted with challenges and adversity, instilling greater confidence and equanimity in the face of stress.[14] Consequently, the strong resilience and proactive strategies associated with high conscientiousness may enable individuals to effectively utilize Zhongyong practical thinking to cope with negative emotions. Based on these observations, we propose Hypothesis 2: Conscientiousness directly and positively moderates the relationship between negative Zhongyong and depression.

The term "involution" originally emerged in the field of sociology. In 1936, the American anthropologist Alexander Golden Weiser used it to describe a cultural pattern characterized by internal complexity and refinement after reaching a certain developmental stage. In 1963, Clifford Geertz applied this concept to summarize the process in Indonesian agriculture, where increasing labor force continued to enter agricultural production despite limited land area. In 2000, the sociologist Huang Zongzhi used the concept of "involution" to analyze the rural economy in China, referring to the phenomenon where, under conditions of more people than land, labor continuously increased while the daily wage per unit of labor gradually decreased.[23] Subsequently, the concept of "involution" has been widely used in academic research across economics, politics, and social studies. In 2022, Yi Da et al developed the first psychological scale to measure involution and defined it as irrational competitive behavior, either passive or active, driven by external pressure or based on external motivations to compete for limited resources.

The concept of Active Involution was introduced by Yi Da et al through factor analysis based on previous research.[15] They classified involution into active involution and passive involution based on different participation motives. Active involution can be further divided into reward-oriented involution and achievement-motivated involution. Active involution involves individuals voluntarily engaging in involution based on external rewards or achievement motives.

To distinguish between reward-oriented involution, achievement-motivated involution, and passive involution, consider an example where a teacher requires a 3000-word assignment submission. If other students submit assignments exceeding 5000 words, a student engaging in passive involution might increase their word count to over 5000 words out of fear of falling behind or being targeted by the teacher, driven by anxiety rather than a proactive or reward-seeking motive. In contrast, a student participating in active involution would proactively submit an assignment exceeding the required word count, regardless of the lengths of other students' assignments. If the motivation is to obtain higher grades for scholarships or recommendations, it is considered Reward Involution. If the motivation is to maintain competitiveness among peers, it is considered achievement-motivated involution. The key characteristic of involution is the presence of non-intrinsic motivation.

Current Study

Previous research has indicated that individuals with high conscientiousness tend to exhibit more goal-directed behavior and higher levels of achievement motivation.[16,17] These traits make them more likely to adopt proactive coping strategies when faced with competition and pressure. The study conducted by Roberts et al further confirmed the positive correlation between conscientiousness and proactive coping strategies.[18] Other studies have also suggested that highly conscientious individuals are more inclined to compete.[19–21] These studies implied that individuals high in conscientiousness may enhance their competitive abilities and obtain external rewards through active engagement in involution as a strategy to cope with external challenges. Therefore, it was hypothesized that highly conscientious college students could enhance their capabilities and gain abundant external resources by participating in active involution. These resources and capabilities may play a supportive role in using Zhongyong practical thinking to cope with negative emotions, thus leading to significant benefits in terms of psychological well-being. Based on this, Hypothesis 3 is proposed: Conscientiousness indirectly moderates the relationship between negative Zhongyong and depression through active involution, resulting in a positive effect. The conceptual model can be found in Figure 1.
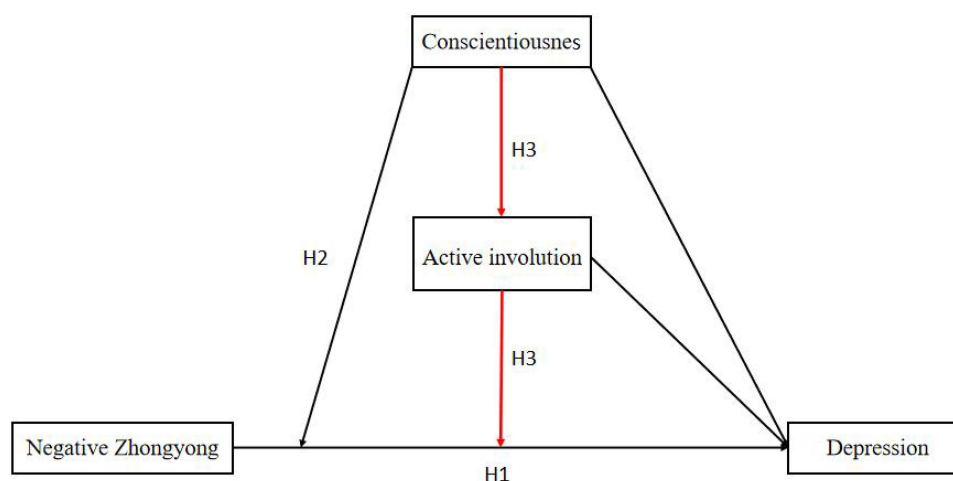
Figure 1 The Conceptual Model Diagram.

Materials and Methods

Participants and Procedures

To ensure the validity of hypothesis testing, it is necessary to estimate the sample size before collecting data. This study used G*Power to estimate the sample size, with the statistical method set to multiple linear regression. According to Cohen's effect size classification standards, small effect size (H1= 0.02), medium effect size (H1 = 0.15), and large effect size (H1=0.35).[24] This study selects a medium effect size H1=0.15, with the other input parameters set as follows: Tail = Two, H0 = 0, α = 0.05, 1-β=0.95, Number of predictors = 3. Based on these parameter settings, the calculated minimum required sample size is 121.

The survey was conducted in the form of an online questionnaire, collected by a teacher from Guangdong Xinhua University. The teacher distributed the questionnaire to students attending their public courses, who came from various majors. A total of 700 questionnaires were collected, and after excluding surveys with sequential responses and anomalous completion times, the valid dataset comprised 669 responses, resulting in an effective response rate of 95.57%. The analyzed sample consisted of students aged between 15 and 33 (M = 21.71, SD = 1.83), with one participant not providing age information. Among the participants, 37.67% (N = 252) identified as male, and 62.33% (N = 417) identified as female. All participants voluntarily participated in the study and read an informed consent form before completing the questionnaire.

