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ORIGINAL RESEARCH

The Depressive Tendency Questionnaire for Chinese Middle School Students: Development and Initial Validation

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Purpose: Depressive tendency refers to the early stage of the onset of depression disorder, which can also have a negative impact on individuals' quality of life. However, there are many numerous depression-related scales that are primarily used to evaluate depression disorders with relatively severe symptom severity. And considering the characteristics of the Chinese cultural background, relatively few corresponding scales are currently developed. This study aimed to develop and validate a depressive tendency questionnaire for Chinese middle school students, based on the psychological structure of depressive tendency in the context of Chinese culture.

Methods: The initial version of the questionnaire was developed through literature reviews, open surveys, and in-depth interviews. The questionnaire was revised based on the predictions made from 865 middle school students (M=15.84, SD=1.50). Finally, the formal questionnaire was developed through valid administration to 1205 students (M=15.63, SD=1.82), using confirmatory factor analysis, reliability, and validity testing, as well as measurement invariance analysis.

Results: The questionnaire consisted of 30 items, including negative self, cognitive function, personal reserve, and social support. The results of confirmatory factor analysis showed that the questionnaire fitted the data with well construct validity. Measurement invariance indicates no gender and grade differences in the questionnaire scores. The questionnaire demonstrates good reliability and validity, meeting the requirements of psychometrics.

Conclusion: From a theoretical point of view, we clarified the psychological structure of depressive tendencies among Chinese middle school students, providing a theoretical and empirical basis for subsequent related research. From a practical point of view, the formal questionnaire plays a positive role in the smooth development of mental health counseling, education, and other work in middle schools.

Keywords: middle school students, depressive tendency, psychological structure, questionnaire development, Chinese culture

Introduction

To promote the mental health of adolescents, the Chinese government has released multiple policy documents in recent years, proposing to prioritize the prevention and treatment of depression.[1] In 2021, the Ministry of Education explicitly incorporated depression screening into the health examination content for students. Depressive tendency is regarded as an initial stage in the development of depression.[2] The study found that up to 29.2% of adolescents are influenced by depressive tendencies,[3,4] its incidence rate is about twice that of major depressive disorder (MDD).[5] And there are even studies indicating that there is no significant difference in mortality rates between individuals with depressive tendencies and those with MDD.[6]

Chinese middle school students aged between 11–18 are in a period of rapid physical and psychological development during adolescence, which is also the peak period for the occurrence and development of depression.[5] Recent studies have found that the detection rate of the depressive tendency among Chinese middle school students is high, exceeding 20%.[7,8] Depressive tendencies may induce a series of problems in middle school students, such as academic burnout, and poor interpersonal relationships.[9–11] Therefore, early identification and intervention are necessary.

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Concept of Depressive Tendency

Previous studies have focused on the differences between healthy individuals and those with clinical depression, treating them as two distinct categories and ignoring the process of healthy individuals transitioning to depression.[12,13] However, it is now widely acknowledged that viewing depression as a categorical condition may not be the most effective approach. Instead, it may be more useful to consider depression as a spectrum, spanning from no depression to severe depression, with various intermediate states in between.[4,14] From this perspective, the depressive tendency is important. Meta-analyses have shown that previous studies have mainly defined depressive tendencies based on three aspects: (1) individuals have at least one or two core symptoms of MDD (such as depressed mood or loss of interest), accompanied by one or more other symptoms of MDD, but do not meet all the criteria for MDD, as well as other specific criteria; (2) high scores on self-reported measures of depression, such as at least 16 points on the Centre for Epidemiological Studies Depression Scale (CES-D); (3) The duration of individual corresponding symptom manifestations is 1–2 weeks.[4,15] However, there is still a lack of unified standards and definitions for depressive tendencies.

Theory of Depressive Tendency

The development from depressive tendencies to depressive disorders is a continuous process,[16] which can be attributed to the interaction of various internal and external factors.[17] According to the depression cognitive theory by Beck, when individuals' self-schemas contain feelings of loss and worthlessness, it can easily trigger depressive tendencies. The self-schema, a comprehensive understanding of oneself formed based on past experiences, is the core concept of this theory.[18] Coyne first proposed that disturbed relationship is also an important factor in triggering individual depression.[19] Monroe and Simons' diathesis-stress model proposes that stress induces depressive emotions in individuals with internalizing traits.[20] However, this model excessively emphasizes the direct relationship between internal traits and external stressors, ignoring other essential influencing factors. Zuroff et al integrated various factors and proposed the dynamic interactionist model of vulnerability to depression, which not only assumes the interaction between personality vulnerability and stressful events but also emphasizes the significant influence of social support provided by interpersonal relationships on depression.[11]

Depression has long been a topic of research, and identifying early depressive tendencies in middle school students is crucial for effective intervention. However, current measurement tools primarily focus on clinical symptoms and are not suitable for identifying early depressive tendencies. This study will employ the dynamic interactionist model of vulnerability to depression, use grounded theory to explore psychological characteristics and develop a standardized measurement questionnaire to promote further research on depressive tendencies. Our approach will pave the way for better interventions and expand the latest theories on depression.

