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Associations of Sport Participation with Depression and Anxiety among Chinese Minority Adolescents

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ABSTRACT

This study aimed to explore associations of sport participation with anxiety and depressive symptoms among Chinese minority adolescents. A cross-sectional study was conducted among Chinese adolescents in Tibet. A convenience sample method was used to select participants. Finally, 1452 students completed the survey and 1421 (52.10% girls, Grades 4–9, 13.46 ± 1.41 years old) adolescents met the inclusion criteria of analysis. Sociodemographic variables, sport participation, depression and anxiety were evaluated by self-reported questionnaires. Among 1421 participants, 80% of adolescents lived in rural area and more than four fifths of participants had siblings. The parent's education level of participants was mostly middle school and below. The prevalence of participating in sport more than 3 times per week was only 7%. More than one-third of adolescents reported they never engaged in sport and 36.5% of adolescents took part in sport 1–3 times per month. In comparison with participants who never engaging in sport participation, those who engaging in one to three time/month (OR = 0.71%, 95% CI: 0.54–0.93) and more than 3 times/week (OR = 0.50%, 95% CI: 0.32–0.79) were less likely to report severe depression symptoms. Compared with participants who never had sport participation, only those counterparts who engaged in sport more than 3 times/week had lower odds for severe anxiety (OR = 0.46%, 95% CI: 0.29–0.73). These results indicated that engaging in sport participation was negatively associated with depression and anxiety. There is an urgent need to improve the level of sport participation for Chinese minority adolescents, and to explore the mechanism of exercise under hypoxia on mental health.

KEYWORDS

Depression; anxiety; adolescent; sport; physical activity

1 Introduction

Data from the World Health Organization has indicated that the global prevalence of 10-to-19-year-old adolescents experiencing mental health problems (e.g., anxiety and depressive symptoms) has reached a maximum of 20 [1]. Such figure/number was significantly larger among Chinese adolescents aged between 13 and 18, with the estimated prevalence of 27% [2], which may be attributed to high academic pressures and parental expectations [3]. Furthermore, depression and anxiety, as the most commonly



identified mental health conditions, have become the global burden of illness and injury among 10-to-19-year-old children and adolescents [1]. Roughly half of this age group with anxiety or/and depressive symptom are not timely detected and treated, which cause both physical impairment and long-lasting mental health issues during adulthood. Likewise, school-aged adolescents were reported to associate with poor academic performance [4], leading to limited employment opportunity [5]. Thus, early prevention of these two intertwined internalizing problems requires further investigations.

Neurobiological mechanism of depression and anxiety has been extensively examined, but its etiology still remains largely unknown. Except for great effort in life science, researchers from the field of physical activity epidemiology have also started to explore associations of physical activity with anxiety and depressive symptoms across different age groups. Accumulating evidence indicate that low-to-moderate intensity of physical activity was linked to reduced level of anxiety and depressive symptoms. For instance, Biddle et al. found that physically active children and adolescents seem less likely to suffer from mental health problems in a recent review of reviews on physical activity and mental wellbeing [6]. Although the positive effect of physical activity on mental health had been identified, majority of previous studies on this topic focused on non-minority group. To this end, researchers should pay greater attention to this unique group, for example, adolescents living in high altitude where they are less likely to engage in physical activity (called sport participation or sport club) during hypoxia. Furthermore, frequency of sport participation or engaging in physical activity was reported to associate with these mental health outcomes regardless of its exercise intensity [7,8]. Against this background, the aim of this study was to investigate the associations of sport participation with anxiety and depressive symptoms among Chinese minority adolescents living in Tibet, China.

2 Method

2.1 Study Design and Participants

This cross-sectional survey study aimed to investigate health behaviors and their potential associations with self-reported health outcomes in Tibetan children and adolescents. We aimed to collect information of data on sociodemographic characteristics (e.g., sex, grade, perceived family affluence), academia related outcomes (e.g., achievement and stress), movement behaviors (e.g., physical activity, sport participation, sleep duration), self-reported fitness, sleep quality, depression symptoms and anxiety, substance use (e.g., smoking) as well as dietary habits. All the measures were well-accepted questionnaire or scale. To recruit study sample, with the help of bureau of education in Shigatse of Tibet Autonomous Region in China, we contacted four schools (two primary schools and two middle schools). All the students in the four schools were invited to participated in this survey study voluntarily. From April to June 2021, 1452 (Grades 4–9, 9–16 years old) students with a mean age of 13.46 years old ($SD = 1.41$). completed the online survey, of whom 1421 (response rate = 97.9%) participants provided valid data for this current study. The reasons for 31 students did not provide valid data were: 1) fifteen students did not know their father or mother's education level and they could not get this information when completing the survey; 2) nine students did not fully completed the nine- item Patient Health Questionnaire (PHQ-9); and 3) seven students did not fully completed the seven- item Generalized Anxiety Disorder Scale (GAD-7). This study was approved by Research Ethics Board in Shanghai University of Sport (102772021RT071).