Measures

Negative Zhongyong

The Negative Zhongyong Scale was used, a subscale of the Zhongyong Behavior Self-Assessment Scale developed by Yang.[22] This scale is specifically designed to assess individuals' imbalances and inappropriateness in thinking processes. It has undergone rigorous psychometric testing and has shown good reliability and validity, making it suitable for research within the Chinese cultural context. It consists of 8 items, all of which are reverse-scored. The scale utilizes a 5-point Likert scoring system, ranging from 1 (Never) to 5 (Always). A higher total score indicates a more robust ability of individuals to use Zhongyong practical thinking when facing negative emotions, thus minimizing the impact of negative emotions. In this study, the Cronbach's alpha coefficient for the Negative Zhongyong Scale was 0.87, indicating sufficient reliability.

Depression

The Patient Health Questionnaire-9 (PHQ-9) was used, a self-assessment questionnaire used to assess the severity of depressive symptoms. It was initially developed and published by Kroenke.[25] The PHQ-9 and its Chinese version have been validated for high efficiency and reliability in various populations. Its concise nine items can effectively capture the core symptoms of depression. The PHQ-9 consists of 9 items and utilizes a 4-point Likert scoring system, ranging from 1 (Not at all) to 4 (Nearly every day). Each item corresponds to one of the nine symptom domains of depression outlined in the DSM-IV diagnostic criteria. The items cover typical symptoms of depression, such as feelings of sadness, loss of

interest, sleep problems, lack of energy, and changes in appetite. A higher total score indicates a greater severity of depressive symptoms. The Chinese version of the PHQ-9 used in this study was adapted by Chen.[26] The Cronbach's alpha coefficient for the PHQ-9 in this study was 0.86, indicating good reliability.

Conscientiousness

The NEO-FFI (NEO Five Factor Inventory) is a standard tool used to assess the five major personality traits, including conscientiousness. In this study, conscientiousness is measured using the conscientiousness subscale of the simplified version of the NEO-FFI.[13] This tool has a broad application base and robust psychometric properties, accurately reflecting an individual's level of conscientiousness. The Chinese version of the NEO-FFI Conscientiousness subscale used in this study was a revised version by Nie.[27] The scale consists of 12 items and utilizes a 5-point Likert scoring system, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A higher total score indicates a higher level of conscientiousness or sense of responsibility. The Cronbach's alpha coefficient for the Conscientiousness subscale in this study was 0.84, indicating good reliability.

Active Involution

The College Student Involution Behavior Scale is the first standardized scale designed to measure involution behavior,[15] with its reliability and validity already verified. Additionally, this scale was developed by local researchers, making it more suitable for the Chinese cultural context. Therefore, this study uses the active involution subscale of the College Student Involution Behavior Scale for measurement. The scale consists of 13 items and can be further divided into two subscales: Active involution (5 items) and Active Involution-Achievement-Motivation (8 items). It utilizes a 5-point Likert scoring system, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A higher total score indicates a higher level of active involvement in involution. The Cronbach's alpha coefficient for the Active involution Scale in this study was 0.91, indicating excellent reliability.

Statistical Analyses

The data analysis comprised two main steps using SPSS 20.0 and Mplus 8.3. Firstly, a descriptive analysis (N = 669) and correlational analysis were performed on all variables. Secondly, two-mediated moderation (2meMO) was analyzed using Mplus 8.3 with Bayesian analysis.[28,29] The variables of negative Zhongyong, conscientiousness, and active involution were mean-centered before analysis. The 2meMO model, developed by Liu Hongyun et al, represents a robust approach for handling heterogeneous variances in a two-layered mediated moderation model.[28] The traditional meMO model often violates the assumption of error homogeneous variances, and there is a lack of measures to assess the magnitude of the meMO effects in applied research. The 2meMO model addressed these limitations by separating random error effects and providing more interpretable results. For more information about the 2meMO model, please refer to Tables S1-S4, Figure S1-S3 and appendix.

Results

Descriptive Statistics

Table 1 presents the means, standard deviations, and correlation coefficients for all variables in the study. Regarding demographic variables, gender (1=male, 2=female) showed a significant weak positive correlation with active involution (ρ = 0.177, p < 0.001). Age exhibited weak negative correlations with active involution and depression (ρ = −0.118, p < 0.001; ρ = −0.092, p < 0.05). The location of the family residence (1=rural, 2=urban, 3=city) demonstrated a significant weak positive correlation with conscientiousness (ρ = 0.121, p < 0.01). Whether or not the participant held a student leadership position (1=yes, 2=no) showed significant weak negative correlations with conscientiousness and active involution (ρ = −0.136, p < 0.01; ρ = −0.147, p < 0.001). The major (1=arts, 2=sciences) exhibited a significant weak positive correlation with active involution (ρ = 0.118, p < 0.01). In the subsequent mediated moderation model, all demographic variables, except being an only child, were controlled for as covariates. Concerning the study variables, except for the nonsignificant correlation between negative Zhongyong and active involution, all other study variables showed significant correlations. Negative Zhongyong, conscientiousness, and active involution were all significantly negatively correlated with depression.

