

## Preplanned Studies

## Exploring Multiple Perspectives on Psychological Health of Adolescents in Relation to Gender and School Grade — Jiangsu Province, China, 2022

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### Summary

#### What is already known about this topic?

Mental health issues in Chinese children and adolescents have emerged as a substantial public health concern, causing distress and strain among families and society.

#### What is added by this report?

This study examines the effects of gender and school grade on mental health symptoms and risky behaviors among Chinese children and adolescents, with a particular focus on the role of family and school environments.

#### What are the implications for public health practice?

Caregivers and educators should enhance their awareness and skills in supporting the mental health of children. These findings offer critical insights for the early detection and intervention of mental health issues in Chinese children and adolescents.

The escalating mental health issues among children and adolescents stem from academic pressures, family dynamics, and societal transformations, considerably impacting their life quality, academic success, and future prospects (1–2). Effective promotion of mental health in these groups necessitates cooperative efforts from families and educational institutions. Yet, both caregivers and educators often lack the necessary understanding and strategies to address these issues (3). This study distinctively integrates perspectives from children, caregivers, and teachers, offering a comprehensive assessment of the mental health environment, an aspect frequently overlooked in prior studies. The prevalence of mental health problems and risky behaviors among students can differ according to grade level and cognitive development. Additionally, gender differences are evident as girls are more likely to report symptoms of anxiety and depression (4),

whereas boys tend to display increased aggression and disruptive behavior (5). Consequently, it is imperative to factor in both gender and educational level to forge a thorough comprehension of mental health challenges in this demographic. While variations in mental health conditions by sex and grade are recognized, this research furnishes detailed, empirical insights into these discrepancies, elucidating specific mental health difficulties and risky actions across different educational phases and between genders.

This study is part of the extensive, mixed longitudinal cohort study conducted in China, known as the “School-based Evaluation Advancing Response for Child Health (SEARCH).” In this setup, schools act as operational hubs, families play a critical supportive and informational role, and students are the primary focus. The current research employed a digital platform to examine the mental health of students in Jiangsu Province, tracking mental health statuses and developmental changes in a scalable and innovative manner. The study, a cross-sectional analysis conducted from September 2022 through February 2023, targeted students at various educational levels — primary, junior, and senior high school — along with their caregivers and teachers. Ethical approval was obtained from the ethics committee of the affiliated brain hospital of Nanjing Medical University (2022-KY095-02). Data collection occurred across three cities in Jiangsu, selecting three primary schools, four junior high schools, and three senior high schools per city. A stratified whole-group sampling method was utilized to monitor participants. The study aimed for a minimum of 450 children and adolescents aged 10–18, including their caregivers and teachers from each grade. Sample size calculation parameters included  $\mu_{\alpha}=1.96$ ,  $\mu_{\beta}=2.58$ ,  $P_0=0.20$ ,  $d=0.05$ , a design effect of 1.2, a predicted missing visit rate of 10%, and a required sample size of 6,930 participants. The study successfully achieved significant response rates, with

11,427 students, 8,839 caregivers, and 1,656 teachers participating. This broad inclusion of participants allows for comprehensive exploration of mental health development in children and adolescents, highlighting the impact of gender and educational level on mental health-related symptoms and risky behaviors.

The questionnaire was divided into two sections: the first section collected socio-demographic data such as gender, age, school grade, study status, and basic family details. The second section evaluated participants' mental health using the Depression, Anxiety and Stress Scale (DASS-21), Insomnia Severity Index (ISI), and Ottawa Self-Injury Inventory (OSI). Additionally, the Strengths and Difficulties Questionnaire (SDQ) was administered to identify emotional and behavioral issues among students, with assessments gathered through self-reports from students and reports from caregivers and teachers. The study also investigated various health risk behaviors in children and adolescents, focusing on indicators like smoking and alcohol consumption. Data analyses were conducted using SPSS software (version 27, IBM SPSS Inc., Chicago, USA), comprising descriptive analyses of participant demographics. Chi-square tests were used to compare demographic characteristics across genders and to analyze the distribution of mental health symptoms and health risk behaviors across academic periods, with a focus on gender differences. Internal consistency was evaluated using Cronbach's alpha to examine inter-rater agreement for SDQ scores, comparing results from self-reports, caregiver reports, and teacher reports across different genders and academic periods. Statistical significance was set at  $P$  values  $<0.05$  (two-tailed).