2.2 Measures

2.2.1 Sport Participation

The frequency of sport participation was self-reported using the item: "Have you participated in sports teams or sports clubs in the past 12 months? Response options were 1 (never), 2 (one to three times per month), 3 (one to two times per week), or 4 (more than three times per week). This item has been adopted in previous research on adolescents.

2.2.2 Depression Symptoms

The nine-item Patient Health Questionnaire (PHQ-9) was used to measure the presence and severity of depression symptoms [9]. The PHQ-9 assesses the frequency of nine depression symptoms in the past 2 weeks, with items rated on a 4-point Likert scale from “not at all” (coded as 0) to “nearly every day” (coded as 3). The responses to each item are summed to obtain a total score ranging from 0 to 27, with higher scores indicating more severe depression symptoms. According to the recommendations [9], the severity of depression symptoms could be classified as follows: normal (scores of 0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). The Chinese version of the PHQ-9 has demonstrated good psychometric properties among adolescents [10,11], and the Cronbach alpha of PHQ-9 in the present study was 0.91.

2.2.3 Anxiety Symptoms

Anxiety symptoms were measured using the seven-item Generalized Anxiety Disorder Scale (GAD-7), with items rated on a 4-point Likert Scale ranging from “not at all” (coded as “0” to “nearly every day” (coded as 3). An overall score of GAD-7 was calculated by summing the responses from each item, giving a possible range of 0 to 21. Higher scores represent a higher level of anxiety symptoms. The scale has good validity and reliability among Chinese populations according to previous studies [12,13], and the Cronbach alpha of GAD-7 in the current study was 0.90.

2.2.4 Sociodemographic Variables

Following sociodemographic variables were collected: grade (4/5/6/7/8/9), gender (boy/girl), residence (rural/sub-urban/urban), whether having siblings (none/one or more), parents' educational level (middle school and below/high school or occupational school/university or college/master and above/unknown), whether living with parents (yes/no). This information was collected by a self-reported questionnaire.

2.3 Data Analyses

Descriptive analyses were conducted to calculate the basic characteristics of participants by frequency (n) and percentage (%). Multivariate logistic regression models were used to examine the associations between the frequency of sport participation with the severity of depression and anxiety symptoms. A value of $p < 0.05$ (two-tailed) was considered statistically significant. All data analyses were performed using the SPSS software.

3 Results

Table 1 presents the sample characteristics of this study. Among 1421 participants (52.10% girls, Grades 4–9), 81.9% of adolescents lived in rural area and 83% of them had siblings. As for parents' education level, most of participants' father or mother possessed education level of middle school and below. Approximately 90% of adolescents lived with their parents. Only 7% of study sample reported more than 3 times per week for sport participation.

The results for the association between sport participant and depression symptoms are showed in Table 2. Compared with adolescents who never had sport participation, the counterparts who had sport participation 1–3 times/month (OR = 0.71%, 95% CI: 0.54–0.93) and more than 3 times/week (OR = 0.50%, 95% CI: 0.32–0.79) were less likely to reported severe depression symptoms. However, adolescents engaged in 1–2 times/week was not significantly associated with depression symptoms.

Table 3 reveals the results for the association between sport participant and anxiety. Compared with participants with never had sport participation, only those adolescents who had sport participation more than 3 times showed lower odds for severe anxiety (OR = 0.46%, 95% CI: 0.29–0.73). Sport participations for 1–3 times/month and 1–2 times/week were not associated with anxiety.

Table 1: Study sample characteristics

	n	%
Grade		
4	144	10.10
5	178	12.50
6	237	16.70
7	276	19.40
8	345	24.30
9	241	17.00
Sex		
Boy	681	47.90
Girl	740	52.10
Mean age \pm SD	13.46 \pm 1.41 years old	
Residence		
Rural	1164	81.90
Sub-urban	156	11.00
Urban	101	7.10
Siblings		
None	241	17.00
One or more	1180	83.00
Father Educational Level		
Middle school and below	888	62.50
High school or occupational school	79	5.60
University or college	138	9.70
Master and above	19	1.30
Unknow	297	20.90
Mother Educational Level		
Middle school and below	812	57.10
High school or occupational school	56	3.90
University or college	109	7.70
Master and above	18	1.30
Unknow	426	30.00
Living with your parents		
Yes	1274	89.70
no	147	10.30

(Continued)

