Meta Analysis of the Psychological Health Survey Results of Chinese College Students Since 2010

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Abstract: *This study used meta-analysis to systematically analyze the results of a survey on the mental health of Chinese college students since 2010. The research background emphasizes the importance of mental health issues for college students and the Chinese Ministry of Education's emphasis on mental health education. The research design includes literature search, screening, coding and processing, as well as calculation of effect values and heterogeneity testing. The literature search strategy is limited to the Web of Science database, and the screening criteria include using the SCL-90 questionnaire, conducting surveys after 2010, having complete data, and targeting Chinese college students. Finally, 30 articles were included for analysis. The research results show that there is significant heterogeneity among Chinese college students in multiple dimensions of the SCL-90 scale, indicating that the variation in research results may be caused by multiple factors. The publication bias test found that the dimensions of somatization (SOM) and anxiety (ANX) may be affected by publication bias, while other dimensions such as depression (DEP), hostility (HOS), and psychoticism (PSY) have less impact. The study discussed the reasons for heterogeneity, including differences in study design, sample characteristics, measurement tools, and possible bias in selective reporting. The limitations of the study include the limitations of literature search scope and the impact of publication bias. Future research should expand the scope of retrieval, construct meta-analysis databases, and conduct more empirical investigations for dynamic comparison and validation. The research results provide valuable reference information for the mental health education of Chinese college students and scientific basis for the development of new SCL-90 norms.*

Keywords: *College Student; Meta-Analysis; SCL-90; Heterogeneity Test; Mental Health Education*

1. Introduction

Psychological health issues have become a common social challenge faced by countries around the world in recent years, and have attracted high attention from governments around the world. In this context, strengthening mental health education for adolescents has become a consensus among all sectors of society. As the backbone of the youth group, college students' physical and mental health and comprehensive quality are the key to the future development of the country and the nation. However, with changes in living environment and lifestyle, high-intensity pressure from studying and working, increasing economic burden, and complex and severe employment situation, college students are facing an increasing number of mental health problems [1] [2] [3]. In addition, the arrival of the internet era, new factors such as online games, social platforms, and information overload have brought more severe challenges to the mental health of college students.

Poor mental health not only poses difficulties for college students' academic adaptation, affecting their academic engagement and performance, and may even lead to negative consequences such as repeating a year or dropping out [4], but also reduces their quality of life and happiness [5], and may hinder their social adaptation ability and career development [6].

Therefore, paying attention to and improving the mental health issues of college students is not only the responsibility of the education sector, but also an urgent task for society as a whole. Efforts need to be made from multiple aspects, including strengthening mental health education, providing professional psychological counseling services, optimizing learning and living environments, etc., to jointly build an ecosystem that supports the mental health of college students. This not only helps to enhance the overall well-being of college students, but also plays an important role in cultivating future pillars of society.

Although the Symptom Checklist-90 (SCL-90) is a widely recognized tool used by many researchers

to assess the mental health status of college students, the results obtained show certain differences. Some research surveys have shown that the positive detection rate of psychological symptoms among college students is relatively high, exceeding 40% [7] [8] [9]. However, other studies have come to the opposite conclusion, pointing out that the overall mental health status of contemporary college students is good, and the positive detection rate of psychological symptoms is relatively low, around 20% [10] [11] [12].

The inconsistency of research results poses a challenge to objectively and accurately assess and understand the mental health status of contemporary college students. In order to overcome this challenge, it is necessary to conduct a meta-analysis of the SCL-90 survey results on the mental health of Chinese college students in the past decade, and use big data methods to comprehensively and systematically sort out and analyze the survey data from previous years. Through this method, we can more accurately grasp the mental health status of contemporary college students and their changing trends over time.

2. Research Design

2.1. Research Methods

Meta-analysis, also known as meta-analysis or meta-analysis, was first proposed by British educational psychologist Glass GV in 1976 when studying the efficacy of psychotherapy [13]. Glass GV defines meta-analysis as a statistical analysis aimed at synthesizing a series of individual research results. It is a quantitative and qualitative analysis method that can improve the credibility of conclusions and solve the problem of inconsistent research results by increasing the sample size. The process of meta-analysis can be roughly divided into the following four steps: clarifying the research question and scope; Literature search and screening; Literature coding and processing; Statistical processing and interpretation of results.