Measurements of Depressive Tendency

Few questionnaires accurately measure depressive tendencies, and researchers typically use depression questionnaires for this purpose, but their use in terms, content, and assessment standards is inconsistent, making it difficult to ensure their effectiveness in identifying depressive tendencies among middle school students. These measurement tools mainly have the following problems: (1) When screening students for depressive tendencies, the current scales are usually applicable to groups of all ages and lack effective targeting for middle school students, such as CES-D.[14,21] (2) The current research often relies on measurement tools for MDD, which mainly reference the clinical diagnostic criteria for depression.[4,15] The self-assessment questions in these tools typically focus on symptoms that only appear in severe depression and emphasize the severity of symptoms, rather than specifically identifying depressive tendencies in students. (3) Due to cultural differences between China and the West, foreign scales are not applicable to evaluating Chinese middle school students. For example, when the domestically translated and revised Children Depression Inventory (CDI) was used with Chinese middle school students, it showed that the structure of the inventory was relatively loose and unstable. The internal consistency coefficients of the subscales in the scale, including "inefficacy", are less than optimal.[22] And when conducting depression surveys on students, most schools in China often delete questions related to 'sex' as sensitive topics.

Depressive Tendency Among Chinese Middle School Students

Research has shown that depression exhibits cross-cultural differences,[23] with different cultures exhibiting different core symptoms of depressive tendencies. For example, among the many symptoms of depression, the core symptoms of Indian adolescents are feelings of failure, while those of American adolescents are feelings of loneliness,[24] and the depressive symptoms of Chinese adolescents mainly manifest as suppressed emotions, feelings of failure, and sadness, etc.[25] Zhou and Ryder believe that Chinese culture influences individuals' understanding and expression of their emotional pain.[26]

Chinese culture is characterized by its collectivist nature.[27] Although cultural differences are multidimensional, individualism and collectivism are the most significant differences between cultures.[28] Knyazev et al believe that collectivism may be a protective factor against depression, as the social support from internal members unique to collectivist societies can protect individuals from affect disorders.[29] But in the domestically translated and revised depression questionnaire, certain questionnaire structures, while incorporating interpersonal factors, actually focus on examining individuals' interpersonal situations (such as "I have many friends" in CDI), neglecting the reporting of social support perceived by individuals from interpersonal relationships. This has significant implications for assessing the depressive tendency levels of middle school students.[30]

Moreover, Confucian culture in China places great emphasis on education, believing that "Nothing else is so worthy as the activity of learning", and leading Chinese parents to expect their son/daughter to be successful.[25] This cultural phenomenon often results in students bearing excessive academic pressure, especially during middle school when they face significant academic exams such as the high school entrance exam and college entrance exam. Research has found that academic pressure is one of the main sources of depression among Chinese middle school students,[31] which may be one of the reasons why the prevalence of depression is generally higher among Chinese middle school students than in European and American countries.[32] Specifically, China's social and cultural environment differs from the West, and different cultural backgrounds determine individuals' general psychological and behavioral patterns.

Thus, this study sought to create and validate a questionnaire measuring depressive tendencies in Chinese middle school students. Firstly, this study was based on a literature review, open-ended questionnaires, in-depth interviews, and some expert opinions to establish a pool of depressive tendency items. Next, it will be further refined through parallel analysis and exploratory factor analysis (EFA), resulting in a preliminary four-factor model. Finally, a formal questionnaire will be developed through confirmatory factor analysis (CFA), reliability and validity tests, and measurement invariance tests.

Methods

Item Development

Firstly, the development of the initial item pool for the depressive tendency questionnaire was based on a large number of previous studies, which focused on analyzing factors that induce depressive tendencies in students. Additionally, some items from classic depression scales were included in the item pool, such as the items related to "talk" and "depressed" in CES-D.[33] The open-ended surveys and interviews produced coded content, which was transformed into 88 questionnaire items using qualitative data analysis methods. This approach integrates the perspectives and experiences of middle school students regarding depressive tendencies, ensuring that the questionnaire items are grounded in real-life experiences. Secondly, experts reviewed and modified the questionnaire, removing unclear, ambiguous, similar, and repetitive items. The feedback of 12 master's students in psychology, 6 doctoral students in psychology, 10 middle school head teachers and mental health teachers, and 5 mental counseling experts was obtained and discussed to create a preliminary version with 80 items. The preliminary questionnaire consists of four dimensions: negative self, personal reserves, cognitive function, and social support. Finally, to ensure that the preliminary questionnaire was appropriate for middle school students' reading habits and comprehension, 38 middle school students were given paper questionnaires to complete. The questionnaire used a 5-point scale to gauge experiences from the past week, where 1 indicated "completely disagree" and 5 indicated "completely agree".