The study involved 11,427 students, comprising 6,083 boys and 5,344 girls (Table 1). Analysis revealed that 23.02% of students displayed depressive symptoms, 33.70% experienced anxiety, and 16.79% exhibited signs of stress. Female students in both junior and senior high school demonstrated significantly higher incidences of depression, anxiety, stress, insomnia, suicidal behavior, self-harm, and suicidal ideation compared to their male counterparts (Table 2). Furthermore, the prevalence of depression, anxiety, stress, and insomnia increased progressively from primary school to junior high and then to senior high. Emotional-behavioral issues and prosocial behaviors showed higher consistency between self-reports and caregiver reports among girls than boys (Table 3). High congruence between self-reports and teacher reports for emotional symptoms, conduct

problems, hyperactivity, peer issues, and prosocial behaviors was more prevalent in primary school students compared to those in junior and senior high schools.

## DISCUSSION

This comprehensive study adopts an innovative methodology to explore mental health status and developmental trajectories among children and adolescents, analyzing perspectives from the subjects themselves along with their caregivers and teachers. We observed significant gender-based discrepancies in mental health symptoms and behavioral patterns among participants. Additionally, the prevalence of these symptoms showed an increasing trend as students progressed from primary to junior and senior high school. Our findings underscore a potential gap in awareness of child and adolescent mental health issues among caregivers and teachers. These insights enhance our understanding of mental health dynamics in young populations and inform the development of targeted mental health policies.

Our findings concur with prior studies that indicate a higher incidence of internalizing symptoms among adolescent girls (6). Earlier research has also shown that there is no significant gender disparity in the prevalence of depression during childhood (7). Our study substantiates these findings, revealing that boys and girls display comparable mental health status during primary school years, with differences becoming more pronounced post-adolescence (8). As students advance academically, the educational system places increased demands on them, leading to elevated stress and mental health challenges. This study highlights the growing trend of mental health-related symptoms from primary to senior high school. It underscores the importance of early detection and intervention for mental health issues beginning in primary school to enhance student well-being and instill effective coping mechanisms.

Furthermore, the study reveals that the prevalence of risk behaviors linked to deteriorating mental health escalates with each academic level, with a notably higher incidence among boys compared to girls (9). Our research highlighted significant disparities in smoking and alcohol consumption among children and adolescents, with male adolescents more prone to these activities than females. Specifically, high school males displayed greater frequencies of smoking and alcohol use than their female counterparts, suggesting that

TABLE 1. Comparison of sociodemographic characteristics between boys and girls in children and adolescents.

Characteristics	Total (n=11,427)	Boys (n=6,083)	Girls (n=5,344)	P value $\chi^2$ test
Age, n (%)				
10–12 years	4,101 (35.89)	2,192 (36.03)	1,909 (35.72)	0.909
13–15 years	4,221 (36.94)	2,238 (36.79)	1,983 (37.11)	
16–18 years	2,863 (25.05)	1,530 (25.15)	1,333 (24.94)	
Education level, n (%)				
Primary school stage	3,209 (28.10)	1,722 (28.31)	1,487 (27.83)	0.044
Junior high school stage	4,353 (38.10)	2,365 (38.88)	1,988 (37.20)	
Senior high school stage	3,865 (33.80)	1,996 (32.81)	1,869 (34.97)	
Economy of the region, n (%)				
Poor	3,800 (33.25)	2,141 (35.20)	2,039 (38.15)	0.002
Moderate	3,447 (30.17)	1,847 (30.36)	1,600 (29.94)	
High	4,180 (36.58)	2,095 (34.44)	1,705 (31.90)	
Serving as a student leader, n (%)				
No	5,452 (47.71)	3,190 (52.44)	2,262 (42.33)	<0.001
Yes	5,975 (52.29)	2,893 (47.56)	3,082 (57.67)	
Living with families, n (%)				
No	10,209 (89.34)	5,403 (88.82)	4,806 (89.93)	0.055
Yes	1,218 (10.66)	680 (11.18)	538 (10.07)	
Only-child status, n (%)				
No	7,081 (61.97)	3,447 (56.67)	3,634 (68.00)	<0.001
Yes	4,346 (38.03)	2,636 (43.33)	1,710 (32.00)	
Frequency of parental quarrels, n (%)				
Never	4,565 (39.95)	2,652 (43.60)	1,913 (35.80)	<0.001
Sometimes	6,386 (55.89)	3,200 (52.61)	3,186 (59.62)	
Often	476 (4.17)	231 (3.80)	245 (4.58)	
Educational level of father, n (%)				
L: Primary education level and below	547 (6.43)	258 (5.74)	289 (7.21)	0.020
M: Secondary education level	5,544 (65.21)	2,961 (65.89)	2,583 (64.45)	
H: University education level and above	2,411 (28.36)	1,275 (28.37)	1,136 (28.34)	
Educational level of mother, n (%)				
L: Primary education level and below	908 (10.68)	435 (9.68)	473 (11.80)	<0.001
M: Secondary education level	5,475 (64.40)	2,979 (66.29)	2,496 (62.28)	
H: University education level and above	2,119 (24.92)	1,080 (24.03)	1,039 (25.92)	

social, cultural norms, and gender roles may influence these behavioral patterns. Additionally, our findings showed a strong correlation between smoking, alcohol intake, and emotional and behavioral difficulties. Adolescents frequently involved in these behaviors were more likely to suffer from increased levels of depression, anxiety, and behavioral problems (10).