Currently, meta-analysis methods have been widely applied in various fields such as medicine, psychology, and education. In the field of library and information science, they are mainly used in topics such as scientific metrology, library management, information management, computer-aided education, and reference consulting [14]. This article adopts meta-analysis method and integrates the empirical research on the influencing factors of users' privacy disclosure willingness on existing social media using CMA3.3 (Comprehensive Meta-Analysis 3.3) meta-analysis professional software developed by the expert team of BioSTAT company.

2.2. Literature Retrieval Strategy

According to the research content of this article, literature search should include two parts: "vocational education" and "self-identity". Using Web of Science as the literature source, the retrieval strategy adopts topic search, and the retrieval formula is TS=(SCL-90 AND ("college" OR "college")). 297 relevant literature were obtained and retrieved on June 14, 2024.

2.3. Literature Screening Strategy

Further screening of relevant literature will be conducted to select articles suitable for meta-analysis, with the screening criteria being:

(1) The literature must use the SCL-90 survey questionnaire, and at least one indicator statistical result must be obtained in the article;

(2) The SCL-90 questionnaire survey was conducted after 2010;

(3) The literature data must be complete and clearly report the sample size, results of each indicator, or statistical measures that can be converted into correlation coefficients (such as the t-value of path significance);

(4) The subject of the literature survey should be Chinese college students.

After literature screening, a total of 30 articles suitable for meta-analysis were obtained, all of which are journal articles.
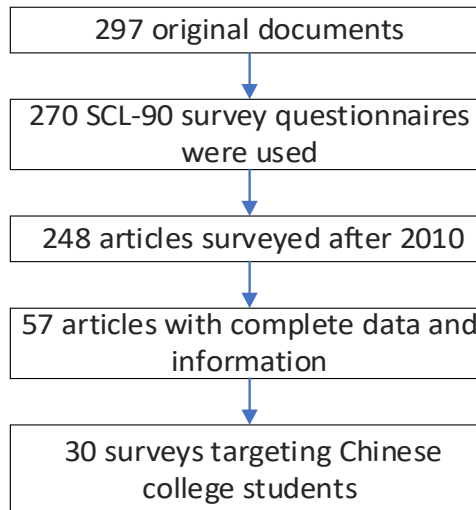
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┌─────────────────────────────────────┐
│        297 original documents        │
└─────────────────────────────────────┘
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┌─────────────────────────────────────┐
│   270 SCL-90 survey questionnaires   │
│              were used               │
└─────────────────────────────────────┘
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┌─────────────────────────────────────┐
│      248 articles surveyed after 2010 │
└─────────────────────────────────────┘
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│   57 articles with complete data and │
│              information              │
└─────────────────────────────────────┘
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                   ▼
┌─────────────────────────────────────┐
│      30 surveys targeting Chinese    │
│            college students          │
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Figure 1: Literature screening process diagram.

2.4. Literature Encoding and Processing

Encode the selected relevant literature one by one, including the basic information of the article (title, author, publication time) as well as the research object, research platform, sample size, influencing factors, and correlation coefficient. The specific operational definition is shown in Table 1. For literature that uses different sample data for empirical research, this article considers it as multiple different studies included in the analysis. To ensure coding consistency and avoid errors caused by manual coding, a library major student encoded the literature according to the literature coding framework. Statistical analysis shows an average coding consistency of 95.3%.

