Check for
updates

Compared With Girls, Boys' Psychological Symptoms Are More Likely to Be Influenced by Lifestyle in Chinese Middle School Students

Jinkui Lu[1], Chun Tan[2], Jianfeng Zhou[1], Mian Sha[1], Yongli Xu[1], Jianhua Qiu[1] and Ningling Liu[1]*

[1] School of Physical Education, Shangrao Normal University, Shangrao, China, [2] Department of Preschool Education, Shangrao Preschool Education College, Shangrao, China

Purpose: To explore the relationship between Chinese middle school students' lifestyles and psychological symptoms and compare the differences between genders.

Method: Using the method of stratified cluster sampling, 14,356 students aged 13–18 years from 8 cities in China were selected as participants. The Multidimensional Sub-health Questionnaire of Adolescents was used to estimate psychological symptoms. Chi-square test and Logistic regression analysis were used to analyze the relationship between lifestyle and psychological symptoms.

Results: The psychological symptom detection rate of Chinese middle school students was 21.37%. The detection rate of psychological symptoms for boys was 22.1%, which was significantly higher than for girls (20.64%, $\chi^2 = 4.608$, $P < 0.05$). According to the Logistic regression analysis, factors that have a positive correlation with the demonstration of psychological symptoms ($P < 0.01$) include: how the students go to school (by foot or on the vehicle) (OR = 1.16, 95% CI: 1.07–1.25); inadequate time for sleep (OR = 1.48, 95% CI: 1.28–1.72); video watching time ≥ 2 h/d (OR = 1.25, 95% CI: 1.13–1.39); never exercise (OR = 2.39, 95% CI: 2.07–2.76); never participate in extracurricular exercises (OR = 1.45, 95% CI: 1.27–1.66); have breakfast occasionally (OR = 1.35, 95% CI:1.22–1.50); never have breakfast (OR = 1.90, 95% CI: 1.62–2.24); always have snacks (OR = 1.27, 95% CI: 1.13–1.44); always drink sugared beverages (OR = 1.37, 95% CI: 1.22–1.55); picky with food occasionally (OR = 1.22, 95% CI: 1.11–1.33).

Conclusions: There was a positive correlation between unhealthy lifestyle and the occurrence of psychological symptoms, and boys are more easily influenced by lifestyles than girls.

Keywords: lifestyles, middle school students, psychological symptoms, correlation analysis, gender differences

INTRODUCTION

Adolescence is an unstable stage of immature mental health development (Kingsbury et al., 2020; Orben et al., 2020; Zhang et al., 2020; Willinger et al., 2021). Adolescent mental health is very important to their behavioral development and any unwanted event will impact their fragile mentality and may leave traumas on their psyche (Zimet and Jacob, 2001). According to WHO (2020), there are about 10–20% of teenagers worldwide plagued with multifarious psychological symptoms. It was reported that approximately 1 trillion dollars in the economy are lost every year in the world because of multifarious psychological symptoms (Younger, 2016). Worse still, presence of the minor psychological symptoms in adolescence are likely to cause harsh consequences including non-suicidal self-hurt, depression, anxiety, and even suicide when they become adults (Resnick et al., 1997; Kieling et al., 2011; Perou et al., 2013; Schoeps et al., 2018).

Research has confirmed that teenagers living a depraved life regarding their health have a higher risk of being diagnosed with psychological symptoms (Kim and Kim, 2017). Mozzillo et al. (2021) suggested that the health-related quality-of-life (HRQOL) will increase by 12.2% with more scores on dietary habit. Recently, the COVID-19 pandemic has forced the lifestyle of the teenagers to take a U-turn, with more time watching the video, less time on sports and exercise, eating too many snacks, and binging on sugared beverages (Nikolaidis et al., 2021, 2022). As a consequence, the physical and mental health of teenagers will be unavoidably impaired by this sick lifestyle. Research showed that eating fatty or high-calorie food and drinking too many sugared beverages will make the kid easier to contract psychological symptoms (Kuhl et al., 2012; Myde et al., 2014).

Meta-analysis suggested that Chinese adolescents' mental health deteriorated across birth cohorts since the early 1990s, shown in increased scores on the negative indicators of mental health (e.g., mental problems, anxiety, and depression) (Xin et al., 2012). Moreover, 1.2 billion dollars of loss are also caused every year because of the psychological problems of the teenagers in China (Xu et al., 2019b). To our best knowledge, we only found one study focused on the relationship between lifestyle and mental health in China (Li et al., 2021). Given the serious psychological problems of Chinese teenagers, the present study aimed to estimate the relationships between lifestyles and psychological symptoms of Chinese middle school students.

MATERIALS AND METHODS

Data Source and Participants

In this study, PASS software was used to calculate the sample size. The sample size of this study can reflect the relationship between lifestyle and psychological symptoms (Wang and Sun, 2016). Participants were distributed in the Jilin, Heilongjiang, Anhui, Shanghai, Henan, Xinjiang, Guangzhou, and Hainan provinces of China. In each province, 4 middle and 4 high schools were selected, and 2 teaching classes in each grade in each school were randomly selected. Consequently, 384 classes were selected with 35–40 students in each class, and students in these selected classes without mental and physical diseases were recruited as participants. Finally, a total of 14,869 middle school students were recruited for the present study. After excluding 333 participants (2.27%) because of missing data or extreme values, 14,356 valid data were obtained. The survey was approved by the Ethics Committee of the School of Physical Education of Shangrao Normal University (2018R-0219). This study was carried out following the Declaration of Helsinki. All the student's names were numerically coded to avoid personal information leaking. All the participants and their parents signed written informed consent.

Procedures

The study was conducted from April to July 2018, by trained staff which was comprised of postgraduate students who majored in human movement science and PE teachers. Before the test, the students were told the purpose, requirements, and significance of the study with consistent words for every class. After being assigned the questionnaires, the students were asked to complete them with the staff present. The questionnaires were retrieved on the spot.

Questionnaires

The questionnaire included demographic information and questions on the lifestyles and psychological symptoms. Demographic information included age, gender, grade, region city, etc. The questionnaire was determined after a pre-survey with an interval of 15 days with a Cronbach α coefficient of 0.87.

