

Mental health and its association with resilience among Chinese adolescent: a cross-sectional study

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Abstract

Aim

To assess the mental health and its relationship with resilience among Chinese adolescents.

Methods

2452 students were recruited from 3 middle schools in Chengdu, China, by convenience. Resilience, depressive symptoms, and anxiety were measured by the Resilience Subscale of the Chinese Positive Youth Development Scale, the Center for Epidemiological Studies Depression Scale for Children, and the Screen for Child Anxiety Related Emotional Disorders, respectively. Univariate and multivariable logistic regression were performed to explore influential factors of anxiety and depressive symptoms and their association with resilience.

Results

The prevalence of anxiety and depressive symptoms among adolescents was 30.30% and 43.30%, respectively. Logistic regression showed higher level of resilience and male were protective factors for both anxiety and depressive symptoms, and longer daily internet duration was a risk factor for both of them. Moreover students with shorter daily sleep duration were more likely to develop depressive symptoms.

Conclusion

Resilience is a protective factor for both anxiety and depressive symptoms among adolescent, indicating school-based resilience programs should be highlighted. Restricted daily online duration and healthy sleep duration are also good for easing the burden of anxiety and depressive symptoms.

1 Introduction

Epidemiological studies have shown that mental disorders are more common among children and adolescents. Prevalence data in the UK show that about 9.0% of 11-16-year-olds and 15.0% of 17- 19-year-olds have a diagnosable mood disorder, with depression and anxiety being the most common ¹. It was reported that more than 20% of Chinese adolescents were suffering from depressive symptoms in 2018 ². Untreated depression and anxiety disorders of teenagers often persist into adulthood ³, increasing the risk of a wide range of long-term adverse outcomes, including poor academic performance, unemployment, substance abuse, teenage pregnancy, and poor physical health ⁴. Moreover, depression was proved to be the main contributor to self-harm and suicide ⁵, which is the third leading cause of death in adolescents ⁶.

In recent decades, research focusing on the promotion of protective factors for mental health is increasing ⁷. It has been demonstrated that higher levels of protective factors, such as strong attachment to family, high social competence, positive personal disposition, and positive social support were associated with better mental health conditions ⁸⁻¹⁰. Resilience, which is an important contributor to mental health, is defined by the American Psychological Association (APA) as “the process of adapting well to adversity, trauma, tragedy, threats or significant sources of stress - such as family and relationship problems, serious health problems or workplace and financial

stressors”¹¹. As an integral part of positive youth development¹², resilience was confirmed to be prospectively and positively associated with adolescents' satisfaction with life, employment prospects, and earnings in adulthood^{13,14}. It was found to be a protective factor for anxiety and depression in dialysis and trauma patients¹⁵. Previous studies also showed that a higher level of resilience was associated with less distress and somatic symptoms^{16–18}.

However, evidence on the relationships between adolescents' resilience and anxiety and depressive symptoms is still insufficient, which limits our understanding of the whole picture of the mental health issues of them. We conducted a cross-sectional study among Chinese adolescents, aimed at measuring the prevalence of anxiety and depressive symptoms, assessing their associations with resilience, and exploring their influential factors, with the hypothesis that a higher level of resilience would be an independent protective factor for both anxiety and depressive symptoms.

2 Methods

2.1 Study population and sampling

We conducted a multi-center cross-sectional study in Chengdu, Sichuan Province, China. Three middle schools were selected by convenience, which are located in the center, north, and south of Chengdu respectively. And then 2455 middle school students from all classes of those three schools were recruited (755, 800, 900 students per school respectively). Among them, 3 with missing data of more than 20% were excluded. Finally, a total of 2452 students were recruited, with a satisfactory response rate of 99.88%.

2.2 Measurement tools

3.2.1 Self-compiled Form

A self-compiled form was used to collect Sociodemographic characteristics of participants, including gender, nationality, grade, age, daily online, sleep, and physical activity duration.

3.2.2 The Center for Epidemiological Studies Depression Scale for Children (CES-DC)

The CES-DC was used to evaluate self-reported depressive symptoms of the participants, which was developed by Radloff¹⁹. It consists of 20 items, each of which is scored on a scale of 0 (none at all) to 3 (very much), with a total score ranges from 0 to 60 points and a recommended cutoff of ≥ 15 points. Higher scores indicate more severe depressive symptoms²⁰. CES-DC had good reliability and validity, with the test-retest alpha coefficients were 0.82 and 0.85, respectively²¹. The Cronbach's α coefficient for CES-DC was 0.884 in our study.