Samples

Participants in an Open-Ended Questionnaire

A qualitative study was conducted on the psychological characteristics and behavioral manifestations of depressive tendencies in middle school students. An open-ended questionnaire was used for this purpose. To ensure the sample's representativeness, the following selection criteria were applied: (1) headteachers and psychology teachers currently teaching in Chinese middle schools; (2) students currently attending Chinese middle schools; (3) all participants were physically and mentally healthy. Participants will be informed of the study's purpose and their data will be kept confidential. They can choose to participate voluntarily. The questionnaire was completed by 60 headteachers and psychology teachers, as well as 63 middle school students, using both online and offline recruitment methods. The questionnaire participants mainly came from 34 middle schools in provinces such as Liaoning, Anhui, Jilin, and Henan.

Interviewees

To gain a comprehensive understanding of the characteristics and manifestations of depressive tendencies in middle school students, we recruited some participants from the open-ended questionnaire. These participants included middle school teachers and students who voluntarily agreed to participate in in-depth interviews. The interviews were conducted in two phases, namely preliminary and formal, to determine the criteria and content for developing a depressive tendency questionnaire suitable for middle school students. The participants are detailed as follows:

(1) Preventive interviews were conducted with 2 psychology graduate students, 1 middle school head teacher, 1 middle school psychology teacher, and 1 middle school student. After the preventive interviews, research team members engaged in repeated discussions to refine the interview design and outline, further summarize the necessary communication skills and considerations during the interview process, and improve the interview procedure.

(2) In this study, based on the principle of "purposive sampling",[34] 21 middle school teachers and 2 middle school students with depressive tendencies ($24 \leq$ CES-D total score < 29) were selected for interviews. The collected data has reached saturation, and the sample size meets the quantity requirements of interview research.[35]

Test Participants and Procedure

This study applied stratified and convenient sampling as the basic sampling principles and collected three batches of samples from middle schools in China to test the reliability and validity of the questionnaire. The inclusion criteria for participants were: (1) students currently attending Chinese middle schools; (2) students were physically and mentally healthy. After the survey was completed, the researchers checked all the data and removed invalid questionnaires. The criteria for deletion: (1) In each questionnaire, a trap question with a designated answer will be added, and if the participant answers incorrectly, the questionnaire is considered invalid. (2) If the participant chooses the same option for more than 1/3 of the questions consecutively in the questionnaire, it is suspected that they are not answering seriously, and the questionnaire is also considered invalid. The specific characteristics of the test participants are presented in Table 1.

Sample 1 was used for item analysis and EFA. The preliminary survey questionnaires were distributed in paper form to two middle schools in Dalian City, Liaoning Province through on-site centralized testing. Finally, a total of 865 valid questionnaires were determined, with an effective rate of 83.74%. The age range was between 13 and 22 years (M=15.84, SD=1.50).

Sample 2 was used for CFA, reliability, and validity testing. A total of 1150 paper questionnaires (formal version) were distributed through on-site centralized testing in three middle schools from the provinces of Liaoning, and Shandong. Additionally, 342 students from a school in Inner Mongolia, participated in the study by answering the online questionnaires (https://www.wjx.cn). In total, 1492 students were involved, and finally, 1205 valid questionnaires were determined, resulting in an effective rate of 80.76%. The participants' ages ranged from 13 to 20 years (M=15.63, SD=1.82). Furthermore, the CES-D questionnaire was included in the formal survey of Sample 2 for criterion-related validity analysis, but due to 11 participants selecting the same option for more than 1/3 of the CES-D questionnaire items, their responses were deemed invalid, resulting in 1194 valid questionnaires for this analysis.

Sample 3 was used for test-retest reliability testing. Test-retest reliability was conducted on 213 students (M=15.39, SD=1.57) from two middle schools in Sample 2, with a 2-week interval, including 75 male students and 138 female students.

Table 1 Demographic Characteristics of Study Participants

	Characteristics	Categories	N	%
Sample 1 (N=865)	Grade	7th	81	9.36
		8th	157	18.15
		9th	154	17.80
		10th	201	23.24
		11th	172	19.88
		12th	100	11.56
	Gender	Male	454	52.49
		Female	398	46.01
		Missing value	13	1.50
Sample 2 (N=1205)	Grade	7th	272	22.57
		8th	272	22.57
		9th	270	22.41
		10th	235	19.50
		11th	156	12.95
	Gender	Male	544	45.15
		Female	658	54.61
		Missing value	3	0.24
Sample 3 (N=213)	Grade	7th	51	23.94
		8th	48	22.54
		10th	51	23.94
		11th	63	29.58
	Gender	Male	75	35.21
		Female	138	64.79

Measurements

The Centre for Epidemiological Studies Depression Scale (CES-D). The Chinese revised version of the CES-D, developed by Radloff, was used as the criterion variable.[36,37] The scale comprises 20 items, measuring dimensions of depressed affect, positive affect, somatic and retarded activity, and interpersonal. Responses are scored on a 0–3 scale, with higher scores indicating a greater frequency of depressive symptoms or feelings experienced in the past week. In this study, the Cronbach's α for this scale was 0.931.