Psychological symptoms were tested by the Multidimensional Sub-health Questionnaire of Adolescents (MSQA), which was specially designed for teenagers (Tao et al., 2008). The scale had a Cronbach α coefficient of 0.963 (Chao et al., 2008; Yu-hui et al., 2008) and has been proved to be valid for the survey on the psychological symptoms of Chinese teenagers (Cao et al., 2011; Wan et al., 2015; Wu et al., 2015; Xu et al., 2019a; Zhang et al., 2020). The scale was composed of three dimensions which were emotional symptoms, behavioral symptoms, and social adaptation difficulties with 18, 8, and 13 entries under each dimension respectively. Each entry had a scale of 1–6 and the participants can choose the number according to their behaviors. Reverse scoring was used in the statistical organization. When a certain behavior endured for 1 month or more, the student was defined as having psychological symptoms. When the student had more than three behaviors under the category of emotional symptoms and they lasted over 1 month, he was diagnosed with emotional symptoms; the same with the behavioral symptoms and social adaptation difficulties. If the student had more than one behavior that last over 1 month under the category of behavioral symptoms, then he was diagnosed with behavioral symptoms. For the diagnosis of adaptation difficulties, the threshold number was four. If the addition of these values under the three categories was larger than 8, the student was defined as having psychological symptoms.

The investigation on lifestyle included: How to go to school and come back from school? How many hours of sleep per night? How many hours of watching videos? Exercising frequency at school? How many hours of exercising at school?

A survey of self-rated psychological symptoms and life style among middle school students in 8 cities in different geographic regions of China from April to July 2018

A stratified cluster random sampling method was used to test and survey 14,689 middle school students aged 13-18 in 8 cities in China

excluding333 participants (2.27%) because of missing data or extreme values

14,356 (7,184 for boys, 7,172 for girls) participants were test and survey

To explore the relationships between the lifestyles and psychological symptoms of Chinese middle school students

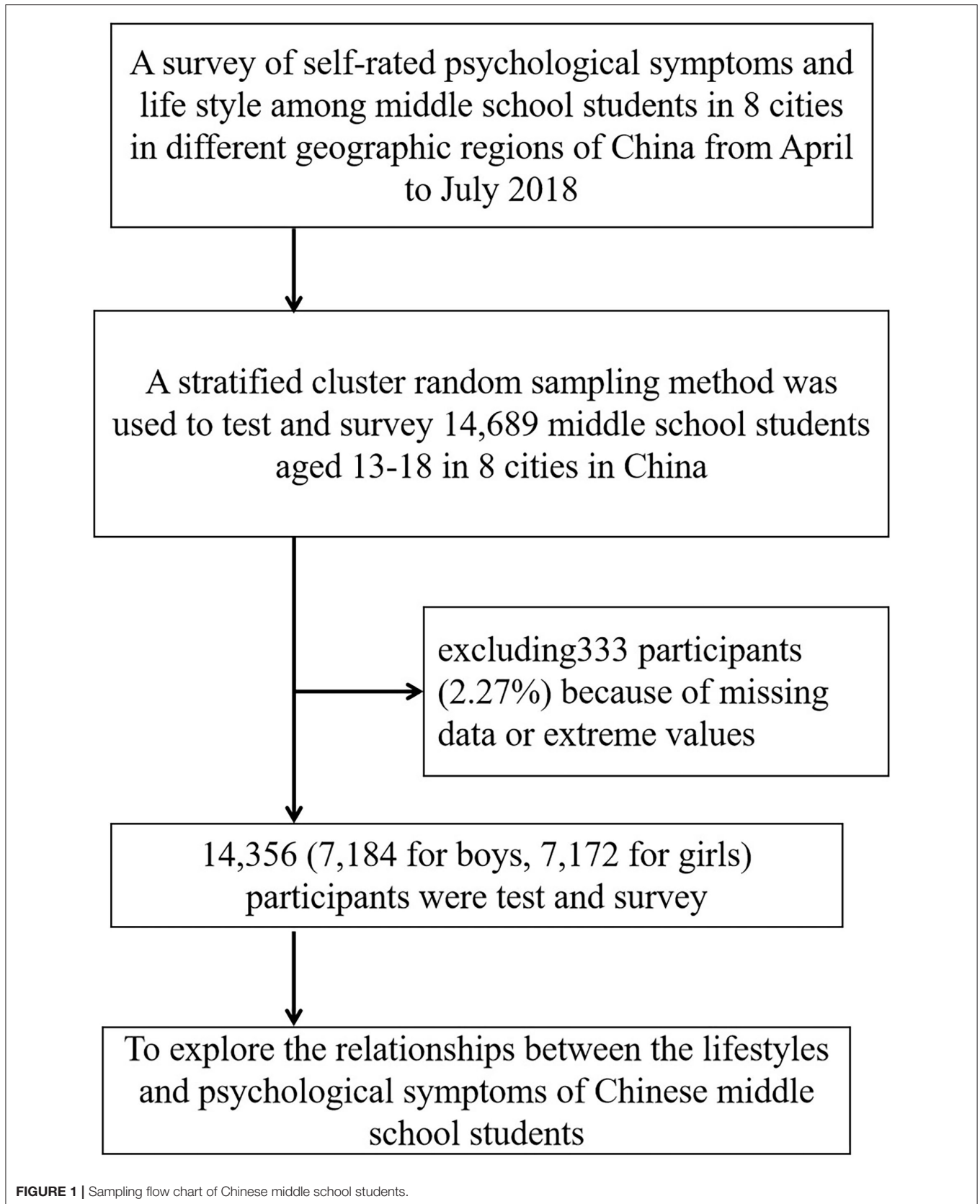**FIGURE 1 |** Sampling flow chart of Chinese middle school students.

TABLE 1 | The comparison of detection rates of psychological symptoms with different lifestyles and for Chinese middle school students (%).