3.2.3 The Screen for Child Anxiety Related Emotional Disorders (SCARED)

The SCARED scale developed by Birmaher in 1997 was used to assess anxiety symptoms²². It is widely used and shows good reliability, with a Cronbach's α coefficient of 0.97 among Chinese population²³. The scale consists of 42 items and each item is scored on a 3-point scale. The SCARED scale has a total score ranging from 0 to 82 points, with a recommended cut-off of ≥ 25 points, with higher scores indicating severe anxiety²⁴. In this study, Cronbach's α coefficient for this scale was 0.985.

3.2.4 The resilience subscale of Chinese Positive Youth Development Scale (RE-CPYDS)

Resilience was assessed by Resilience Subscale of Chinese Positive Youth Development Scale (RE-CPYDS). CPYDS was developed by Shek et al. in 2007 and is widely used to assess positive development in Chinese youth^{25,26}. Resilience subscale consists of 6 items, and each item is scored on a 6-point scale. The total score of the resilience subscale is the average score of 6 items, and the score ranges from 1 to 6, with a higher score indicating better resilience. The resilience subscale showed good reliability and validity, and the Cronbach's α coefficient of this scale was 0.865 in the current study.

2.3 Data collection

Data were collected by uniformly trained researchers in three schools using self-assessment questionnaires in December 2020. Uniform instruction was provided after the distribution of the questionnaires and necessary explanations when any queries arose. All participants independently filled out questionnaires and immediately returned it to the researchers. It took about 30 minutes for each participant to complete the entire study.

2.4 Ethical consideration

Our study was conducted according to the Helsinki Declaration standards. The study was approved by the Medical Ethical Committee of SiChuan University. Informed written consent by guardians was obtained before recruitment. Participants' names were replaced by numbers for confidentiality.

2.5 Statistical analysis

SPSS 25.0 software was used to analyze data. Categorical variables were reported as numbers and percentages and skewed distribution variables were recorded as median and 25th and 75th quantiles. Independent sample t-test was used to compare the resilience among students with different level of anxiety and depressive symptoms. Univariate and multivariate logistic regressions were used to explore the influential factors of anxiety and depressive symptoms among the participants. Before regression analysis, multicollinearity among the variables was be examined. All tests were two-sided, and a p-value of ≤ 0.05 was considered statistically significant.

3 Results

3.1 Prevalence of anxiety and depressive symptoms

A total of 2452 participants completed the entire study. The majority of them (99.10%) were of Han nationality, and almost half of them (50.30%) were boys. 1070 were in 7th grade, 1038 in 8th grade and 344 in 9th grade. The average age of the participants was 14.19 ± 0.88 (ranges from 12 to 19). The median (M), 25th percentile (P_{25}) and 75th percentile (P_{75}) of daily online, daily sleep, and daily physical activity duration of them were 120.00 (61.00, 190.00), 480.00 (480.00, 540.00), and 60.00 (60.00, 120.00) minutes respectively. The prevalence of anxiety and depressive symptoms among students in this study was 30.30% (SCARED score ≥ 25) and 43.30% (CES-DC score ≥ 15), respectively, as shown in table 1.

3.2 Associations between anxiety, depressive symptoms and resilience

The results of t-test showed that the levels of resilience were different between students with different levels of anxiety (mean $\pm$ SD= 5.27 $\pm$ 0.82 vs 4.85 $\pm$ 0.97, $t=11.117$, $p<0.001$) and depressive symptoms (mean $\pm$ SD= 5.33 $\pm$ 0.78 vs 4.90 $\pm$ 0.96, $t=12.271$, $p<0.001$). Students with positive anxiety and depressive symptoms had lower resilience than others, as displayed in Table 2.

3.3 Influential factors of anxiety and depressive symptoms

Multivariate logistic regression analysis showed that higher level of resilience (OR 0.609, 95% CI [0.550, 0.674]; OR 0.592, 95% CI [0.534, 0.655]) and male (OR 0.493, 95% CI [0.411, 0.593]; OR 0.704, 95% CI [0.595, 0.833]) were protective factor for both anxiety and depressive symptoms, and longer daily internet duration was a risk factor for both of them (OR 1.002, 95%CI [1.001,1.002]; OR 1.002, 95%CI [1.002,1.003]). Moreover, compared with students in grade 7, students in grade 9 were more likely to experience anxiety symptoms (OR 1.961, 95% CI [1.199, 3.061]). Students with longer daily sleep duration were less likely to generate depressive symptoms (OR 0.998, 95% CI [0.996, 0.999]), as shown in Table 3 and Table 4.