Table 1: Basic feature data encoding

Author(year)	Title	Sample size
Yu, YL; Wa2020	Undergraduate students' norms for the Chinese version of the symptom check-List-90-R (SCL-90-R)	4456
Li, FZ; Li2022	Changes in mental health levels among Chinese physical education college students from 1995 to 2019	358
Zhang, L; 2023	Epidemiological analysis of axillary apocrine bromhidrosis in China: a survey from Chinese higher education students	2571
Wang, X; X2018	Psychological assessment in 355 Chinese college students with androgenetic alopecia	406
Li, JY; Li2020	Mental health problems and associated school interpersonal relationships among adolescents in China: a cross-sectional study	10131
Liu, XJ; J2017	Mental Health of the Prison Medical Workers (PMWs) and Influencing Factors in Jiangxi, China	330
Yang, Z; S2022	The Quality of Life and Its Relationship With Systemic Family Dynamics and Mental Health in Senior High School Students From Shaanxi, China	1367
Yang, F; M2014	Influencing factors of mental health of medical students in China	624
Liu, XJ; J2018	Mental Health Status and Associated Contributing Factors among Gay Men in China	367
Han, MM; S2023	The status and influencing factors of adolescents' mental health in a province of China: A cross-sectional study	2820
Guo, JR; L2022	Psychological support for public-funded normal students engaged in	90

	teaching profession	
Lei, XS; L2021	Mental health of college students and associated factors in Hubei of China	302
Wang, ZF; 2022	Cross-sectional investigation and correlation analysis of psychology of college students returning to campus after COVID-19 lockdown lift	4141
Chen, FZ; 2014	Identification and characterization of college students with Attenuated Psychosis Syndrome in China	20
Tang, F; B2018	Psychological distress and risk for suicidal behavior among university students in contemporary China	6099
Jiang, RC2020	Knowledge, attitudes and mental health of university students during the COVID-19 pandemic in China	12160
Wei, PJ2022	The impact of social support on students' mental health: A new perspective based on fine art majors	452
Liu, HX; Z2021	A mixed method study to examine the mental health problems of college students who had left-behind experiences	1605
Liu, HX; Z2020	The Influence of Left-Behind Experience on College Students' Mental Health: A Cross-Sectional Comparative Study	1505
Guo, JM; H2022	The Influence of Self-Esteem and Psychological Flexibility on Medical College Students' Mental Health: A Cross-Sectional Study	788
Wang, Y; J2023	A comparison of the effects of remote coaching HIIT training and combined exercise training on the physical and mental health of university students	60
Liu, JF; L2019	Subjective perceptions and psychological distress associated with the deep underground A cross-sectional study in a deep gold mine in China	179
Zhang, TT;2024	A New Machine-Learning-Driven Grade-Point Average Prediction Approach for College Students Incorporating Psychological Evaluations in the Post-COVID-19 Era	229
Wang, SZ; 2023	The predictive role of impulsivity and perceived social support in psychiatric symptoms of women with methamphetamine use disorder	228
Cao, H; Zh2022	Coping Style and Resilience Mediate the Effect of Childhood Maltreatment on Mental Health Symptomology	740
Tian, WT; 2017	Depression, anxiety, and quality of life in paroxysmal kinesigenic dyskinesia patients	1890
Liao, JP; 2019	Psychological status of nursing survivors in China and its associated factors: 6 years after the 2008 Sichuan earthquake	597
Yi, XR; Li2020	Clustering effects of health risk behavior on mental health and physical activity in Chinese adolescents	4630
Dong, JQ; 2023	Relationship Between Freshmen's Psychological Health and Family Economic Status in Chinese Universities: A Latent Profile Analysis	1031
Yang, MB; 2024	Bridging the relationship between physical exercise and mental health in adolescents based on network analysis	9072

3. Experimental results

3.1. Calculate the effect value

When the sample literature reports the regression coefficient between the variable and the dependent variable, the effect value is the standardized regression coefficient; When the literature only reports the

significance t-value of the pathway, the effect value is shown in formula (1).

$$r = \sqrt{\frac{t^2}{t^2 + df}} \qquad (1)$$

where t represents path significance, df is the degree of freedom.

On the basis of data encoding, the single effect value can be directly or indirectly calculated by calculating the correlation coefficient, t-value, chi square test value, and other numerical values of various influencing factors. This article selects the z-value of the correlation coefficient r after Fisher transformation as the effect value. If the correlation coefficient r value is not directly given in the literature, the t-value is selected and converted into the r-value according to the formula for calculating the effect value. This article uses CMA V3.3 software to calculate the effect values.