Category		N	Emotional symptoms			Behavioral symptoms			Social adaptation difficulties			Psychological symptoms		
			Prevalence	χ^2	P-value	Prevalence	χ^2	P-value	Prevalence	χ^2	P-value	Prevalence	χ^2	P-value
Gender	Boys	7,184	1,996 (27.78)	0.097	0.756	2,038 (28.37)	6.161	<0.05	1,308 (18.21)	12.254	<0.01	1,588 (22.10)	4.608	<0.05
	Girls	7,172	1,976 (27.55)			1,902 (26.52)			1,148 (16.01)			1,480 (20.64)		
Grade	Junior high school	7,180	2,108 (29.36)	20.535	<0.01	2,168 (30.19)	54.553	<0.01	1,224 (17.05)	0.037	0.847	1,600 (22.28)	7.13	<0.05
	High school	7,176	1,864 (25.98)			1,772 (24.69)			1,232 (17.17)			1,468 (20.46)		
Region	City	1,0974	3,008 (27.41)	1.545	0.214	3,002 (27.36)	0.187	0.665	1,804 (16.44)	14.701	<0.01	2,280 (20.78)	9.797	<0.01
	Rural	3,382	964 (28.5)			938 (27.74)			652 (19.28)			788 (23.30)		
How to go to school and come back from school	Active	7,406	1,966 (26.55)	9.62	<0.01	1,982 (26.76)	3.583	0.058	1,200 (16.2)	8.83	<0.01	1,500 (20.25)	11.359	<0.01
	Passive	6,950	2,006 (28.86)			1,958 (28.17)			1,256 (18.07)			1,568 (22.56)		
How many hours of sleep at night	Deprivation	1,2932	3,666 (28.35)	30.159	<0.01	3,618 (27.98)	18.54	<0.01	2,286 (17.68)	29.791	<0.01	2,834 (21.91)	22.942	<0.01
	Adequate	1,424	306 (21.49)			322 (22.61)			170 (11.94)			234 (16.43)		
How many hours of watching videos	<2 h/d	1,1944	3,224 (26.99)	16.196	<0.01	3,144 (26.32)	44.953	<0.01	1,964 (16.44)	22.131	<0.01	2,468 (20.66)	21.192	<0.01
	≥2 h/d	2,412	748 (31.01)			796 (33)			492 (20.4)			600 (24.88)		
Exercising frequency at school	Never	1,364	562 (41.2)	139.951	<0.01	526 (38.56)	95.108	<0.01	382 (28.01)	128.465	<0.01	480 (35.19)	172.85	<0.01
	Occasional	9,672	2,570 (26.57)			2,514 (25.99)			1,572 (16.25)			1,952 (20.18)		
	Often	3,320	840 (25.3)			900 (27.11)			502 (15.12)			636 (19.16)		
How many hours of exercising at school	<60 min/d	12,312	3,446 (27.99)	4.455	<0.05	3,372 (27.39)	0.141	0.707	2,144 (17.41)	5.713	<0.05	2,656 (21.57)	2.091	0.148
	≥60 min/d	2,044	526 (25.73)			568 (27.79)			312 (15.26)			412 (20.16)		
Exercise after class	Yes	1,744	394 (22.59)	25.56	<0.01	434 (24.89)	6.532	<0.05	226 (12.96)	24.099	<0.01	286 (16.40)	29.202	<0.01
	No	12,612	3,578 (28.37)			3,506 (27.8)			2,230 (17.68)			2,782 (22.06)		
How regular they have breakfast	Always	11,226	2,920 (26.01)	80.774	<0.01	2,906 (25.89)	69.867	<0.01	1,778 (15.84)	77.281	<0.01	2,228 (19.85)	86.592	<0.01
	Occasional	2,386	768 (32.19)			760 (31.85)			478 (20.03)			602 (25.23)		
	Never	744	284 (38.17)			274 (36.83)			200 (26.88)			238 (31.99)		
How often they have snacks	Always	3,668	1,182 (32.22)	51.594	<0.01	1,148 (31.3)	36.856	<0.01	720 (19.63)	29.638	<0.01	922 (25.14)	45.096	<0.01
	Occasional	8,196	2,126 (25.94)			2,134 (26.04)			1,286 (15.69)			1,612 (19.67)		
	Never	2,492	664 (26.65)			658 (26.4)			450 (18.06)			534 (21.43)		
How often they drink sugared drinks	Always	2,230	750 (33.63)	46.99	<0.01	736 (33)	48.072	<0.01	478 (21.43)	35.115	<0.01	578 (25.92)	32.52	<0.01
	Occasional	7,564	2,004 (26.49)			2,062 (27.26)			1,244 (16.45)			1,556 (20.57)		
	Never	4,562	1,218 (26.7)			1,142 (25.03)			734 (16.09)			934 (20.47)		
How pick they are with the food	Never	4,308	1,038 (24.09)	125.03	<0.01	1,012 (23.49)	117.666	<0.01	648 (15.04)	83.455	<0.01	784 (18.2)	134.994	<0.01
	Occasional	8,578	2,358 (27.49)			2,368 (27.61)			1,436 (16.74)			1,806 (21.05)		
	Always	1,470	576 (39.18)			560 (38.1)			372 (25.31)			478 (32.52)		

N, Number; χ^2, Chi-square.

Exercise after class? How regularly do they have breakfast? How often do they have snacks? How often do they drink sugared drinks? How pick they are with the food? These items were prepared and discussed by relevant experts with reference to the Chinese National Survey on Students' Constitution and Health (CNSSCH Association, 2016).

Stats and Analysis

The chi-square test (χ^2 test) was used to compare the detection rates of the psychological symptoms as well as each dimension of the Chinese teenagers. The correlations between lifestyles and psychological symptoms for boys and girls were analyzed using the Logistic regression method after gender, grade, and city were controlled. The Logistic regression analysis was conducted on the gender difference based on the reference of girls, with the factors of grade and city control. Epidata entry 3.1 was used for data entry and was double-checked to guarantee accuracy. SPSS25.0 software was used for data analysis and $\alpha = 0.05$ was the two-sided test level.

RESULTS

A total of 14,869 middle school students (7,184 boys, 50.4%; 7,180 junior middle school students, 50.01%) participated in the present study (**Figure 1**). The average age of the surveyed students was (15.51 ± 1.71) years old.

Table 1 shows that the detection rate of psychological symptoms in middle school students was 21.37% (3,068/14,356). Among the three dimensions, the detection rate of emotional symptoms, behavioral symptoms, and social adaptation difficulties was 27.67% (3,972/14,356), 27.44% (3,940/14,356), and 17.11% (2,456/14,356), respectively. The detection rate of psychological symptoms in boys (22.1%) was higher than that of girls (20.64%, $\chi^2 = 4.608$, $P < 0.05$). The detection rate of psychological symptoms for teenagers with different lifestyles almost had statistical significance ($\chi^2 = 11.359, 22.942, 21.192, 172.850, 29.202, 86.592, 45.096, 32.520, 134.994, P < 0.01$).

Table 2 showed the logistic regression analysis of the correlations between lifestyles and psychological symptoms of Chinese middle school students. We found that psychological

TABLE 2 | Logistic regression analysis on the correlations between lifestyles and psychological symptoms of Chinese middle school students.