4 Discussion

The results of this study showed a high prevalence of anxiety (30.30%) among adolescents, which is similar to Chen's findings in Chinese adolescents and Kevin's findings in American population^{27,28}, but lower than the 42.4% reported by Zhang et al. in data collected from participants in 25 countries²⁹. The prevalence of depressive symptoms among our participants was 40.6%, which is higher than the 22.28% reported by Li Duan et al. among Chinese adolescents³⁰. Differences are due to differences in the timing and location of the surveys. Firstly, the mental health level of the population varies by region. Secondly, different assessment tools used might contribute to this difference based on the varieties in sensitivity and specificity of those tools. SCARED was used to assess anxiety symptoms among adolescents in our study. However, GAD-7 was used in Khader's study. Overall, adolescents showed a high level of mental problems, suggesting that protective precautions are imperative. It is also suggested that future investigations should cover populations from all regions and select samples scientifically to improve the representativeness of research findings.

In the current study, we found that resilience was a protective factor for both anxiety and depressive symptoms, which was consistent with Dehnel's and Anyan's findings^{31,32}. Resilience describes the phenomenon in which an individual gets a positive adaptation to adversity³³, that is, the ability to bounce back to regain functional equilibrium in a state of health in response to stressful events and positive adaption even in face of significant threat and/or adversity³⁴. This may partly explain students with better resilience were less likely to be anxious and depressed, for better resilience encourages individuals to adopt positive coping strategies to deal with problematic or negative conditions. It was found that resilient individuals could cope with psychological distress more successfully³⁵, indicating school-based resilience programs should be highlighted.

Our findings showed that daily internet duration was a risk factor for both anxiety and depressive symptoms. The results of studies regarding the associations between internet use and mental health outcomes remains controversial. Thom et al found there was an inverse correlation between time spent on websites and levels of anxiety, but no association between internet use and depression³⁶. Results of Maras's study showed internet use is associated with depression and anxiety in Canadian youth³⁷. This might be explained by the different definitions of "internet use". In our study, daily online duration refers to time spent on smartphones, computers, and intelligent televisions, while Maras's study refers to the duration of screen time and Thom's study refers to time spent on

websites. Our findings also showed that adolescent with longer daily sleep duration were less like to generate depressive symptoms which was supported by Sampasa and Liao et, al ^{38,39}. It may be because dysregulated melatonin secretion plays an important role in the pathogenesis of depression, and good sleep facilitates the rhythmic secretion of melatonin⁴⁰. In addition, sleep disruption can affect circadian rhythms, and when biological rhythms are affected, desynchrony between biological clocks and sleep-wake cycles over time can lead to mood disorders such as depression⁴¹. The pathogenesis of both sleep disorders and depression is associated with dysfunction of the cholinergic neurotransmitter system and prefrontal cortex, as well as increased activity of the limbic system ^{42,43}. And this may explain why sleep is linked to depression.

There are several limitations of this study. Firstly, although a satisfactory response rate was achieved by onsite data collection, the data collection was based on participants' self-report. Although all participants were instructed uniformly before the survey, there were some degree of reporting bias due to differences in individual understanding. Secondly, despite multi-center sampling being adopted, the current study was conducted in Sichuan Province only, which may undermine its representativeness. Participants from other regions of China should be considered in further studies. Thirdly, influential factors we explored were limited to resilience, age, gender, nationality, grade, daily internet use, sleep, and physical activity duration, ignoring other confounding variables such as academic stress and family dynamics. Lastly, the cross-sectional research design of this study limited the possibility to draw clear causal associations from such an observational study.

5 Conclusion

This study shows a high prevalence of anxiety and depressive symptoms among chinese adolescents. This study also finds resilience is a protective factor for both anxiety and depressive symptoms among adolescent, indicating school-based resilience programs should be highlighted. Restricted daily online duration and healthy sleep duration are also good for easing the burden of anxiety and depressive symptoms.

Declarations

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The authors are grateful to all the participants.