Statistical Analyses

First, to assess if each item in the questionnaire effectively discriminates between different responses, we used Sample 1 for item analysis, employing critical ratio analysis, item-total correlation analysis, and homogeneity test. Assuming a critical ratio greater than 3 and a p-value less than 0.05. Under these conditions, the average difference in items between the high-scoring group (top 27%) and the low-scoring group (bottom 27%) is highly significant, indicating that the item is well-distinguished. Subsequently, parallel analysis was conducted using Mplus 8.3 and EFA was performed

using SPSS 21.0. EFA used principal component analysis extraction and Promax rotation to allow for the correlation between measures created for measurement, thus determining a 4-factor structure for depressive tendencies in Chinese middle school students.

Sample 2 was used for CFA to test the fit of the measurement model and the structural validity of the questionnaire. Mplus 8.3 was used to fit the structural equation model. Due to the susceptibility of the Chi-square test to sample size, the following fit indices were used for model fit assessment: the root mean square error of approximation (RMSEA index, with 0.08 or below indicating good fit), the comparative fit index (CFI above 0.90 indicating good model fit), the Tucker-Lewis index (TLI above 0.90 indicating good model fit), and the standardized root mean square residual (SRMR < 0.08) for evaluating model fit.

In addition, Cronbach's α value and split-half coefficient were used to test the internal consistency of the items for each dimension. Also, the heterotrait - monotrait ratio (HTMT) method was used to test the discriminant validity of the questionnaire. All HTMT values were below 0.85, indicating good discriminant validity. And assessing criterion-related validity by calculating the correlation between the Depressive Tendency Questionnaire and CES-D. These analyses were all conducted using SPSS 21.0.

Furthermore, to ensure the questionnaire's factorial validity, a multiple-group CFA was conducted using Mplus 8.3 to examine any gender and age differences in measurement equivalence. The study assessed configural invariance (Model 1), metric invariance (Model 2), and scalar invariance (Model 3). As the Chi-square test can be influenced by sample size, even small differences can yield significant results. Therefore, this study evaluated the equivalence of measurements using the model fit index CFI and the difference in TLI (ΔCFI, ΔTLI) values. The equivalent model is deemed acceptable if ΔCFI≤0.01 and ΔTLI≤0.01.[38]

Finally, to test the temporal stability of the questionnaire items, we used sample 3 to calculate the test-retest reliability, and this analysis was conducted using SPSS 21.0. Overall, these analyses conform to the basic principles of scale development.[39]

Results

Item Analysis

For the analysis of the items using Sample 1 data, first, the critical ratio method was employed. Participants' scores were sorted in ascending order, and the top 27% were assigned to the high-score group while the bottom 27% were assigned to the low-score group. Then, independent samples *t*-tests were conducted on the two groups, revealing significant differences in scores across all items ($p < 0.001$). Additionally, when the decision value was greater than 3, it indicated good discriminant validity for each item. Only one item did not meet the requirement ($t = 2.856$), while the decision values for other items were within the standard range ($t = 3.271–31.228$), thus they were retained. Secondly, item-total correlation analysis was performed, and items with correlation coefficients below 0.4 and not significant were considered for deletion. Eighteen items showed significantly low correlation coefficients (<0.4) and thus were considered for removal, while the remaining items demonstrated correlations with a total score ranging from 0.398 to 0.733 ($p < 0.001$). Finally, a homogeneity test was conducted, retaining items with commonalities above 0.2 or factor loadings above 0.4. Among them, Item 24 exhibited item-total correlation and factor loading indices close to the standard, thus it was decided to be retained. By integrating the three methods mentioned above, a total of 18 items were deleted, leaving 62 items.

Exploratory Factor Analysis

First, KMO and Bartlett's tests of sphericity were conducted on the data from Sample 1. The results indicated a KMO value of 0.961, and Bartlett's sphericity test was significant ($\chi^2 = 29{,}913.810$, df = 3160, $p < 0.001$), suggesting that the items of the questionnaire are suitable for EFA.