Independent variable		β value	Standard error	Wald χ^2	P-value	OR (OR 95% CI)
How to go to school and come back from school	Active					1.00
	Passive	0.15	0.04	12.61	<0.01	1.16 (1.07–1.25)
How many hours of sleep at night	Adequate					1.00
	Deprivation	0.40	0.08	27.34	<0.01	1.48 (1.28–1.72)
How many hours of video watching every day	<2 h/d					1.00
	≥2 h/d	0.23	0.05	18.59	<0.01	1.25 (1.13–1.39)
Exercising frequency at school	Often					1.00
	Occasional	0.09	0.05	3.00	0.08	1.09 (0.99–1.21)
	Never	0.87	0.07	143.14	<0.01	2.39 (2.07–2.76)
How many hours of exercising at school	≥60 min/d					1.00
	<60 min/d	0.11	0.06	3.48	0.06	1.12 (0.99–1.26)
Exercise after class	Yes					1.00
	No	0.37	0.07	29.27	<0.01	1.45 (1.27–1.66)
How regular they have breakfast	Always					1.00
	Occasional	0.30	0.05	33.00	<0.01	1.35 (1.22–1.50)
	Never	0.64	0.08	61.33	<0.01	1.90 (1.62–2.24)
How often they have snacks	Never					1.00
	Occasional	−0.10	0.06	2.84	0.09	0.91 (0.81–1.02)
	Always	0.24	0.06	14.90	<0.01	1.27 (1.13–1.44)
How often they drink sugared beverages	Never					1.00
	Occasional	0.00	0.05	0.01	0.94	1.00 (0.92–1.10)
	Always	0.32	0.06	26.86	<0.01	1.37 (1.22–1.55)
How picky they are with the food	Never					1.00
	Occasional	0.20	0.05	16.57	<0.01	1.22 (1.11–1.33)
	Always	0.80	0.07	136.05	<0.01	2.24 (1.95–2.56)

Whether the student has the psychological symptoms (indicated in "yes" and "no") was the dependent variable and the lifestyle variables were the independent variables and they are: how the students go to and come back from school (active = 1, passive = 2), how many hours of sleep at night (adequate = 1, inadequate = 2), how many hours of using a digital device and watching TV(<2 h/d = 1, ≥2 h/d = 2), how often they exercise (often = 1, occasional = 2, never = 3), how long they exercise (more than 60 min = 1, <60 min = 2), participation in extracurricular exercises (yes = 1, no = 2), how regularly they have breakfast (always = 1, occasionally = 2, never = 3), how often they have snacks (never = 1, occasionally = 2, always = 3), how often they drink sugared drinks (never = 1, drink occasionally = 2, always = 3), how pick they are with the food (never = 1, occasionally = 2, always = 3).
OR, Adjusted Odds Ratio; 95% CI, 95% Confidence interval.

TABLE 3 | Regression analysis of the correlation between psychological symptoms and lifestyles.

Independent variable		Boys		Girls		Boys compared to girls	
		P-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)
How to go to school and come back	Active		1.00		1.00	0.48	1.04 (0.93–1.17)
	Passive	<0.01	1.21 (1.09–1.36)	0.13	1.09 (0.97–1.23)	<0.05	1.16 (1.04–1.30)
How many hours of sleep at night	Adequate		1.00		1.00	0.81	0.97 (0.72–1.28)
	Deprivation	<0.01	1.52 (1.26–1.85)	<0.01	1.41 (1.12–1.77)	<0.05	1.12 (1.03–1.22)
How many hours of video watching/using digital device per day	< 2 h/d		1.00		1.00	0.05	1.09 (1.00–1.19)
	≥2 h/d	<0.01	1.24 (1.08–1.42)	<0.01	1.29 (1.11–1.51)	0.74	1.03 (0.86–1.25)
Exercising frequency at school	Often		1.00		1.00	0.68	1.04 (0.87–1.25)
	Occasional	<0.01	2.41 (1.96–2.95)	<0.01	2.31 (1.88–2.84)	<0.01	1.19 (1.08–1.31)
	Never	<0.05	1.14 (1.01–1.30)	0.99	1.00 (0.85–1.18)	0.35	1.12 (0.89–1.40)
How many hours of exercising every day	≥60 min/d		1.00		1.00	0.21	0.86 (0.68–1.09)
	< 60 min/d	<0.05	1.21 (1.05–1.40)	0.48	0.93 (0.75–1.14)	<0.01	1.15 (1.06–1.25)
Exercise after class	Yes		1.00		1.00	0.67	0.94 (0.72–1.23)
	No	<0.01	1.55 (1.3–1.83)	<0.05	1.30 (1.04–1.62)	<0.01	1.14 (1.05–1.24)
How regular they have breakfast	Always		1.00		1.00	0.18	1.07 (0.97–1.17)
	Occasional	<0.01	1.44 (1.25–1.66)	<0.01	1.26 (1.08–1.47)	0.05	1.21 (1.00–1.45)
	Never	<0.01	1.95 (1.55–2.44)	<0.01	1.82 (1.45–2.29)	0.40	1.14 (0.84–1.56)
How often they have snacks	Never		1.00		1.00	0.65	0.96 (0.78–1.16)
	Occasional	0.88	1.01 (0.88–1.17)	<0.05	0.78 (0.66–0.93)	<0.01	1.25 (1.12–1.39)
	Always	<0.05	1.25 (1.06–1.48)	<0.05	1.23 (1.03–1.48)	0.98	1.00 (0.86–1.16)
How often they have sugared drinks	Never		1.00		1.00	<0.05	1.18 (1.02–1.36)
	Occasional	0.26	0.93 (0.81–1.06)	0.26	1.08 (0.95–1.22)	0.87	1.01 (0.90–1.13)
	Always	<0.01	1.33 (1.13–1.57)	<0.01	1.39 (1.16–1.67)	0.23	1.13 (0.93–1.37)
How picky they are with the food	Never		1.00		1.00	0.37	1.08 (0.92–1.26)
	Occasional	<0.01	1.25 (1.11–1.42)	<0.05	1.16 (1.01–1.34)	<0.05	1.16 (1.04–1.29)
	Always	<0.01	2.53 (2.07–3.09)	<0.01	2.02 (1.68–2.43)	<0.05	1.33 (1.06–1.66)

OR, Adjusted Odds Ratio; 95% CI, 95% confidence interval.

symptoms were positively correlated with (a higher OR value indicates a stronger correlation): the way to and from school passively (OR = 1.16, 95% CI: 1.07–1.25), sleeping < 8 h at night (sleep deprivation) (OR = 1.48, 95% CI: 1.28–1.72), watching TV/using the digital device more than 2 h per day (OR = 1.25, 95% CI:1.13–1.39), never exercise at school (OR = 2.39, 95% CI: 2.07–2.76), never exercise after class (OR = 1.45, 95% CI: 1.27–1.66), eating breakfast occasionally (OR = 1.35, 95% CI: 1.22–1.50), never eating breakfast (OR = 1.90, 95% CI: 1.62–2.24), always eating snacks (OR = 1.27, 95% CI: 1.13–1.44), always have sugared beverages (OR = 1.37, 95% CI: 1.22–1.55), picky with food occasionally (OR = 1.22, 95% CI: 1.11–1.33), often picky with food (OR = 2.24, 95% CI: 1.95–2.56) (*P* < 0.01).