Author contributions

Y. Y contributed to the drafting of the manuscript and design of the work;

M.W, and X.C contributed to the analysis of the data;

Q.Z and Q.J contributed to the acquisition of the data;

B.L contributed to the conception and design of the work;

J.Y contributed to the revision of the manuscript and the final approved version of the manuscript.

Data availability statement (mandatory)

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing Interests Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Tables

Table 1. Sociodemographic characteristics and prevalence of anxiety and depressive symptoms of the participants (N=2452).

Variables	<i>N (%)</i> / <i>M (P₂₅ P₇₅)</i>
Gender	
Male	1218(49.70)
Female	1234(50.30)
Nationality	
Han	2431(99.10)
Others	21(0.90)
Grade	
7	1070(43.60)
8	1038(42.30)
9	344(14.10)
SCARED	
≤25	1710(69.70)
≥25	742(30.30)
CES-DC	
≤15	1390(56.70)
≥15	1062(43.30)
Age	14.19(0.87)
Daily online duration (minute)	120.00 (61.00,190.00)
Daily sleep duration (minute)	480.00 (480.00,540.00)
Daily physical activity duration (minute)	60.00 (60.00,120.00)

Note: NSCARED, the Screen for Child Anxiety Related Emotional Disorders. CES-DC, the Center for Epidemiological Studies Depression Scale for Children. SD ,Standard deviation. N,Number. M,median. *M (P₂₅ P₇₅)*, Median (25th percentiles ,75th percentiles).

Table 2. Associations between anxiety, depressive symptoms and resilience (*N*=2452).

	Anxiety symptoms		<i>t</i>	<i>p</i>	Depressive symptoms		<i>t</i>	<i>p</i>
	No	Yes			No	Yes		
Resilience[Mean(SD)]	5.27±0.82	4.85±0.97	11.117	≤0.001	5.33±0.78	4.90±0.96	12.271	≤0.001

Note: SD,standard deviation

Table 3. Influential factors of anxiety among the participants (*N* =2452).

Variables	Univariate analysis		Multivariate analysis	
	<i>p</i>	<i>OR (95% CI)</i>	<i>p</i>	<i>OR (95% CI)</i>
Age	0.001	1.178(1.069,1.298)	0.338	0.914(0.760,1.099)
Gender=Male	✗0.001	0.528 0.443,0.629	✗0.001	0.493(0.411,0.593)
Nationality=Han	0.520	1.392(0.508,3.814)	-	-
Grade(ref:7)	-	-	-	-
8	0.059	1.200(0.993,1.450)	0.456	1.110(0.843,1.461)
9	✗0.001	1.881(1.459,2.426)	0.007	1.916(1.199,3.061)
Daily internet duration	✗0.001	1.002(1.002,1.003)	✗0.001	1.002(1.001,1.002)
Daily sleep duration	0.005	0.998(0.997,0.999)	0.404	0.999(0.998,1.001)
Daily physical activity duration	0.093	0.999(0.997,1.000)	-	-
Resilience	✗0.001	0.598(0.542,0.659)	✗0.001	0.609(0.550,0.674)

Note: OR=odds ratio, CI=confidential interval.

Table 4. Influential factors of depressive symptoms among the participants (N=2452).

Variables	Univariate analysis		Multivariate analysis	
	<i>p</i>	<i>OR (95% CI)</i>	<i>p</i>	<i>OR (95% CI)</i>
Age	0.011	1.125(1.027,1.233)	0.921	1.009(0.851,1.195)
Gender=Male	✗0.001	0.729(0.621,0.855)	✗0.001	0.704(0.595,0.833)
Nationality=Han	0.629	1.244(0.514,3.012)	-	-
Grade(ref:7)	-	-	-	-
8	0.081	1.166(0.981,1.386)	0.683	0.949(0.737,1.222)
9	0.007	1.399(1.096,1.786)	0.992	0.998(0.644,1.547)
Daily internet duration	✗0.001	1.003(1.002,1.004)	✗0.001	1.002(1.002,1.003)
Daily sleep duration	✗0.001	0.997(0.996,0.998)	0.001	0.998(0.996,0.999)
Daily physical activity duration	0.053	0.999(0.997,1.000)	-	-
Resilience	✗0.001	0.560(0.507,0.619)	✗0.001	0.592(0.534,0.655)

Note: OR=odds ratio, CI=confidential interval.