Secondly, parallel analysis was conducted to estimate the number of retained factors, as shown in Figure 1. Subsequently, principal component analysis and Promax were employed based on psychometrics theory to delete items with factor loadings not exceeding 0.40, items with commonalities less than 0.30, items with loadings higher

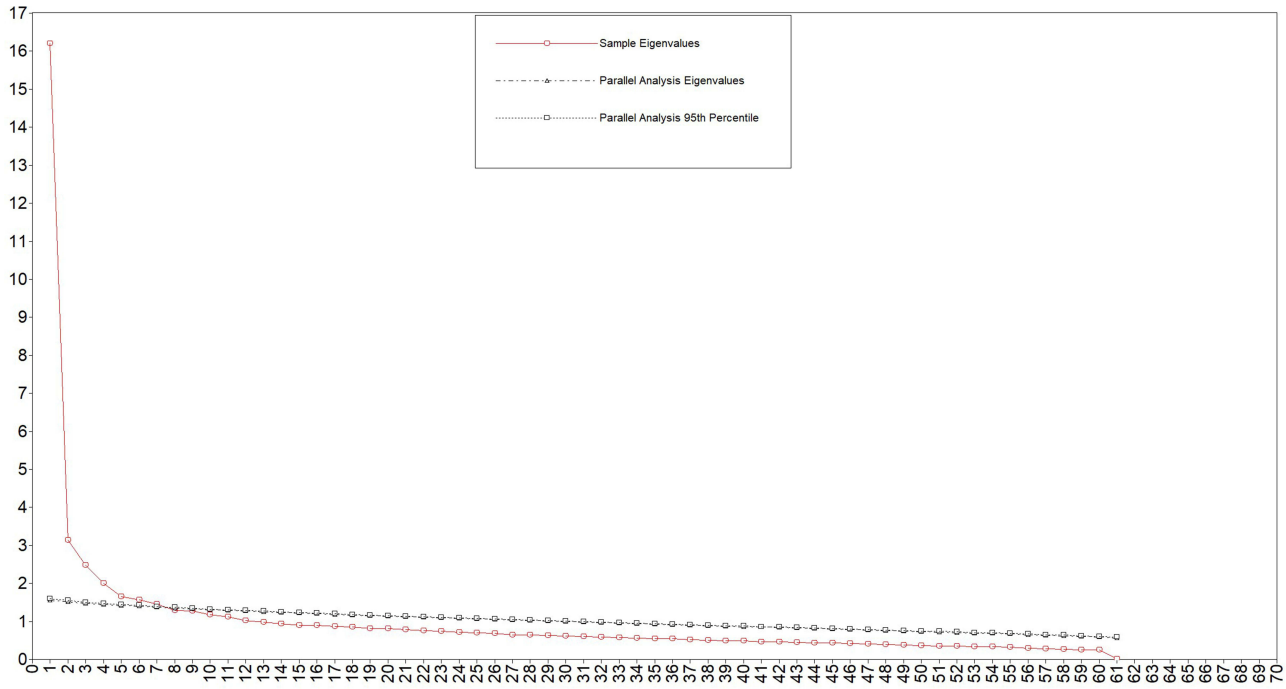

Figure 1 Parallel analysis plot.

than 0.30 on 2 or more factors, as well as factors with only 1–2 items. The aforementioned criteria were applied following the principles of deleting items with low loadings on all factors, then deleting items with the highest cross-factor loading, and finally removing factors with fewer than 2 items, with one item or factor being deleted at a time.

Based on the above steps, items that did not meet the criteria were deleted. After multiple explorations, 4 factors with eigenvalues greater than 1 were eventually extracted, retaining 30 items, and the cumulative explained total variance reached 51.888% (see Table 2).

Based on the results of the factor analysis and the meaning of items within each dimension, the 4 dimensions were named more directionally: factor 1 was named negative self, mainly referring to middle school students' self-awareness and self-evaluation, accompanied by a certain extent of negative emotions; factor 2 was named cognitive function, mainly referring to the decline in cognitive function in aspects such as attention, memory, and thinking displayed by middle school students in learning-oriented activities; factor 3 was named personal reserve, mainly referring to the reduction in interest and willingness of middle school students in social and activities; factor 4 was named social support, mainly referring to the perceived care, support, and help from others by middle school students.

Confirmatory Factor Analysis

Conducting CFA on the four-factor model of depressive tendencies in middle school students, the results indicated that the model met the statistical requirements with good construct validity, as evidenced by CFI and TLI greater than 0.90, RMSEA less than 0.05, and SRMR less than 0.8, demonstrating a good fit of the model.[40]

Additionally, the four-factor model was compared with other potential competing models. Competing Model 1: The correlation between the Negative self and Personal reserve factors of depressive tendencies in middle school students was strong ($r = 0.858$, $p<0.001$), therefore, they were combined into one factor to determine the possible three-factor structure of depressive tendencies in middle school students. Competing Model 2: Building upon Competing Model 1, the factor combining Negative self and Personal reserve showed a strong correlation with the Cognitive function factor ($r = 0.858$, $p<0.001$), thus combining them into one factor to determine the possible two-factor structure of depressive tendencies in middle school students. Competing Model 3: All items were combined into one factor to determine the possible one-factor structure of depressive tendencies in middle school students. The results showed that the four-factor model had the best-fit indices compared to the three-