Our study reveals a closely aligned understanding of mental health concerns between girls and their caregivers, likely due to enhanced communication or

increased emotional expressiveness among girls, which may facilitate caregivers' comprehension of their mental health experiences. However, the congruence between self-reports and teacher reports diminishes as students progress to higher educational levels. This decrease in consistency poses substantial challenges in effectively identifying and managing mental health issues during junior and senior high school. Additionally, the results concerning inter-rater agreement on SDQ scores across different genders and

TABLE 2. Prevalence of mental health-related symptoms and multiple risk behaviors by gender and school grade.

Characteristics	Primary school stage (n=3,209)			Junior high school stage (n=4,353)			Senior high school stage (n=3,865)			P value
	Boys (n=1,722)	Girls (n=1,487)	P value $\chi^2$ test	Boys (n=2,365)	Girls (n=1,988)	P value $\chi^2$ test	Boys (n=1,996)	Girls (n=1,869)	P value $\chi^2$ test	
	Depression, n (%)									
No	1,537 (89.26)	1,339 (90.05)	0.464	1,869 (79.03)	1,511 (76.01)	0.017	1,322 (66.23)	1,218 (65.17)	0.486	<0.001
Yes	185 (10.74)	148 (9.95)		496 (20.97)	477 (23.99)		674 (33.77)	651 (34.83)		
Anxiety, n (%)										
No	1,429 (82.98)	1,201 (80.77)	0.103	1,658 (70.11)	1,249 (62.83)	<0.001	1,119 (56.06)	919 (49.17)	<0.001	<0.001
Yes	293 (17.02)	286 (19.23)		707 (29.89)	739 (37.17)		877 (43.94)	950 (50.83)		
Stress, n (%)										
No	1,576 (91.52)	1,357 (91.26)	0.79	2,035 (86.05)	1,665 (83.75)	0.035	1,508 (75.55)	1,367 (73.14)	0.086	<0.001
Yes	146 (8.48)	130 (8.74)		330 (13.95)	323 (16.25)		488 (24.45)	502 (26.86)		
Insomnia, n (%)										
No	1,518 (88.15)	1,307 (87.9)	0.822	1,758 (74.33)	1,404 (70.62)	0.006	1,339 (67.08)	1,302 (69.66)	0.085	<0.001
Yes	204 (11.85)	180 (12.1)		607 (25.67)	584 (29.38)		657 (32.92)	567 (30.34)		
Suicidal behavior, n (%)										
No	1,667 (96.81)	1,424 (95.76)	0.118	2,245 (94.93)	1,769 (88.98)	<0.001	1,909 (95.64)	1,687 (90.26)	<0.001	<0.001
Yes	55 (3.19)	63 (4.24)		120 (5.07)	219 (11.02)		87 (4.36)	182 (9.74)		
Self-harm behavior, n (%)										
No	1,579 (91.70)	1,360 (91.46)	0.81	2,066 (87.36)	1,631 (82.04)	<0.001	1,772 (88.78)	1,566 (83.79)	<0.001	<0.001
Yes	143 (8.30)	127 (8.54)		299 (12.64)	357 (17.96)		224 (11.22)	303 (16.21)		
Suicidal ideation, n (%)										
No	1,636 (95.01)	1,387 (93.28)	0.036	2,166 (91.59)	1,671 (84.05)	<0.001	1,835 (91.93)	1,609 (86.09)	<0.001	<0.001
Yes	86 (4.99)	100 (6.72)		199 (8.41)	317 (15.95)		161 (8.07)	260 (13.91)		
Drink history, n (%)										
No	1,606 (93.26)	1,431 (96.23)	<0.001	1,922 (81.27)	1,717 (86.37)	<0.001	1,196 (59.92)	1,438 (76.94)	<0.001	<0.001
Yes	116 (6.74)	56 (3.77)		443 (18.73)	271 (13.63)		800 (40.08)	431 (23.06)		
Smoke history, n (%)										
No	1,672 (97.1)	1,475 (99.19)	<0.001	2,158 (91.25)	1,908 (95.98)	<0.001	1,669 (83.62)	1,744 (93.31)	<0.001	<0.001
Yes	50 (2.90)	12 (0.81)		207 (8.75)	80 (4.02)		327 (16.38)	125 (6.69)		

educational levels provide crucial insights into consistency among informants.