Table 3 and **Figure 2** show the regression analysis of the correlation between psychological symptoms and lifestyles. Taking girls as a reference, logistic regression analysis showed that boys have higher OR values, which means they are more easily influenced by lifestyles than girls (**Figure 3**).

DISCUSSION

The present study used 14,356 data of Chinese middle school students to estimate the correlation between psychological

symptoms and lifestyles, finding out that there was a positive correlation between unhealthy lifestyle and the occurrence of psychological symptoms, and boys are more easily influenced by lifestyles than girls.

We found out that the detection rate of psychological symptoms in Chinese middle school students was 21.37%, which is higher than that in studies by Tao et al. (2020) (11.18%) and Wu (2019) (19.65%). Although the same questionnaire was used, the detection rate of psychological symptoms was different because of the different recall levels of the participants. Our study also showed that Chinese boys had a higher detection rate of psychological symptoms than girls, which is consistence with the conclusion of Gu et al. (2017) and Wu (2019). An important reason could be that boys have worse living habits than girls, such as smoking, drinking, and over gaming (Vaezghasemi et al., 2012). The detection rate of the junior middle school students was higher than that of senior middle school students, inconsistent with the research findings of Wen (2020). The reason may be that senior middle school students are better at regulating themselves psychologically (Rao et al., 2019). Besides, the unpredictable environment and unstable minds of junior middle school students added to their susceptibility to the psychological symptoms (Chi et al., 2020).
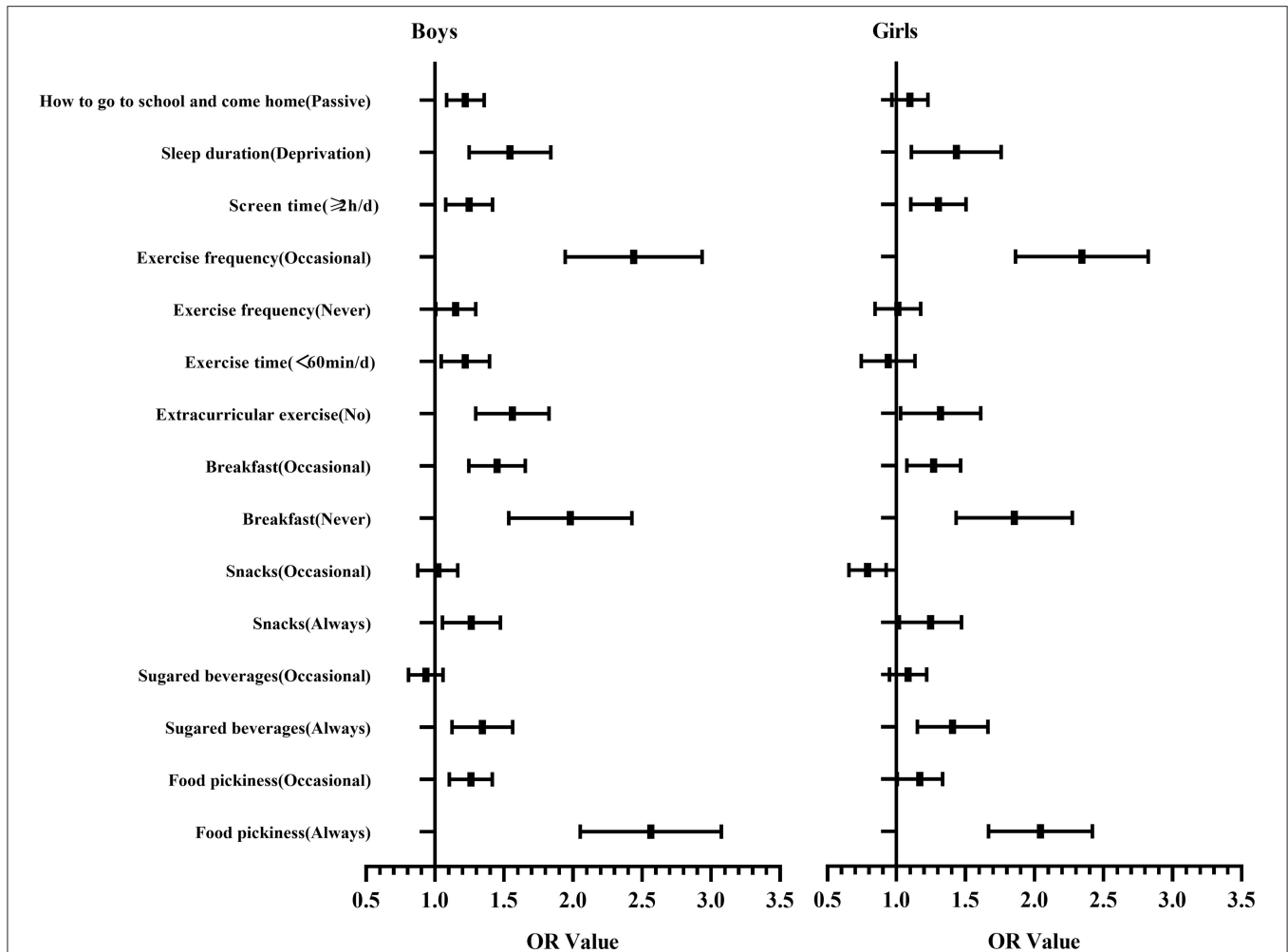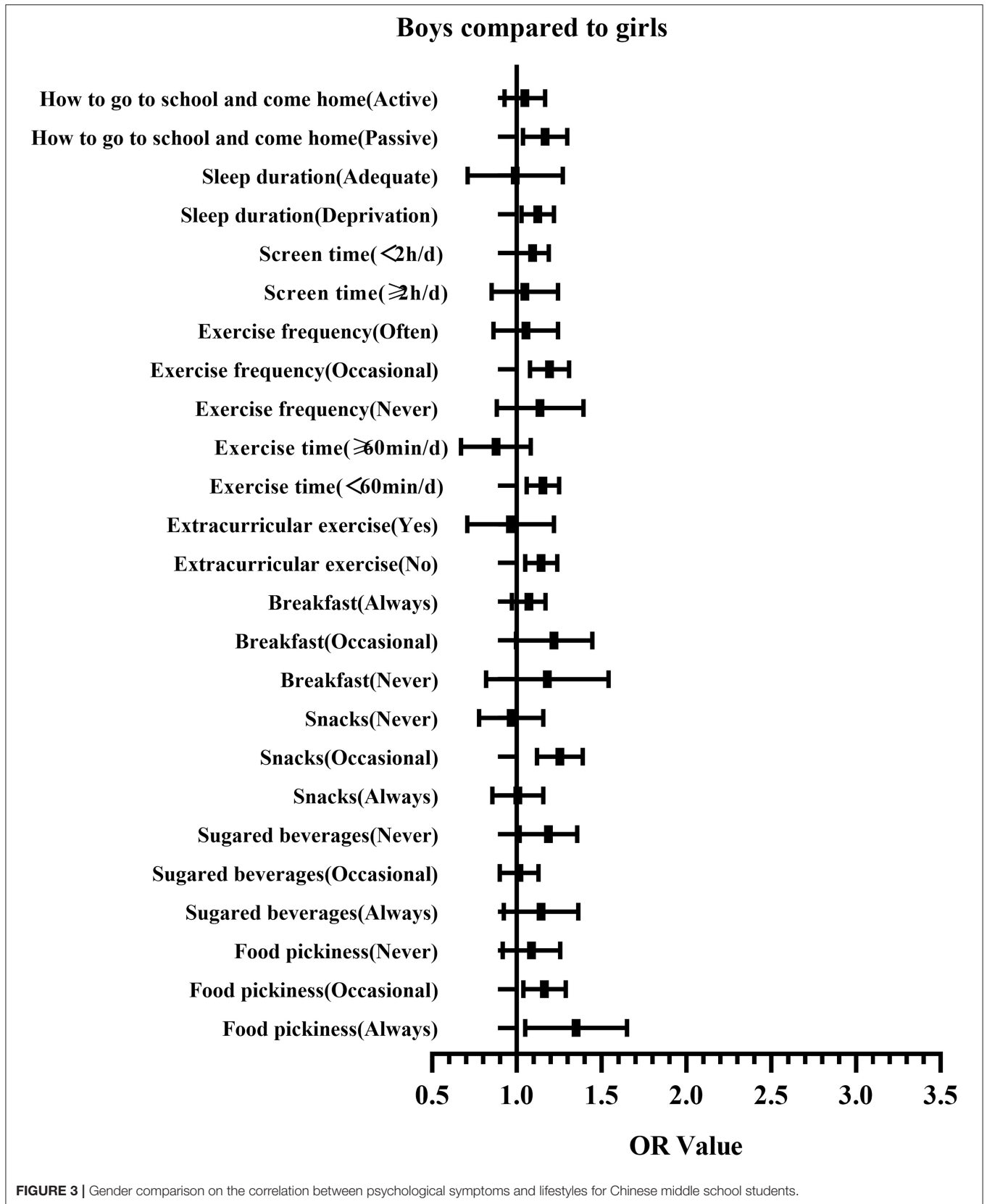
FIGURE 2 | The diagram of the OR value (95% CI) of regression analysis on the correlation between psychological symptoms and lifestyles for boys and girls, respectively.