Table 2 Exploratory Factor Analysis Results of Depressive Tendency

Item	Factor 1	Factor 2	Factor 3	Factor 4	Commonality
6	0.790				0.659
2	0.784				0.482
5	0.771				0.449
14	0.721				0.655
27	0.620				0.556
33	0.598				0.560
41	0.559				0.517
9	0.549				0.492
67		0.937			0.605
70		0.819			0.573
73		0.722			0.606
76		0.629			0.536
78		0.626			0.427
11		0.606			0.431
75		0.593			0.670
58		0.575			0.341
39			0.871		0.612
60			0.805		0.560
63			0.739		0.486
10			0.702		0.488
31			0.598		0.370
40			0.596		0.431
57			0.491		0.461
23			0.479		0.548
24				0.841	0.608
16				0.764	0.531
20				0.763	0.599
68				0.615	0.428
74				0.611	0.482
32				0.530	0.402
Eigenvalue	10.300	1.960	1.873	1.434	
Variance explained (%)	34.332	6.533	6.243	4.780	
Cumulative variance explained (%)	34.513	40.865	47.108	51.888	

Note: Items with factor loading below 0.40 are not listed.

factor model ($\Delta\chi^2(3) = 406.778 > 11.3, p < 0.01$), two-factor model ($\Delta\chi^2(5) = 1013.017 > 15.1, p < 0.01$), and one-factor model ($\Delta\chi^2(6) = 1996.358 > 16.8, p < 0.01$). Therefore, the fit indices of the four-factor model were superior to other competing models, making it an ideal model (see Table 3).

Reliability

The study's reliability test indicated that the formal questionnaire had a Cronbach's α coefficient of 0.952 and a split-half reliability of 0.918. After a 2-week interval, a retest was conducted, and the obtained test-retest reliability was 0.851, as shown in Table 4, indicating the high reliability of the questionnaire.

Validity

Discriminant Validity

In this study, the heterotrait - monotrait ratio (HTMT) method was used to test the discriminant validity of the questionnaire, as shown in Table 5, where all HTMT values were below 0.85, indicating good discriminant validity.[41]

Table 3 Results of the Fit Indicators for the Confirmatory Factor Analysis

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	90% CI	SRMR
Four-factor model	1312.359	397	3.306	0.937	0.931	0.044	[0.041, 0.046]	0.040
Three-factor model	1612.605	400	4.032	0.916	0.909	0.050	[0.048, 0.053]	0.043
Two-factor model	2061.281	402	5.128	0.885	0.876	0.059	[0.056, 0.061]	0.048
One-factor model	2789.711	403	6.922	0.835	0.822	0.070	[0.068, 0.073]	0.061

Table 4 Results of Reliability Tests for the Depressive Tendency Questionnaire

	Cronbach's α	Split-half Coefficient	Test-Retest
Negative self	0.906	0.888	0.825***
Cognitive function	0.891	0.860	0.801***
Personal reserve	0.876	0.853	0.801***
Social support	0.829	0.768	0.708***
Total score	0.952	0.918	0.851***

Note: ***$p<0.001$.

Table 5 Analysis of Heterotrait-Monotrait Ratio of Correlations (HTMT) for Discriminant Validity

HTMT	Negative Self	Cognitive Function	Personal Reserve	Social Support
Negative self	—			
Cognitive function	0.813	—		
Personal reserve	0.843	0.776	—	
Social support	0.655	0.607	0.609	—

Criterion-Related Validity

The analysis was conducted using Sample 2, and 11 invalid data points with consecutive repeated responses were excluded from the criterion questionnaire. In this study, the depression inventory used by the survey center was adopted as the criterion for the questionnaire on depressive tendencies among middle school students. The results revealed significant correlations of varying degrees between the total score and dimension scores of the questionnaire on depressive tendencies among middle school students and the total score and dimension scores of the criterion questionnaire. The specific correlation coefficients can be found in Table 6, indicating good criterion-related validity of the questionnaire on depressive tendencies among Chinese middle school students.

Measurement Invariance Across Gender and Grade

The data results provided support for the configural, metric, and scalar invariance of the four-dimensional measurement structure of the questionnaire across gender and grade groups (see Table 7), indicating satisfactory model fit as the changes in CFI and RMSEA did not exceed the recommended critical values, that is, $\Delta CFI \leq 0.01$, $\Delta RMSEA \leq 0.01$.[38]

In summary, the study conducted item analysis, EFA, CFA, and tests for the reliability and validity of a questionnaire on depressive tendencies among Chinese middle school students. The item analysis led to the deletion of 18 items, resulting in a 62-item questionnaire. EFA identified 4 factors with 30 retained items, explaining 51.888% of the total variance. The factors were named negative self, cognitive function, personal reserve, and social support. CFA has validated the four-factor model, confirming its suitability and construct validity. The questionnaire also exhibited high reliability and good discriminant validity and criterion-related validity. Moreover, measurement invariance across gender and grade groups was supported, indicating satisfactory model fit across different groups. Overall, the results suggest the questionnaire is a valid and reliable tool for assessing depressive tendencies among Chinese middle school students.