Subsequently, independent samples *t*-tests were conducted to examine the differences between study variables across demographic variables (Table 2). As shown in Table 2, there were no significant differences in negative Zhongyong and

Table 1 Mean, Standard Deviation and Correlation

Variables	1	2	3	4	5	6	7	8	9	10
1. Gender	–									
2. Age	−0.201***	–								
3. The Location of The Family	0.06	−0.143***	–							
4. Only-Child Status	0.079*	0.112***	−0.296***	–						
5. Student Leadership Position	−0.008	0.165***	−0.038	0.077*	–					
6. Major	0.434***	−0.101**	0.092*	0.021	0.026	–				
7. Negative Zhongyong	−0.056	0.066	0.072	−0.055	−0.014	0.016	–			
8. Conscientiousness	−0.052	0.046	0.121**	−0.076	−0.136**	0.07	0.405***	–		
9. Active involution	0.177***	−0.118***	0.044	0.058	−0.147***	0.118**	0.031	0.266***	–	
10. Depression	0.064	−0.092*	−0.061	0.073	−0.01	−0.014	−0.586***	−0.438***	−0.150**	–
M	–	21.713	–	–	–	–	26.451	42.114	15.719	14.277
SD	–	1.8315	–	–	–	–	6.3533	6.6934	5.4318	4.6326

Notes: N = 669; *$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$.

Table 2 Independent Samples *t*-Test

		Negative Zhongyong			Conscientiousness			Active involution			Depression		
		M	*SD*	*t*	*M*	*SD*	*t*	*M*	*SD*	*t*	*M*	*SD*	*t*
Gender	Male	27.22	6.3	1.6	42.2	6.51	0.89	44.00	11.23	−4.29**	13.93	4.63	−0.98
	Female	26.57	6.26		41.82	6.45		47.66	9.72		14.23	4.48	
Only-Child Status	Yes	27.52	6.4	1.77	42.53	7.15	1.37	44.96	10.09	−1.50	13.62	4.63	−1.7
	No	26.62	6.25		41.82	6.31		46.56	10.52		14.24	4.5	
Student Leadership	Yes	26.7	5.97	−0.2	43.51	6.47	3.62***	49.17	10.27	3.54***	14.27	4.65	0.47
Position	No	26.8	6.34		41.61	6.42		45.59	10.39		14.1	4.5	
Major	Arts	26.3	6.11	−1.38	41.05	6.39	−2.47*	44.45	11.05	−2.874**	14.31	4.74	0.72
	Sciences	26.93	6.33		42.21	6.47		47.01	10.13		14.08	4.46	

Notes: N = 669; **p* < 0.05, ** *p* < 0.01, ***p < 0.001.

depression based on gender, only-child status, student leadership position, or major. Conscientiousness exhibited significant differences based on student leadership position and major, with participants in student leadership positions and science-related majors displaying slightly higher levels of conscientiousness. Active involution demonstrated significant differences based on gender, student leadership position, and major. Specifically, females, those in student leadership positions, and those in science-related majors exhibited higher levels of active involution.

The Moderated Mediation Model

To investigate the moderating effect of conscientiousness on the relationship between negative Zhongyong and depression, all variables were standardized in advance, and an interaction term was constructed by multiplying negative Zhongyong and conscientiousness. Negative Zhongyong and conscientiousness were treated as first-level predictor variables, while the interaction term was included as a second-level predictor variable in a hierarchical regression model. The results indicated that the regression coefficient of the interaction term (ie, the total moderation effect c_3') was statistically significant ($\beta = 0.092$, $p < 0.01$), with $\Delta R^2 = 0.400$, suggesting that conscientiousness moderated the relationship between negative Zhongyong and depression.

To further elucidate the mechanism behind the moderating effect of conscientiousness on the relationship between negative Zhongyong and depression, we introduced a mediated moderator, active involution, and established an indirect moderation model. Following the causal steps approach, we first regressed conscientiousness on active involution, yielding a statistically significant regression coefficient ($a1$) for conscientiousness ($\beta = 0.282$, $p < 0.001$). Subsequently, we regressed depression on negative Zhongyong, conscientiousness, active involution, the interaction term between negative Zhongyong and conscientiousness, and the interaction term between negative Zhongyong and active involution. The regression coefficient ($b2$) for the interaction term between negative Zhongyong and active involution was statistically significant ($\beta = 0.084$, $p < 0.01$). Thus, the indirect moderation model was supported, indicating that conscientiousness positively influenced participants' active involution, thereby positively moderating the relationship between negative Zhongyong and depression. Furthermore, despite excluding the indirect moderation effect, conscientiousness retained a statistically significant direct moderation effect ($\beta = 0.077$, $p < 0.05$), suggesting that the mediated moderation of active involution was only partial, and there might be other mediated moderators. The model schematic diagram with analysis results and the path coefficient diagram can be found in Figures 2 and 3.

However, the mediated moderation (meMO) model based on regression analysis, due to the lack of reasonable indicators for meMO effect size, is rarely reported in applied research, with an excessive focus on statistical significance.[28] Effect size serves as a quantitative representation of the magnitude of a phenomenon, such as the extent of influence, and an appropriate effect size should be directly tailored to the specific research question of interest.[30] To address this issue, Liu et al proposed an
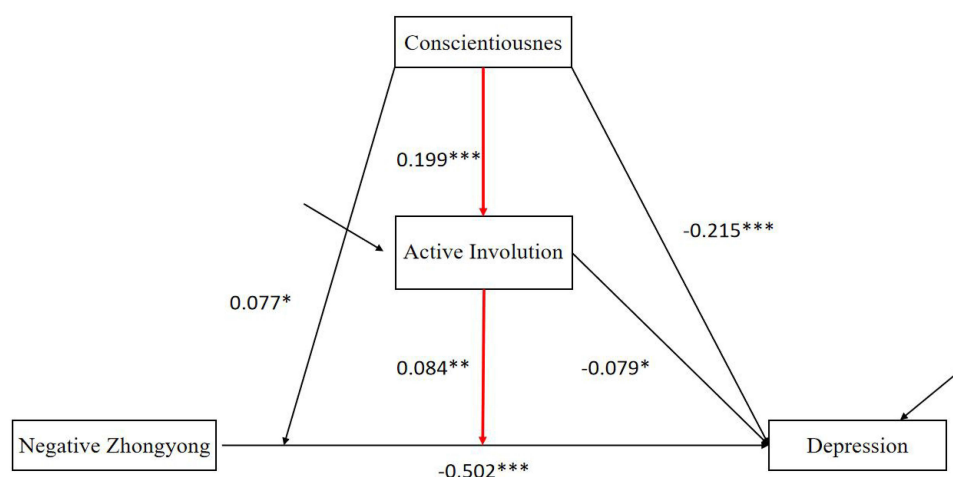