Students who chose to go to school and come back home in a passive way (take the bus, metro, and automobile) got a higher detection rate of psychological symptoms. Research has confirmed that actively going to school (by foot or riding a bicycle) is beneficial by improving physical activity level, which can in turn influence their psychological development (Weist et al., 2000; Whetten et al., 2006; Kutcher and Wei, 2012; Avitsland et al., 2020). Wang et al. (2020) suggested that the occurrence of psychological symptoms among Chinese teenagers was increasing. The possible reasons may be that their lifestyles have changed, including lower physical levels, and higher sedentary behavior (Rodriguez-Ayllon et al., 2019; Wang et al., 2020).

We also found out that deprivation of sleep and excessively watching videos would lead to a higher risk of them getting psychological symptoms, which is in the agreement with other relevant studies (Cao et al., 2011; Backovic et al., 2013; Riemann, 2018, 2020). It was reported that inadequate sleep or staring at the LED screen too long would keep the brain stimulated or stressed, causing psychological symptoms

(Zhang et al., 2020). Similarly, our study suggested that students without exercising were positively correlated with the occurrence of the psychological symptoms, which was consistent with the result of Kandola et al. (2020). Studies have confirmed that psychological symptoms associated with depression and anxiety disorders are increasingly common in obese children and adolescents, and skipping breakfast and drinking sugared beverages beyond normal limits would increase the risk of obesity (Britz et al., 2000; Quek et al., 2017). Therefore, students with these poor-eating habits tend to have psychological symptoms.

Our study showed that, compared with girls, Chinese boys were more easily contract psychological symptoms, and were more susceptible to lifestyle influences. It was reported that unhealthy life would cost physical health and cause bigger risks of getting psychological symptoms (Ekelund et al., 2016; Janssen et al., 2020). A cross-sectional study of Catalonia adolescents showed that girls scored higher on eating behavior and hygiene habits than boys, further supporting the findings of our study (Costa-Tutusaus and Guerra-Balic, 2016). This reminds us that

FIGURE 3 | Gender comparison on the correlation between psychological symptoms and lifestyles for Chinese middle school students.

it is time for middle school students, especially boys, to establish healthy lifestyles for better psychological states.

The present study has some advantages. The first advantage of our study lies in the large sample of Chinese middle school students. Second, we found the gender differences in the correlations between the lifestyles and the occurrence of psychological symptoms, which can remind parents and educators to pay attention to boys' mental health.

However, the study was limited in its way. First of all, the study was a cross-sectional investigation and was unable to deduce the causal relations between lifestyles and psychological symptoms and further cohort study is necessary to solve this problem. Second, the present study used a questionnaire to estimate psychological symptoms, which are susceptible to the level of recall, and future studies would be better using the objective measurements method.