3.2. Heterogeneity test

In this article, the various studies included in meta-analysis have differences in research methods, research subjects, research contexts, etc., which lead to differences in effect values not only caused by sampling errors. The Q value represents heterogeneity, I2 represents the proportion of heterogeneity in the total variation of the effect size, I2=0 indicates no heterogeneity, 0-40% indicates mild heterogeneity, 40-60% indicates moderate heterogeneity, 50-90% indicates significant heterogeneity, and 75-100% indicates significant heterogeneity [15]. The experimental results showed that I2 was all greater than 75%, and the Q-test results were significant (P<0.05), indicating significant heterogeneity among the influencing factors. Therefore, this article chooses a random effects model for moderation effect testing to determine whether the cause of heterogeneity is due to sampling error (variance) and inter study variability [16]. The results of heterogeneity test for 9 metrics of SCL-90 are shown by Figures 2-10.

Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.910	0.908	0.911	401.275	0.000	25106.861	29	0.000	99.884	0.401	0.177	0.031	0.633
Random	30	0.952	0.926	0.969	15.975	0.000								

Figure 2: Somatic SOM heterogeneity test.

Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.936	0.935	0.937	448.672	0.000	10064.006	29	0.000	99.712	0.160	0.071	0.005	0.401
Random	30	0.955	0.941	0.966	25.525	0.000								

Figure 3: Obsessive-compulsive symptoms OC heterogeneity test.

Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.929	0.928	0.930	434.534	0.000	16964.056	29	0.000	99.829	0.271	0.120	0.014	0.520
Random	30	0.939	0.912	0.958	18.064	0.000								

Figure 4: Interpersonal sensitivity IS heterogeneity test.

Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.939	0.938	0.940	454.549	0.000	22419.334	29	0.000	99.871	0.358	0.158	0.025	0.598
Random	30	0.962	0.942	0.975	17.953	0.000								

Figure 5: Depression DEP heterogeneity test.

Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.921	0.920	0.922	419.958	0.000	18499.927	29	0.000	99.843	0.295	0.130	0.017	0.543
Random	30	0.951	0.928	0.966	18.426	0.000								

Figure 6: Anxiety ANX heterogeneity test.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.916	0.914	0.917	410.547	0.000	11016.287	29	0.000	99.737	0.176	0.078	0.006	0.419
Random	30	0.936	0.914	0.952	22.022	0.000								

Figure 7: Hostile HOS heterogeneity test.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.838	0.836	0.840	319.624	0.000	34591.641	29	0.000	99.916	0.553	0.244	0.060	0.743
Random	30	0.913	0.855	0.948	11.324	0.000								

Figure 8: Horror PHOB heterogeneity test.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.896	0.894	0.897	381.642	0.000	25239.171	29	0.000	99.885	0.403	0.178	0.032	0.635
Random	30	0.918	0.874	0.947	13.531	0.000								

Figure 9: Paranoid PAR heterogeneity test.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	30	0.913	0.912	0.915	406.840	0.000	18228.970	29	0.000	99.841	0.291	0.128	0.017	0.539
Random	30	0.934	0.904	0.955	17.050	0.000								

Figure 10: Psychotic PSY heterogeneity test.

3.3. Publication bias test

In the process of literature search, literature included in meta-analysis may be affected by retrieval strategies, systematicity, and other factors, resulting in incomplete literature retrieval and inability to download some literature during research, leading to publication bias. Therefore, first, a funnel diagram of each influencing factor is drawn to visually demonstrate it.