Figure 2 The Model Diagram of Conscientiousness Indirectly Moderating Negative Zhongyong and Depression (Causal Steps Approach).*$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$.
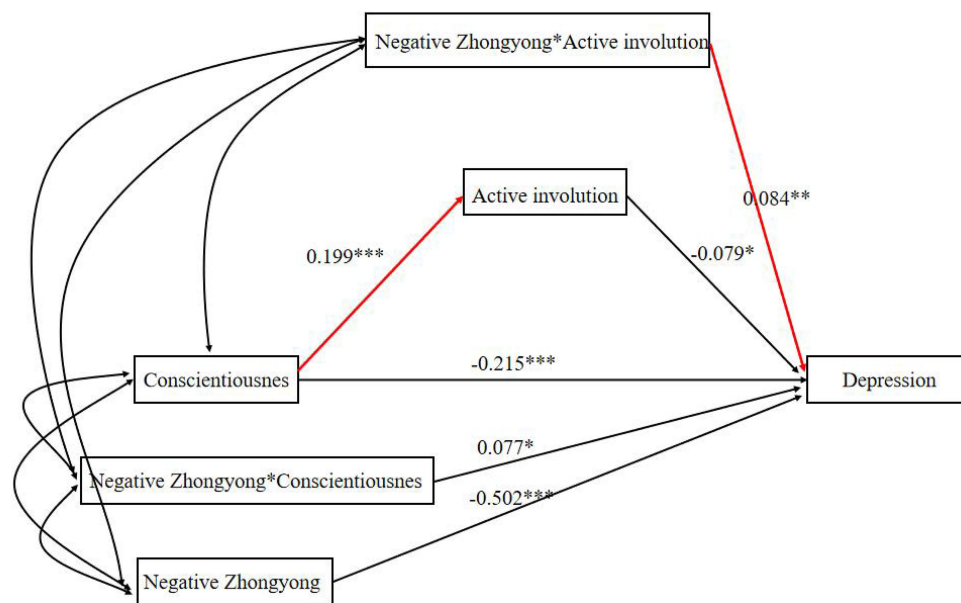
Figure 3 The Model Path Diagram of Conscientiousness Indirectly Moderating Negative Zhongyong and Depression (Causal Steps Approach).*p < 0.05, ** p < 0.01, ***p < 0.001.

expanded model (2meMO model) and its effect size.[28] The 2meMO model adopts a two-layer framework that accommodates heteroscedasticity in error variance. The Layer 1 model focuses on the variations in the independent and dependent variables. Subsequently, based on the definition of moderator, the Layer 2 model elucidates the impact of the moderating variable on the relationship between the dependent and independent variables. This model decomposes the variability in the X-to-Y effect into different components and defines effect size measures that quantify the total moderation effect, direct moderation effect, and mediated moderation effect sizes. We conducted parameter estimation for the 2meMO model using Bayesian estimation in Mplus, and the results are presented in Table 3.

Table 3 Parameter Estimates of the 2meMO Model

Statistic	2meMO		95% CI
	Posterior Mean	Posterior Standard Deviation	
Path Coefficients			
$\hat{\lambda}_{M1}$ (The indirect regulatory pre-segment path): Conscientiousness →Active involution	0.349***	0.041	[0.270, 0.431]
$\hat{\lambda}_{c0}$ (Primary Effect of Negative Zhongyong): Negative Zhongyong → Depression	−2.848***	0.203	[−3.249, −2.459]
$\hat{\lambda}_{d2}$ (Primary Effect of Conscientiousness): Conscientiousness → Depression	−1.829***	0.289	[−2.421, −1.287]
$\hat{\lambda}_{d1}$ (Primary Effect of Active involution): Active involution → Depression	−0.509**	0.180	[−0.864, −0.160]
$\hat{\lambda}_{c2}$ (Direct Moderation Effect): Conscientiousness × Negative Zhongyong → Depression	0.676*	0.317	[0.042, 1.278]
$\hat{\lambda}_{c1}$ (The indirect regulatory post-segment path): Active involution × Negative Zhongyong → Depression	0.511**	0.207	[0.106, 0.919]
$\hat{\lambda}_{M1}$ (Mediated Mediation Effect): Conscientiousness × Negative Zhongyong →Active involution × Negative Zhongyong	0.349***	0.041	[0.270, 0.431]
Residual Variances			
σ^2_{eM}	11.872	0.806	[10.302, 13.465]
σ^2_{eY}	0.663	0.036	[0.595, 0.737]
σ^2_{uc}	1.437	0.873	[0.019, 3.033]
Mediated Moderation meMO			
$\hat{\lambda}_{M1}\hat{\lambda}_{c1}$	0.178	0.076	[0.035, 0.331]

(Continued)

Table 3 (Continued).

Statistic	2meMO		95% CI
	Posterior Mean	**Posterior Standard Deviation**	
Effect Sizes			
$\hat{\phi}_{MO\,tot}$	0.167	0.135	[0.000, 0.448]
$\hat{\phi}_{MO\,dir}$	0.112	0.106	[0.000, 0.327]
$\hat{\phi}_{meMO}$	0.008	0.007	[0.000, 0.021]
$\hat{\phi}_{MO\,tot}^{(f)}$	0.557	0.236	[0.145, 1.000]
$\hat{\phi}_{MO\,dir}^{(f)}$	0.379	0.238	[0.000, 0.812]
$\hat{\phi}_{meMO}^{(f)}$	0.026	0.015	[0.000, 0.053]

Notes: N = 669; *p < 0.05, ** p < 0.01, ***p < 0.001.