CONCLUSIONS

The present study used 14,356 data of Chinese middle school students to estimate the correlation between psychological symptoms and lifestyles, finding out that there was a positive correlation between unhealthy lifestyle and the occurrence of psychological symptoms, and boys are more easily influenced by lifestyles than girls. Targeted measures such as lessons on health lifestyle, and dissemination of health knowledge should be taken for the better mental health of Chinese middle school students.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Sports College of Shangrao Normal University (2018R-0219). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

FUNDING

ACKNOWLEDGMENTS

REFERENCES

Avitsland, A., Leibinger, E., Haugen, T., Lerum, O., Solberg, R. B., Kolle, E., et al. (2020). The association between physical fitness and mental health in Norwegian adolescents. *BMC Public Health.* 20, 776. doi: 10.1186/s12889-020-08936-7

Backovic, D. V., Maksimovic, M., Davidovic, D., Zivojinovic, J. I., and Stevanovic, D. (2013). Stress and mental health among medical students. *Srp. Arh. Celok. Lek.* 141, 780–784. doi: 10.2298/SARH131 2780B

Britz, B., Siegfried, W., Ziegler, A., Lamertz, C., Herpertz-Dahlmann, B. M., Remschmidt, H., et al. (2000). Rates of psychiatric disorders in a clinical study group of adolescents with extreme obesity and in obese adolescents ascertained via a population based study. *Int. J. Obes. Relat. Metab. Disord.* 24, 1707–1714. doi: 10.1038/sj.ijo.0801449

Cao, H., Qian, Q., Weng, T., Yuan, C., Sun, Y., Wang, H., et al. (2011). Screen time, physical activity and mental health among urban adolescents in China. *Prev. Med.* 53, 316–320. doi: 10.1016/j.ypmed.2011. 09.002

Chao, X., Fang-biao, T., and Chang-jiang, Y. (2008). Evaluation of reliability and validity of the multi-dimensional sub-health questionnaire of adolescents. *Chin J Public Health* 24, 1031–1033.

Chi, X., Liu, X., Huang, Q., Huang, L., Zhang, P., and Chen, X. (2020). Depressive symptoms among junior high school students in Southern China: prevalence, changes, and psychosocial correlates. *J. Affect. Disord.* 274, 1191–1200. doi: 10.1016/j.jad.2020.05.034

CNSSCH Association (2016). *Report on the 2014th National Survey on Students'Constitution and Health.* Beijing: China College & University Press.

Costa-Tutusaus, L., and Guerra-Balic, M. (2016). Relationship between healthy lifestyle and sociodemographic factors in adolescents in catalonia: application of VISA-TEEN questionnaire. *PLoS ONE* 11, e0163381. doi: 10.1371/journal.pone.0163381

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., et al. (2016). Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet.* 388, 1302–1310. doi: 10.1016/S0140-6736(16)3 0370-1

Gu, X., Li, H., Tang, J., and Wan, Y. (2017). Analysis of factors related to health literacy and psychological sub-health symptoms of middle school students in Bengbu City, Anhui Province. *Health Educ. China* 33, 8–11. doi: 10.16168/j.cnki.issn.1002-9982.2017.01.002

Janssen, A., Leahy, A. A., Diallo, T., Smith, J. J., Kennedy, S. G., Eather, N., et al. (2020). Cardiorespiratory fitness, muscular fitness and mental health in older adolescents: a multi-level cross-sectional analysis. *Prev. Med.* 132, 105985. doi: 10.1016/j.ypmed.2020.105985

Kandola, A. A., Osborn, D., Stubbs, B., Choi, K. W., and Hayes, J. F. (2020). Individual and combined associations between cardiorespiratory fitness and grip strength with common mental disorders: a prospective cohort study in the UK Biobank. *BMC Med.* 18, 303. doi: 10.1186/s12916-020-01 782-9

Kieling, C., Baker-Henningham, H., Belfer, M., Conti, G., Ertem, I., Omigbodun, O., et al. (2011). Child and adolescent mental health worldwide: evidence for action. *Lancet*. 378, 1515–1525. doi: 10.1016/S0140-6736(11)60827-1

Kim, J., and Kim, H. (2017). Demographic and environmental factors associated with mental health: a cross-sectional study. *Int. J. Environ. Res. Public Health*. 14, 431. doi: 10.3390/ijerph14040431

Kingsbury, M., Clayborne, Z., Colman, I., and Kirkbride, J. B. (2020). The protective effect of neighbourhood social cohesion on adolescent mental health following stressful life events. *Psychol. Med.* 50, 1292–1299. doi: 10.1017/S0033291719001235

Kuhl, E. S., Rausch, J. R., Varni, J. W., and Stark, L. J. (2012). Impaired health-related quality of life in preschoolers with obesity. *J. Pediatr. Psychol.* 37, 1148–1156. doi: 10.1093/jpepsy/jss090

Kutcher, S., and Wei, Y. (2012). Mental health and the school environment: secondary schools, promotion and pathways to care. *Curr. Opin. Psychiatry* 25, 311–316. doi: 10.1097/YCO.0b013e3283543976

Li, X., Tian, D., Qin, P., Guo, W., Lu, J., Zhu, W., et al. (2021). Dietary, physical exercises and mental stress in a Chinese population: a cross-sectional study. *BMC Public Health* 21, 1138. doi: 10.1186/s12889-021-11189-7

Mozzillo, E., Zito, E., Calcaterra, V., Corciulo, N., Di Pietro, M., Di Sessa, A., et al. (2021). Poor health related quality of life and unhealthy lifestyle habits in weight-loss treatment-seeking youth. *Int. J. Environ. Res. Public Health* 18, 9355. doi: 10.3390/ijerph18179355

Myde, B., Adelle, A., Amy, G., and Sonia, M. (2014). Ability of a mass media campaign to influence knowledge, attitudes, and behaviors about sugary drinks and obesity. *Prev. Med.* 67, S40–S45. doi: 10.1016/j.ypmed.2014.07.023

Nikolaidis, A., Derosa, J., Kass, M., Droney, I., Alexander, L., Di Martino, A., et al. (2021). Heterogeneity in COVID-19 pandemic-induced lifestyle stressors and predicts future mental health in adults and children in the US and UK. *medRxiv*. 147, 291–300. doi: 10.1101/2021.08.10.21261860

Nikolaidis, A., Derosa, J., Kass, M., Droney, I., Alexander, L., Di Martino, A., et al. (2022). Heterogeneity in COVID-19 pandemic-induced lifestyle stressors predicts future mental health in adults and children in the US and UK. *J. Psychiatr. Res.* 147, 291–300. doi: 10.1016/j.jpsychires.2021.12.058

Orben, A., Tomova, L., and Blakemore, S. J. (2020). The effects of social deprivation on adolescent development and mental health. *Lancet Child Adolesc Health* 4, 634–640. doi: 10.1016/S2352-4642(20)30186-3

Perou, R., Bitsko, R. H., Blumberg, S. J., Pastor, P., Ghandour, R. M., Gfroerer, J. C., et al. (2013). Mental health surveillance among children–United States, 2005-2011. *MMWR* 62, 1–35.