This study was subject to some limitations. First, the cross-sectional design of the study constrains our ability to determine causal relationships between gender, school grade, and symptoms related to mental health. Second, as the study sample consisted only of children and adolescents from China, this may restrict the applicability of the findings to other cultural or geographical contexts. Despite these limitations, the

study offers important insights into the variations in mental health-related symptoms and health risk behaviors among children and adolescents based on gender and school grade.

Our study emphasizes the critical importance of early detection and intervention in addressing mental health issues from primary school onward. We have identified the need for intervention programs that are both gender- and grade-specific to effectively tackle these challenges. To improve the psychological well

TABLE 3. Inter-rater agreement for SDQ scores by gender and school grade.

SDQ scales	Self-report vs. caregiver-report ICC (95% CI)		Self-report vs. teacher-report ICC (95% CI)		Self-report vs. caregiver-report ICC (95% CI)		Self-report vs. teacher-report ICC (95% CI)			
	Boys (n=4,170)	Girls (n=170)	Boys (n=875)	Girls (n=781)	Primary (n=2,907)	Junior high (n=3,045)	Senior high (n=2,881)	Primary (n=317)	Junior high (n=934)	Senior high (n=405)
	0.202 (0.155, 0.246)	0.294 (0.250, 0.335)	-0.002 (-0.144, 0.123)	0.068 (-0.073, 0.19)	0.103 (0.036, 0.166)	0.352 (0.305, 0.397)	0.234 (0.176, 0.288)	0.023 (-0.218, 0.217)	0.074 (-0.053, 0.185)	-0.029 (-0.252, 0.153)
Emotional symptoms	0.253 (0.209, 0.295)	0.234 (0.186, 0.279)	-0.062 (-0.213, 0.070)	-0.080 (-0.243, 0.062)	0.209 (0.150, 0.265)	0.293 (0.241, 0.342)	0.212 (0.152, 0.267)	0.080 (-0.148, 0.262)	0.059 (-0.070, 0.172)	-0.085 (-0.320, 0.107)
Conduct problems	0.252 (0.208, 0.294)	0.293 (0.249, 0.335)	0.010 (-0.130, 0.133)	0.063 (-0.078, 0.186)	0.296 (0.243, 0.345)	0.260 (0.206, 0.311)	0.308 (0.255, 0.356)	0.106 (-0.115, 0.283)	0.019 (-0.115, 0.138)	-0.014 (-0.233, 0.166)
Hyperactivity	0.323 (0.283, 0.361)	0.331 (0.289, 0.370)	0.024 (-0.115, 0.145)	0.062 (-0.08, 0.185)	0.305 (0.253, 0.354)	0.326 (0.277, 0.373)	0.340 (0.291, 0.387)	0.112 (-0.108, 0.288)	0.096 (-0.028, 0.205)	0.024 (-0.186, 0.197)
Peer problems	0.180 (0.131, 0.226)	0.283 (0.238, 0.325)	0.083 (-0.047, 0.197)	0.101 (-0.035, 0.218)	0.297 (0.243, 0.346)	0.338 (0.289, 0.384)	0.224 (0.165, 0.278)	0.193 (-0.006, 0.353)	0.119 (-0.001, 0.225)	0.061 (-0.141, 0.228)
Prosocial behavior	0.318 (0.278, 0.356)	0.379 (0.340, 0.416)	0.000 (-0.142, 0.124)	-0.039 (-0.196, 0.097)	0.307 (0.255, 0.355)	0.269 (0.215, 0.319)	0.331 (0.280, 0.378)	0.129 (-0.086, 0.302)	-0.040 (-0.182, 0.085)	0.011 (-0.202, 0.187)
Difficulties Total										

Note: Results of ICC are calculated using absolute agreement, two-way random-effects model. Interpretations of ICC values: values <0.20=poor agreement, values between 0.20 and 0.40=fair agreement, values between 0.40 and 0.60=moderate agreement, values between 0.60 and 0.80=strong agreement, values between 0.80 and 1.00=very strong agreement. Abbreviation: ICC=intraclass correlation coefficients; 95% CI=95% confidence interval; SDQ=the strengths and difficulties questionnaire.

without of young learners, we recommend that schools establish dedicated psychological health service platforms. Enhancing these services can be achieved by training school nurses and integrating professional psychology educators into the school environment. Moreover, the formation of a collaborative “family-school-healthcare” model could be beneficial, making use of community resources to provide psychological education and support. Additionally, the development of a cloud-based provincial platform for psychological health interventions would connect educational institutions, families, and professional services, creating an extensive network of support for students.

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