The results in Table 3 indicate that the posterior mean of the mediated moderation effect estimated by 2meMO is 0.178, with a corresponding 95% confidence interval (CI) of (0.035, 0.331). The CI does not include 0, indicating a significant mediated moderation effect. Specifically, the posterior mean $\hat{var}_{(c_i)}$ of the total variation in the impact of negative Zhongyong to depression is 1.437, with a 95% CI of (0.019, 3.033). This indicates that the total variance of the impact of negative Zhongyong on depression is relatively large in the sample data and statistically significant. The posterior means of the effect sizes $\hat{\phi}_{MO\,tot}^{(f)}$, $\hat{\phi}_{MO\,dir}^{(f)}$, and $\hat{\phi}_{meMO}^{(f)}$, and obtained through Bayesian estimation are 0.167, 0.112, and 0.008, respectively.

The total moderating effect refers to the overall moderating role of conscientiousness in the relationship between negative Zhongyong and depression. This effect includes the impact of conscientiousness on depression through both direct and indirect paths. $\hat{\phi}_{MO\,tot}^{(f)}$ =0.167 indicates that the total moderating effect of conscientiousness explains 16.7% of the total variance in the impact of negative Zhongyong on depression.

The direct moderating effect ($\hat{\phi}_{MO\,dir}^{(f)}$) refers to the impact of conscientiousness on the relationship between negative Zhongyong and depression without any mediating variables. $\hat{\phi}_{MO\,dir}^{(f)}$=0.112 indicates that the direct moderating effect of conscientiousness explains 11.2% of the total variance. The indirect moderating effect refers to the influence of conscientiousness on the relationship between negative Zhongyong and depression through proactive involution. $\hat{\phi}_{meMO}^{(f)}$ =0.008 indicates that the indirect moderating effect (mediated moderating effect) explains 0.8% of the total variance.

It is worth noting that, based on the effect sizes defined by variance decomposition, the path coefficients corresponding to the direct moderating effect λ_{c2} and the indirect moderating effect $\lambda_{c1}\lambda_{M1}$ are both related to the moderating variable, conscientiousness, and are not independent. Therefore, the variance explained by the path coefficients is not additive; the sum of the direct and indirect moderating effect sizes does not equal the total moderating effect size, ie, $\hat{\phi}_{MO\_tot} \neq \hat{\phi}_{MO\_dir} + \hat{\phi}_{meMO}$. Further analysis shows that when the random error μ_{ci} in the path coefficient of the negative Zhongyong to depression relationship is removed, the posterior mean estimates of the effect sizes $\hat{\phi}_{MO\,tot}^{(f)}$, $\hat{\phi}_{MO\,dir}^{(f)}$, and $\hat{\phi}_{meMO}^{(f)}$ are 0.557, 0.379, and 0.026, respectively. This indicates that the explanatory power of conscientiousness as a moderating effect on the relationship between negative Zhongyong and depression is significantly enhanced, especially the direct moderating effect, when random error is not considered.

The standardized path diagram and coefficient diagram of the 2meMO model are shown in Figures 4 and 5. Overall, the 2meMO model based on Bayesian analysis is similar to the path analysis results based on the causal steps approach. Both the direct and mediated moderation effects are significant. Negative Zhongyong can directly predict depression, conscientiousness can directly moderate the relationship between negative Zhongyong and depression, and it can also indirectly moderate the relationship between negative Zhongyong and depression through active involution. College students with higher levels of negative Zhongyong exhibit lower levels of depression, and high levels of
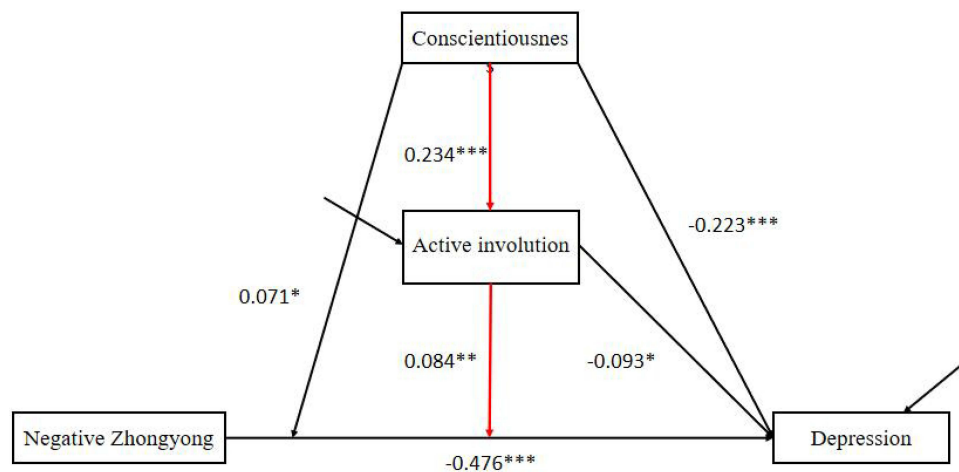
Figure 4 The Model Diagram of Conscientiousness Indirectly Moderating Negative Zhongyong and Depression (Based on Bayesian Analysis of 2meMO). *p < 0.05, ** p < 0.01, ***p < 0.001.
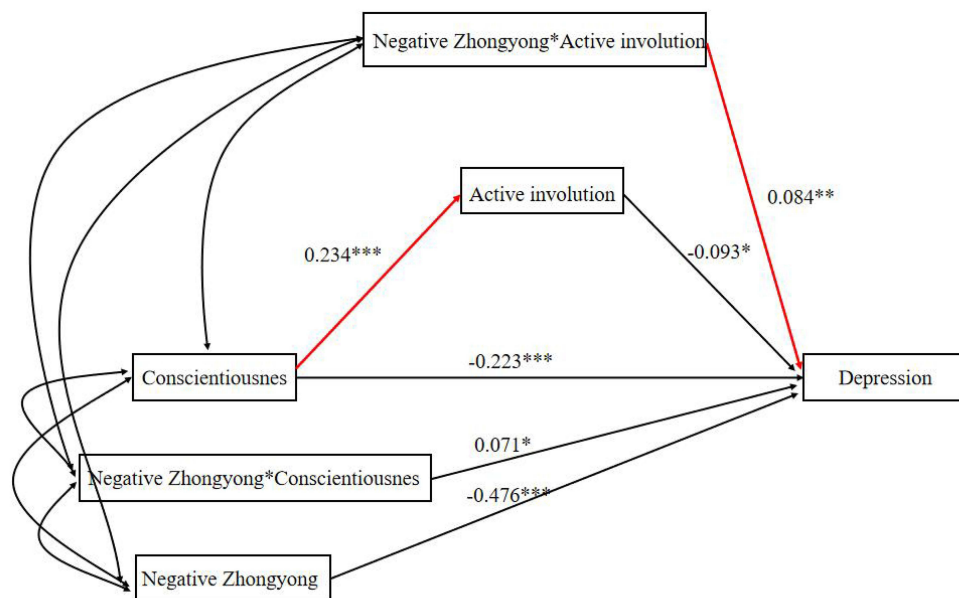