Table 6 Results of Criteria Correlation Analysis

	Negative Self	Cognitive Function	Personal Reserve	Social Support	Total Score
Depressed affect	0.846***	0.649***	0.703***	0.527***	0.809***
Positive affect	0.616***	0.551***	0.575***	0.557***	0.671***
Somatic and retarded activity	0.732***	0.731***	0.720***	0.485***	0.793***
Interpersonal	0.630***	0.476***	0.617***	0.477***	0.647***
Total CES-D	0.858***	0.729***	0.775***	0.599***	0.875***

Note: ***$p<0.001$.
Abbreviation: CES-D, the Centre for Epidemiological Studies Depression Scale.

Table 7 Measurement Invariance of Depressive Tendency Across Gender and Grade

	Model	χ^2	df	CFI	TLI	RMESA [90% CI]	ΔCFI	ΔTLI	ΔRMESA
Gender	M1	1749.179	794	0.935	0.928	0.045 [0.042, 0.048]			
	M2	1817.237	820	0.932	0.928	0.045 [0.042, 0.048]	0.003	0.000	0.000
	M3	1934.867	846	0.926	0.923	0.046 [0.044, 0.049]	0.006	0.005	−0.001
Grade	M1	3229.244	1985	0.921	0.914	0.051 [0.048, 0.054]			
	M2	3404.806	2089	0.917	0.913	0.051 [0.048, 0.054]	0.004	0.001	0.000
	M3	3590.610	2193	0.912	0.912	0.052 [0.048, 0.055]	0.005	0.001	−0.001

Note: M1=Configural Invariance model; M2=Metric Invariance model; M3=Scalar Invariance model.

Discussion

In the cultural context of China, during the middle school stage, individuals do not only experience significant physical and mental changes due to puberty but also face various external pressures (such as academic stress), which can easily induce depressive tendencies in middle school students.[42,43] However, there is currently no unified standard for the basic research on the psychological characteristics, behavioral manifestations, and duration of depressive tendencies in middle school students in China. The measurement tools used are often adapted from foreign questionnaires. In the research data on the incidence of depression, the phenomenon of depressive tendencies and depression are often not distinguished and are confused. Therefore, it has theoretical and practical significance to develop a depressive tendency questionnaire suitable for middle school students based on Chinese culture.

The Psychological Structure of Depressive Tendency

Based on previous literature and referencing depression-related scales, this study designed an initial questionnaire for depressive tendencies in middle school students by analyzing open-ended surveys and conducting in-depth interviews, after expert discussions, the initial questionnaire was subjected to item analysis, EFA, and CFA, resulting in the establishment of a formal questionnaire for depressive tendencies in middle school students with 30 items and four factors: negative self, personal reserve, cognitive function, and social support.

Firstly, in Chinese culture, Master Zeng said, every day I examine myself on three counts.[44] This old saying encourages people to reflect on themselves, so people have long regarded reflecting on negative self-experience as a daily behavior.[45] Studies have found that the important feature of depression-prone individuals in a collectivist cultural background is self-criticism tendency.[46,47] According to the theory of depression cognition,[18] self-schema refers to the individual's general understanding of oneself based on past experiences. When the self-schema has a sense of failure and worthlessness, individuals are prone to depressive symptoms.[48] Moderate self-criticism or reflection can promote individual self-improvement, but for middle school students, they are in a period of growth and their self-awareness is not yet mature. If their self-criticism tendency is not guided in time, it often leads to negative self-awareness and negative emotions.[49,50] Therefore, the "negative self" dimension is involved in the formal questionnaire to investigate middle school students' self-awareness and emotional experience, to detect and intervene early and prevent the emergence of depression tendencies.

Secondly, compared with Western individualistic culture, in the East Asian collectivist social environment, people value their relationships with others and emphasize interdependence and coexistence with others in harmony.[28,51] Their psychological state is largely influenced by the surrounding social and interpersonal processes.[51] For middle school students, interpersonal factors such as teacher-student relationships and parent-child relationships are closely related to their depressive tendencies.[52,53] In the results of this study, the "social support" dimension includes middle school students' cognition and feelings of care and support from parents and teachers.