As shown in Figure 11, it can be seen that somatic SOM is significantly affected by publication bias in the literature included in the study.
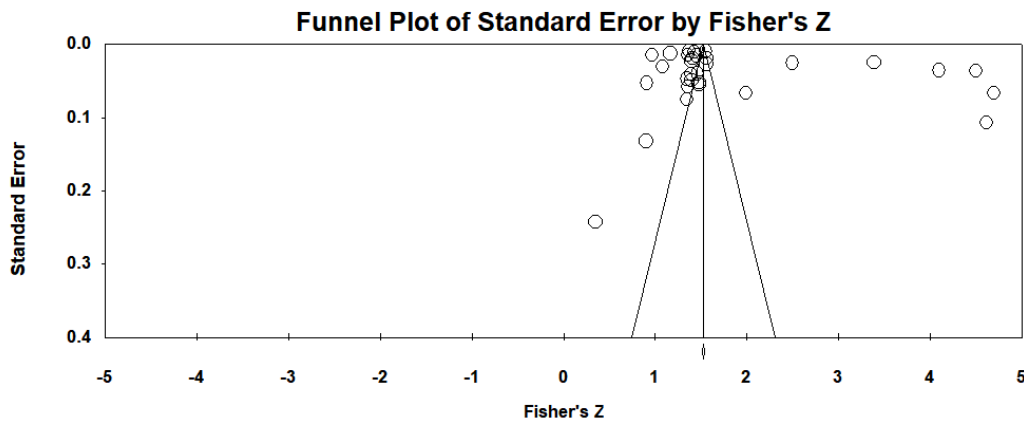

Figure 11: Somatic SOM publication offset test.

The Egger test is used to determine the presence of publication bias by identifying whether there is significance between the regression intercept and 0. Generally, a P-value greater than 0.05 in the Egger test indicates a low likelihood of publication bias [17]. The result of Egger test for Somatic SOM is given by Figure 12.

Egger's regression intercept

Intercept	17.34314
Standard error	8.64481
95% lower limit (2-tailed)	-0.36496
95% upper limit (2-tailed)	35.05124
t-value	2.00619
df	28.00000
P-value (1-tailed)	0.02729
P-value (2-tailed)	0.05458

Figure 12: Somatic SOM Egger test.

The Egger test results of somatized SOM are shown in Figure 12, with a P (2-tailed) value of less than 0.05. Therefore, the somatic SOM studied in this article is more likely to be affected by publication bias in the literature included in the study.

4. Conclusions

This study used meta-analysis to conduct extensive research on the mental health status of Chinese college students. Through systematic literature search and screening, a total of 30 articles were included for meta-analysis, and the data was statistically processed using CMA3.3 software.

(1) Heterogeneity test: The results showed significant heterogeneity in all dimensions of the included studies (I2 values greater than 75%), indicating that the variation in research results cannot be attributed solely to sampling errors, but may also include differences in study design, sample characteristics, measurement tools, and other factors.

(2) Publication bias test:

When analyzing the results of the Symptom Checklist-90 (SCL-90), the publication bias of the dimensions of Paranoia (PAR) and Phob may be caused by multiple factors. Firstly, different studies may have differences in sample selection, measurement tool usage, and data collection methods, all of which may affect the measurement results of these two dimensions. Secondly, changes in cultural background and social environment may also have an impact on the scores of these two dimensions, as they are closely related to individuals' subjective experiences and behavioral responses. In addition, researchers may have selective bias when reporting results, tending to report those results that are statistically significant while ignoring or insufficiently reporting those that are not significant, which may lead to publication bias.

The dimensions of somatization (SOM) and anxiety (ANX) show a small publication bias in the SCL-90 scale, which may be related to multiple factors. Firstly, the evaluation of these dimensions may be influenced by individual differences, cultural backgrounds, and research methodologies, leading to inconsistencies in results between different studies. Secondly, researchers' selective reporting, which tends to publish results with statistical significance, may overlook non significant findings, thereby increasing publication bias. In addition, over time, society's understanding of mental health continues to evolve, which may affect individuals' perception and reporting of physical symptoms and anxiety. In order to improve the accuracy and reliability of research results, it is necessary to conduct more extensive meta-analysis, establish and update norms applicable to different populations, and adopt standardized research methods to reduce this bias. Through these measures, we can gain a more comprehensive understanding of the mental health status of college students and provide strong data support for mental health interventions.

Acknowledgements

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