Figure 5 The Model Path Diagram of Conscientiousness Indirectly Moderating Negative Zhongyong and Depression (Based on Bayesian Analysis of 2meMO). *p < 0.05, ** p < 0.01, ***p < 0.001.

conscientiousness positively moderate the negative predictive relationship between negative Zhongyong and depression, both directly and indirectly through active involution. Higher levels of conscientiousness lead individuals to engage in active involution, which positively moderates the relationship between negative Zhongyong and depression. Additionally, the direct moderation effect of conscientiousness is also significant, indicating that the mediated moderation of active involution was only partial, suggesting the potential existence of other mediated moderators.

It further illustrated the relationship between negative Zhongyong and depression via the indirect moderating path of conscientiousness → active involution using simple slope analysis (Figure 6). The method of selecting points was employed, where the mean plus one standard deviation of conscientiousness and active involution was designated as the high W and high M condition, while the mean minus one standard deviation of conscientiousness and active involution was designated as the low W and low M condition. In the high conscientiousness and high active involution group, the preventive effect of negative Zhongyong on depression was more pronounced. However, the difference in depression
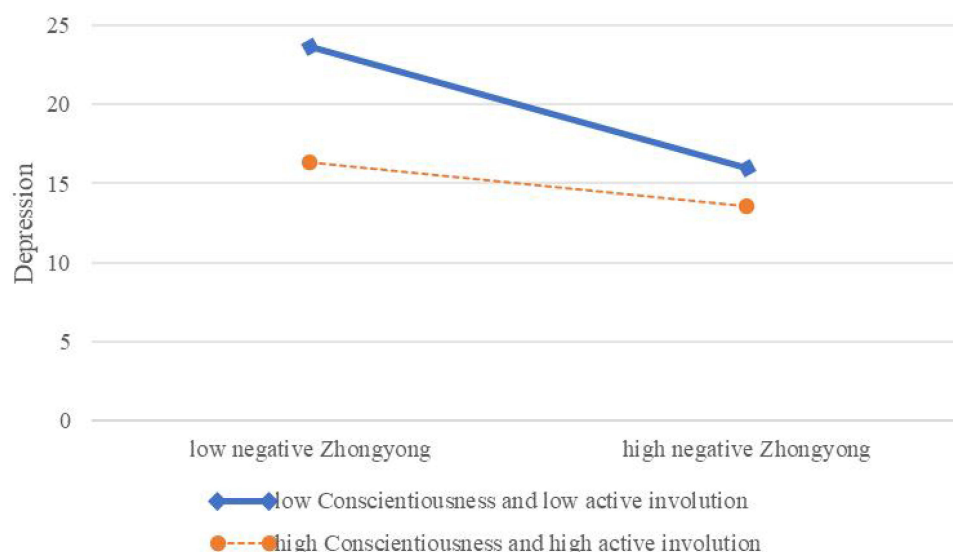
Figure 6 Simple Slope Analysis of Conscientiousness Indirectly Moderating Negative Zhongyong and Depression.

levels between the high and low negative Zhongyong groups was more minor ($b = -1.871$, $p < 0.001$). In the low conscientiousness and low active involution group, the preventive effect of negative Zhongyong on depression was weaker, and the difference in depression levels between the high and low negative Zhongyong groups was more substantial ($b = -3.793$, $p < 0.001$).

Discussion

This study aimed to elucidate the mechanism of how negative Zhongyong influences depression, expanding the theoretical research on traditional culture in mental health.

Firstly, the results of this study demonstrated that Zhongyong thinking can negatively predict depression, aligning with previous research findings and supporting Hypothesis 1. For instance, Yang found that Zhongyong beliefs and practices have a positive impact on individuals' mental health, and Zhongyong beliefs are negatively correlated with clinical symptoms.[31] Chen et al also found a significant negative correlation between Zhongyong thinking and negative cognitive emotion regulation strategies and depressive symptoms.[11] As a balanced and moderate cognitive approach, Zhongyong thinking may reduce the risk of depression by enhancing individuals' emotional regulation and stress resilience. It encourages individuals to maintain balance and composure when dealing with emotions and facing pressure, avoiding excessive emotional reactions and extreme responses. This helps individuals better cope with life's challenges and difficulties, thereby reducing the occurrence of depression. Additionally, Guo discovered that individuals with a high level of Zhongyong thinking exhibit faster and more accurate responses to positively arousing pictures, and they experience stronger positive emotions in positive events.[12]

This indicates that Zhongyong thinking can also enhance individuals' emotional experiences, making them more positive and optimistic about life, thereby reducing the risk of depression.