Table 1 (continued)			
Father Educational Level			
Sport participation			
Never	459	32.30	
1–3 times per month	518	36.50	
1–3 times per week	344	24.20	
More than 3 times per week	100	7.00	
Depression symptoms			
Normal	926	65.20	
Mild	306	21.50	
Moderate	118	8.30	
Moderately severe	61	4.30	
Severe	10	0.70	
Total scores (mean \pm SD)	4.16	4.94	
Anxiety			
Normal	1015	71.40	
Mild	280	19.70	
Moderate	110	7.70	
Severe	16	1.10	
Total scores (mean \pm SD)	3.16	3.94	

Table 2: Association between sport participation and depression symptoms

Depression symptoms				
Sport participation	<i>p</i>	OR	95% CI	
More than 3 times/week	0.003	0.50	0.32	0.79
One to two times/week	0.541	0.91	0.67	1.24
One to three times/month	0.012	0.71	0.54	0.93
Never		Ref		

Table 3: Association between sport participation and anxiety

Anxiety				
Sport participation	<i>p</i>	OR	95% CI	
More than 3 times/week	0.001	0.46	0.29	0.73
One to two times/week	0.948	1.01	0.72	1.41
One to three times/month	0.184	0.82	0.61	1.10
Never		Ref		

Note: OR: odds ratio; CI: confidence interval; Ref: reference group.

4 Discussion

This cross-sectional study aimed to investigate the association between sport participation and mental health among Chinese minority adolescents in Tibet. The results showed significantly negative associations of sport participation with depression and anxiety.

A growing body of evidence is suggesting that engaging in physical activity is linked to depression in adults [14–16]. It also found a correlation between exercise and depression in adolescents [17,18]. The relationship between sport participation and mental health among adolescents is complex, and the relationship may vary by factors such as sport type and level. Sport participation as a form of physical activity has been shown to reduce psychological issues [19–21]. A previous study has investigated the effectiveness of sport participation on declining depression in 291 Chinese college students, showing negative association between high level of sport participation and declined depression [22]. The adolescents in our study were from Tibetan minority, which is located at a higher altitude over 3500 m, compared to participants in previous studies who were recruited from low altitude areas. The living environment in high-altitude area is characterized by relative low population density, and oxygen thin [23]. Therefore, the Tibetan adolescents commonly have social interaction or sports activities in places where the school has a large population. At the same time, sport participation may offer opportunities to connect with each other, and this positive sport experience may also improve their social acceptance and alleviate their body dissatisfaction. In addition, a recent study documented that engaging in exercise under hypoxia can improve mental health [24]. Thereby, in the present study, actively engaging in sport participation was found to reduce the risk of depression in adolescents of Tibetan minority.

Anxiety has been shown to be associated with depression [25,26], and is primary concern for adolescents [27]. There are less studies on investigating the association between physical activity and anxiety, compared to the extensive researches on the physical activity and depression. Our finding is consistent with previous studies [18,28,29], which have shown that physical activity contributes to reduce anxiety in adolescents. The reason why the exercise under hypoxia reduces anxiety is unclear. However, a previous study showed a positive association between hypoxia and anxiety [30]. It is probably that the mitochondrial dysfunction caused by the hypoxia plays an important role in the relationship between altitude and mental health [31] because exercise has been documented a positive effect on mitochondrial function, thereby anxiety can be improved [32]. Therefore, it is believed that the adolescents in our study engaged in more sport participation had a significant reduction of anxiety.

The adolescents of Tibetan minority in Western China is living in higher altitude of over 3500 m. This is one of the poorest areas in China. Tibetans here are one of the two largest groups of plateau humans around the world, living at the highest altitudes. In addition, it is of great significance to investigate the physical and mental health of plateau adolescents based on the narrow geographic range and limited available resources (e.g., medical aid) compared with the situation of the entire China. Therefore, investigating the mental problems of the Tibetan adolescents is necessary.

Sport participation has been beneficially related to various health outcomes [20,33,34], and our findings suggest a deep focus on strategies to prevent mental problems. In Tibetan area, this finding is useful information for the prevention of mental problems based on the availability and ease of participation in sports. It requires schools and governments to formulate sports activities policies and programs in various aspects to encourage students to actively participate in sports. In addition, investigating the mechanism about exercise under hypoxia on mental health is recommended.

Nevertheless, there are several limitations to be considered. First, it does not infer causality due to the cross-sectional study design in our study. Second, self-report questionnaire was used to collect all variables. Subjective factors may lead to biased results. Third, the intensity of sport participation did not monitor, it cannot examine the influence of exercise intensity on mental health in adolescents.

5 Conclusion

In general, our study indicated that engaging in sport participation was negatively associated with depression and anxiety among Chinese minority adolescents in Tibetan. There is an urgent need to improve the level of sport participation for Chinese minority adolescents, and to explore the mechanism of exercise under hypoxia on mental health.

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Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

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