Quek, Y. H., Tam, W., Zhang, M., and Ho, R. (2017). Exploring the association between childhood and adolescent obesity and depression: a meta-analysis. *Obes. Rev.* 18, 742–754. doi: 10.1111/obr.12535

Rao, J., Wang, H., Pang, M., Yang, J., Zhang, J., Ye, Y., et al. (2019). Cyberbullying perpetration and victimisation among junior and senior high school students in Guangzhou, China. *Inj. Prev.* 25, 13–19. doi: 10.1136/injuryprev-2016-042210

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm. Findings from the national longitudinal study on adolescent health. *JAMA* 278, 823–832. doi: 10.1001/jama.1997.03550100049038

Riemann, D. (2018). Sleep hygiene, insomnia and mental health. *J. Sleep Res.* 27, 3. doi: 10.1111/jsr.12661

Riemann, D. (2020). Focus on sleep, insomnia and mental health. *J. Sleep Res.* 29, e13189. doi: 10.1111/jsr.13189

Rodriguez-Ayllon, M., Cadenas-Sanchez, C., Estevez-Lopez, F., Munoz, N. E., Mora-Gonzalez, J., Migueles, J. H., et al. (2019). Role of physical activity and sedentary behavior in the mental health of preschoolers, children and adolescents: a systematic review and meta-analysis. *Sports Med.* 49, 1383–1410. doi: 10.1007/s40279-019-01099-5

Schoeps, K., Villanueva, L., Prado-Gasco, V. J., and Montoya-Castilla, I. (2018). Development of emotional skills in adolescents to prevent cyberbullying and improve subjective well-being. *Front. Psychol.* 9, 2050. doi: 10.3389/fpsyg.2018.02050

Tao, F., Hu, C., Sun, Y., and Hao, J. (2008). The development and application of multidimensional sub-health questionnaire of adolescents (MSQA). *Chin. J. Dis. Control Prev.* 12, 309–314.

Tao, S., Wan, Y., Wu, X., Sun, Y., Xu, S., Zhang, S., et al. (2020). Psychological evaluation and application of the Concise Questionnaire for Adolescent Mental Health Assessment. *Chin. School Health* 41, 1331–1334. doi: 10.16835/j.cnki.10-00-817.2020.09.014

Vaezghasemi, M., Lindkvist, M., Ivarsson, A., and Eurenius, E. (2012). Overweight and lifestyle among 13-15 year olds: a cross-sectional study in northern Sweden. *Scand. J. Public Health* 40, 221–228. doi: 10.1177/1403494812443603

Wan, Y. H., Xu, S. J., Chen, J., Hu, C. L., and Tao, F. B. (2015). Longitudinal effects of psychological symptoms on non-suicidal self-injury: a difference between adolescents and young adults in China. *Soc. Psychiatry Psychiatr. Epidemiol.* 50, 237–247. doi: 10.1007/s00127-014-0917-x

Wang, M., Jia, L., Xin, W., Lei, L., Hao, X., Qing, S., et al. (2020). A meta-analysis of the prevalence of depression among college students in China in the past decade. *J. Hainan Med. Coll.* 26, 686–693. doi: 10.13210/j.cnki.jhmu.20200-218.001

Wang, Y. Y., and Sun, R. H. (2016). Application of PASS in sample size estimation of non-inferiority, equivalence and superiority design in clinical trials. *Zhonghua Liu Xing Bing Xue Za Zhi.* 37, 741–744. doi: 10.3760/cma.j.issn.0254-6450.2016.05.032

Weist, M. D., Myers, C. P., Danforth, J., Mcneil, D. W., Ollendick, T. H., and Hawkins, R. (2000). Expanded school mental health services: assessing needs related to school level and geography. *Community Ment. Health J.* 36, 259–273. doi: 10.1023/A:1001957130982

Wen, Y. (2020). *A Survey on the Mental Health Status of Middle School Students Based on MHT: A Case Study of W Middle School in Dongguan City.* Mental Health Education in Primary and Secondary Schools, 54–59. doi: 10.3969/j.issn.1671-2684.2020.08.018

Whetten, R., Whetten, K., Pence, B. W., Reif, S., Conover, C., and Bouis, S. (2006). Does distance affect utilization of substance abuse and mental health services in the presence of transportation services? *AIDS Care* 18, S27–34. doi: 10.1080/09540120600839397

WHO (2020). *The WHO Special Initiative for Mental Health (2019-2023):Universal Health Coverage for Mental Health.* Available online at: https://apps.who.int/iris/handle/10665/310981 (accessed April 26, 2020).

Willinger, D., Karipidis, I. I., Dimanova, P., Walitza, S., and Brem, S. (2021). Neurodevelopment of the incentive network facilitates motivated behaviour from adolescence to adulthood. *Neuroimage* 237, 118186. doi: 10.1016/j.neuroimage.2021.118186

Wu, H. (2019). *Study on Physical Health and Its Influencing Factors of Chinese Adolescents with Mental Sub-health.* Shanghai: East China Normal University.

Wu, X., Tao, S., Zhang, Y., Zhang, S., and Tao, F. (2015). Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. *PLoS ONE* 10, e0119607. doi: 10.1371/journal.pone.0119607

Xin, Z., Niu, J., and Chi, L. (2012). Birth cohort changes in Chinese adolescents' mental health. *Int. J. Psychol.* 47, 287–295. doi: 10.1080/00207594.2011.626048

Xu, H., Sun, Y., Wan, Y., Zhang, S., Xu, H., Yang, R., et al. (2019a). Eating pattern and psychological symptoms: a cross-sectional study based on a national large sample of Chinese adolescents. *J. Affect. Disord.* 244, 155–163. doi: 10.1016/j.jad.2018.10.090

Xu, L., Li, C., Li, J., Yang, F., and Wang, J. (2019b). The economic burden of mental disorders in children and adolescents in China: a cross-sectional study. *Lancet* 394, S48. doi: 10.1016/S0140-6736(19)32384-0

Younger, D. S. (2016). Epidemiology of childhood and adult mental illness. *Neurol. Clin.* 34, 1023–1033. doi: 10.1016/j.ncl.2016.06.010

Yu-hui, W., Chuan-lai, H., and Fang-biao, t. (2008). Research on responsiveness of multidimensional sub-health questionnaire of adolescents. *Chin. J. Public Health* 24, 1035–1036. doi: 10.3321/j.issn:1001-0580.2008.09.005

Zhang, F., Yin, X., Bi, C., Ji, L., Wu, H., Li, Y., et al. (2020). Psychological symptoms are associated with screen and exercise time: a cross-sectional study of Chinese adolescents. *BMC Public Health* 20, 1695. doi: 10.1186/s12889-020-09819-7

Zimet, D. M., and Jacob, T. (2001). Influences of marital conflict on child adjustment: review of theory and research. *Clin.*

Child Fam. Psychol. Rev. 4, 319–335. doi: 10.1023/A:1013595 304718

Conflict of Interest: 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.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.