Secondly, this study revealed for the first time the positive moderating effect of conscientiousness in the relationship between negative Zhongyong and depression, supporting Hypothesis 2. On the one hand, individuals with higher conscientiousness possess high organizational skills, orderliness, and perseverance, and they might be more inclined to adopt proactive coping strategies, such as effective stress management through time management and goal setting.[18] These positive traits and coping strategies might complement Zhongyong thinking, strengthening the effectiveness of Zhongyong thinking in dealing with negative emotions. On the other hand, Wang et al found a negative correlation between persistent depression and conscientiousness, indicating that individuals with high conscientiousness have lower susceptibility and stronger recovery capabilities concerning depressive symptoms.[32] Therefore, high conscientiousness can enhance the efficacy of Zhongyong abilities and reduce individuals' susceptibility and persistence to depression.

Finally, this study further revealed the internal mechanism of how conscientiousness moderates the relationship between negative Zhongyong and depression, discovering that conscientiousness can positively predict active involution, indirectly moderating the relationship between negative Zhongyong and depression, thus supporting Hypothesis 3. Previous research has demonstrated that individuals with high conscientiousness are more inclined to adopt competitive or proactive strategies, and active involution is a form of special competition.[19–21] Therefore, college students with high conscientiousness might be more inclined to engage in active involution to enhance their abilities or obtain external rewards. The improvement in abilities and the external rewards obtained through active involution provide psychological and material support for college students to use Zhongyong thinking to cope with negative emotions. Therefore, conscientiousness moderates the relationship between Zhongyong thinking and depression by promoting individuals to adopt positive coping strategies and goal-oriented behaviors (such as active involution).

In conclusion, the use of Zhongyong thinking in dealing with negative emotions can moderately reduce the level of depression, and conscientiousness can directly positively moderate the relationship between negative Zhongyong and depression. This suggests that we can try to apply the Zhongyong thinking from traditional culture to the prevention and treatment of depression, helping individuals learn how to use Zhongyong thinking to regulate emotions and cope with stress. Meanwhile, enhancing conscientiousness in educational and mental health work, for example through goal setting, time management, and self-monitoring strategies, can help individuals improve self-management and stress coping abilities. To sum up, it is recommended to guide individuals in proactive involution by providing resources and support, helping them achieve self-improvement and a sense of accomplishment, thereby reducing the risk of depression.

The application of Zhongyong thinking, conscientiousness and active involution to the treatment and prevention of depression not only enriches the theoretical framework in the mental health field but also provides new perspectives and methods for practical interventions.

Limitations and Future Directions

This study has several limitations that can be addressed in future research.

First, as a cross-sectional study, it is difficult to infer causal relationships between variables. Therefore, future research should use longitudinal data to explore the causal relationships between variables. It is suggested to conduct a questionnaire survey on the participants every semester for 2–3 years to verify the negative predictive effect of negative Zhongyong on depression and the moderating role of conscientiousness.

Second, the study used a questionnaire survey method, which may be influenced by social desirability bias. Although the Harman's single-factor test showed that common method bias was within an acceptable range, future data collection should use multiple channels, such as informant reports and behavioral measures, to obtain a more comprehensive understanding of the relationships between Zhongyong thinking, conscientiousness, and involution behavior.

Third, the participants in this study were only from the college student population. Future researchers should consider different participant groups, such as employees, high school students, and graduate students, to improve the generalizability of the findings and verify the applicability of the conclusions in different populations.

Fourth, consider other possible mechanisms affecting Zhongyong thinking, conscientiousness, and depression, such as emotion regulation, cognitive reappraisal, and social support. Also, consider the relationship between Zhongyong thinking and other psychological factors, such as self-esteem, optimism, and coping strategies.

Fifth, conduct intervention studies and random controlled trials, utilizing existing interventions such as school mental health courses and group counseling, to observe changes in depression levels among students participating in Zhongyong thinking courses compared to those who do not.

Sixth, consider the impact of cultural differences on the research findings and conduct cross-cultural comparative studies.

The study makes several contributions to the existing literature. Firstly, it reveals potential mechanisms by which Zhongyong thinking promotes mental well-being and suggests the possibility of integrating Zhongyong thinking into depression treatment, providing a novel perspective on the application of traditional culture in the modern mental health field. Secondly, the study incorporates the novel psychological concepts of conscientiousness and active involution into the explanation of the relationship between Zhongyong thinking and depression, supporting the utilization of traditional

culture in the field of mental health and reevaluating the concept of involution. It highlights that not all forms of involution are detrimental to mental health, and active involution can strengthen the preventive and therapeutic effects of Zhongyong thinking on depression. Lastly, the study provides practical support for designing effective psychological interventions, demonstrating that Zhongyong thinking has a more substantial impact on preventing and treating depression for individuals with high conscientiousness and a tendency for active involution.

Ethics Statement

All participants in the study provided informed consent, and all the methods and research procedures were conducted in accordance with the Declaration of Helsinki. The study was approved by the Biological and Medical Ethics Committee of Guangzhou Xinhua University.

Funding

Disclosure

The authors have no conflicts of interest to declare that are relevant to the content of this article.