In addition, the "cognitive function" dimension mainly includes the situation of middle school students' cognitive functions such as attention, memory, and thinking in the context of learning and life. As a critical period of cognitive development during adolescence,[54] studies have found that cognitive dysfunction is one of the core features of depression and cannot be completely regarded as a secondary phenomenon accompanying low mood symptoms.[55] There is a significant correlation between the depressive state of adolescents and the decline of their cognitive function.[56,57] Adolescents at risk of depression may experience a decrease in their ability to think or concentrate, which affects their academic performance.[9]

Finally, the dimension of "personal reserve" assesses students' interest and willingness towards socializing and activities. Research has shown that personal reserve is one of the personality susceptibility factors related to depression.[58] When individuals tend to experience depression, they are more likely to exhibit symptoms such as avoiding others or activities, and reduced interest.[59] The dynamic interactionist model of vulnerability to depression susceptibility proposes that depression is primarily caused by the combined effects of personality susceptibility factors (such as the sense of self and personal reserve) and stressors (such as academic demands), and emphasizes the significant role of social support provided by interpersonal relationships in depression.[11] Based on these theories and empirical research, further confirm

the rationality of the structure of depressive tendencies among Chinese middle school students, which includes negative self, personal reserve, social support, and cognitive functioning.

Theoretical and Practical Significance

This study has certain theoretical significance. On the one hand, it clarifies the psychological structure of depressive tendencies among Chinese middle school students, providing theoretical and empirical evidence for subsequent related research. On the other hand, based on the cultural background of China and targeting middle school students, a culturally appropriate, comprehensive, and scientifically reliable depressive tendency measurement questionnaire has been developed by combining qualitative and quantitative research methods, laying the foundation for subsequent empirical research related to depressive tendencies among middle school students.

In recent years, with the increasing detection rate of emotional problems such as depression among middle school students, the issue of depressive tendencies among middle school students has received much attention and importance. Exploring the aspects of depressive tendencies among Chinese middle school students provides a scientific tool for early identification of such tendencies, and the research topic is in line with current social development, especially the needs of school students' mental health work, with certain practical significance. As an early stage of depression, depressive tendencies can be directly promoted in middle school's psychological health education practice using the measurement tool developed in this study, used for screening middle school students with depressive tendencies, achieving early detection and early treatment, which is beneficial for promoting the smooth implementation of psychological counseling and education in middle schools, and holds significant importance for cultivating physically and mentally healthy, well-rounded middle school students.

Limitations and Directions for Future Research

Based on literature analysis, this study collected and organized the psychological characteristics and behavioral manifestations of depressive tendencies in middle school students by combining open surveys and interviews with middle school students and teachers. Through expert discussions, a questionnaire for depressive tendencies in middle school students was developed. The study strictly followed the process of factor analysis and questionnaire development to comprehensively validate the psychological structure of depressive tendencies in middle school students within the Chinese cultural background. A formal questionnaire that meets the standards of psychological measurement was developed.

However, details still need to be improved and refined in this study. First, the depressive tendency is complex and involves various factors. In middle school students, it is primarily measured through four dimensions: negative self, personal reserve, cognitive function, and social support. However, these dimensions do not encompass all the psychological characteristics and manifestations of depressive tendencies in this group. It is important to note that the theory is still evolving. Therefore, further research is needed to validate whether the four-factor structure proposed in this study is the best fit for understanding depressive tendencies among middle school students in Chinese culture.

Second, although the study sample covers multiple provinces such as Liaoning, Inner Mongolia, Shandong, and Anhui in China, the representativeness of the sample is limited due to the lack of strict random sampling. It is necessary to expand the sampling range in the future to ensure that the questionnaire can be effectively applied to middle school students in other areas of the country.

Finally, this study mainly utilized self-report methods, making it difficult to avoid the possibility of students being influenced by social expectation bias. Future research could consider developing assessment questionnaires for teachers/parents or more objective measurement tools to comprehensively and accurately assess the depressive tendencies of middle school students.

Conclusion

This study combines qualitative and quantitative research methods to develop and validate a questionnaire for assessing depressive tendencies among Chinese middle school students. The results indicate that the questionnaire has good reliability and validity, meets the standards of psychological measurement, and comprehensively assesses depressive

tendencies among middle school students from the perspectives of negative self, personal reserve, cognitive function, and social support. In the future, teachers can use this questionnaire to early identify middle school students' depressive tendencies, and researchers can use it to evaluate the effectiveness of interventions, promoting the healthy development of students' personality and mental health.

Data Sharing Statement

The data from the current study can be available from the corresponding author upon a request that is deemed appropriate.

Ethics Statement

This study was conducted in compliance with the principles of the Declaration of Helsinki. The Research Ethics Committee of Liaoning Normal University approved the content and data collection procedures of this study [No. LL2023045]. The research primarily utilized questionnaire and interview methods. Participants were provided with a cover letter before data collection, which explained the study's purpose, requested their willingness to participate, and assured the confidentiality of their responses. Participation was voluntary and could be quit at any time. Informed consent was obtained from all participants.

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Disclosure

The authors state that they do not have any conflicts of interest related to the publication of this paper.

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