References

1. World Health Organization. Depression and other common mental disorders: global health estimates. 2017. Available from: https://apps.who.int/iris/handle/10665/254610. Accessed August 13, 2024.
2. Beck AT. *Depression – Clinical Experimental and Theoretical Aspects, Vol. 32*. New York: Harper and Row; 1967.
3. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed. Arlington, America, VA: American Psychiatric Publishing; 2013.
4. Bloom DE, Cafiero E, Jané-Llopis E, et al. The global economic burden of non-communicable diseases. Pgda Working Papers, 2012.
5. Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C. A systematic review of studies of depression prevalence in university students. *J Psychiatr Res*. 2013;47(3):391–400. doi:10.1016/j.jpsychires.2012.11.015
6. Liu CH, Stevens C, Wong SHM, Yasui M, Chen JA. The prevalence and predictors of mental health diagnoses and suicide among US college students: implications for addressing disparities in service use. *Depression Anxiety*. 2019;36(1):8–17. doi:10.1002/da.22830
7. Rosenthal BS, Wilson WC, Futch VA. Trauma, protection, and distress in late adolescence: a multi-determinant approach. *Adolescence*. 2009;44 (176):693–703. doi:10.1016/j.addbeh.2007.07.016
8. Azmitia M, Syed M, Radmacher K. Finding your niche: identity and emotional support in emerging adults' adjustment to the transition to college. *J Res Adolescence*. 2013;23(4):744–761. doi:10.1111/jora.12037
9. Arnett J, Jensen J. Emerging adulthood: a theory of development from the late teens through the twenties. *Am Psychologist*. 2000;55(5):469–480. doi:10.1037//0003-066X.55.5.469
10. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Collaborators WI. WHO world mental health surveys international college student project: prevalence and distribution of mental disorders. *J Abnormal Psychol*. 2018;127(7):623–638. doi:10.1037/abn0000362
11. Chen P, Chen Y, Yang X. Mechanisms of Zhongyong practical thinking's impact on depressive symptoms in college students: the mediating role of negative cognitive emotion regulation strategies. *Intl J Phys Beh Res*. 2021;19:571–576.
12. Guo K *The impact of Zhongyong practical thinking on emotions and their regulation in college students*. Master's Thesis, University of Electronic Science and Technology of China, Chengdu, China, 2012.
13. Costa PT Jr, McCrae RR. *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual*. FL, Odessa: Psychological Assessment Resources; 1992.
14. Carver CS, Connor-Smith J. Personality and coping. *Annu Rev Psychol*. 2010;61(1):679–704. doi:10.1146/annurev.psych.093008.100352
15. Yi D, Wu J, Zhang M, et al. Does involution cause anxiety? An empirical study from Chinese universities. *Int J Environ Res Public Health*. 2022;19(16):9826. doi:10.3390/ijerph19169826
16. Barrick MR, Mount MK. The Big Five personality dimensions and job performance: a meta-analysis. *Personnel Psychol*. 1991;44(1):1–26. doi:10.1111/j.1744-6570.1991.tb00688.x
17. Judge TA, Ilies R. Relationship of personality to performance motivation: a meta-analytic review. *J Appl Psychol*. 2002;87(4):797–807. doi:10.1037/0021-9010.87.4.797
18. Roberts BW, Lejuez C, Krueger RF, Richards JM, Hill PL. What is conscientiousness and how can it be assessed? *Dev Psychol*. 2014;50(5):1315–1330. doi:10.1037/a0031109
19. Forrester WR, Tashchian A. Factors that influence students to participate in team decision making. *Am J Bus Educ*. 2011;4:33–42. doi:10.19030/ajbe.v4i11.6491
20. Jin ZH *The Impact of Conscientiousness on Work Engagement: Consistency between Leaders and Employees and Individual Perspectives*. Master's Thesis, Southwest University, Chongqing, China, 2021.

21. Li MZ *The Relationship between Personality Traits of Enterprise Executives, Market Orientation, and Innovation Performance*. Master's Thesis, South China University of Technology, Guangzhou, China, 2021.

22. Yang ZF. Preliminary progress in the exploration of the Zhongyong practical thinking system. *Studies of Psycho Behav*. 2010;34:3–96.

23. Ouyang TM. The semantic evolution of "Involution". *Lang Teach Res*. 2021;11:151.

24. Cohen J. *Statistical Power Analysis for the Behavioral Sciences (2nd Ed.)*. New York: Routledge; 1988.

25. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606–613. doi:10.1046/j.1525-1497.2001.016009606.x

26. Chen S, Chiu H, Xu B, et al. Reliability and validity of the PHQ-9 for screening late-life depression in Chinese primary care. *Int J Geriatr Psychiatry*. 2010;25(11):1127–1133. doi:10.1002/gps.2442

27. Nie Y, Lin CD, Zheng X, Ding L, Peng YS. The relationship between adolescent social adaptation behavior and the big five personality traits. *Psychol Sci*. 2008;31:6. doi:10.3969/j.issn.1671-6981.2008.04.002

28. Liu HY, Yuan KH, Gan KY. Extension and effect size of the mediated moderation model. *Acta Psychologica Sinica*. 2021;53:17. doi:10.3724/SP. J.1041.2021.00322

29. Wang Y, Wen ZL, Wang HH, Guan F. The second type of mediated moderation model. *Adv Psychol Sci*. 2022;30:15. doi:10.3724/SP. J.1042.2022.02131

30. Kelley K, Preacher KJ. On effect size. *Psychol Methods*. 2012;17(2):137–152. doi:10.1037/a0028086

31. Yang ZH *Research on the relationship between Zhongyong practical thinking and family functioning and mental health*. Doctoral dissertation, Central South University, Changsha, China, 2012.

32. Wang T, Li QS, Liu HR, Jian WY. Urban-rural differentials in the relationship between personality traits and changes in depressive symptoms. *Beijing Da Xue Xue Bao Yi Xue Ban*. 2023;55(3):385–391. doi:10.19723/j.issn.1671-167X.2023.03.001