Associations between depression risk, bullying and current smoking among Chinese adolescents: Modulated by gender

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ABSTRACT

This school-based study aimed to investigate the prevalence of being at risk for depression, bullying behavior, and current smoking among Chinese adolescents in order to explore gender differences in the vulnerability of adolescents with these behaviors to develop a smoking habit. A total of 35,893 high school students sampled from high schools in eighteen cities in China participated in the study from 2011 to 2012. Overall, the prevalence of current smoking was estimated at 6.4%. In total, 1.7% (618) of the participants admitted to bullying others, 5.8% (2071) reported being bullied, 3.5% (1269) were involved in both bullying others and being bullied, and 5.6% (2017) were at high risk for depression. Logistic regression analysis indicated that among girls, with high depression risk, bullying others, being bullied, and both bullying others and being bullied were independently and positively associated with current smoking habits, while the final results among boys showed that bullying others and both bullying others and being bullied were independently associated with an increased risk of current smoking. School-based prevention programs are highly recommended, and we should focus on high-risk students, particularly girls with high risk of depression or involved in school bullying and boys who are involved in school bullying.

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1. Introduction

Adolescence, often described as occurring between 10 and 19 years of age, is a period filled with immense behavioral, psychological and social changes and challenges (Crockett and Beal, 2012). Among adolescents, cigarette smoking is a common behavior in modern society. A prior meta-analysis illustrates that there has been a rapid increase in smoking among adolescents in China since 1996–2000, and a total of 11.18 (95% CI: 10.87–12.06) million adolescents are current smokers (Han and Chen, 2015). However, this behavior should be prevented because it inhibits an individual's growth and maturation (Newcomb and Bentler, 1989). Smoking is estimated to cause approximately 42% of chronic respiratory diseases and approximately 10% of cardiovascular diseases (Alwan et al., 2014), and one study in the United States predicts that approximately 33% of youths who smoke will die

prematurely from smoking (Arday et al., 1994). Furthermore, the high and growing level of current smoking among Chinese adolescents also could lead to a huge economic and social burden for families and communities.

Prior studies have demonstrated that emotional and behavioral factors are associated with cigarette smoking (Patton et al., 1998; Maes et al., 2004); this paper examines gender-related variation in the relationships between depression risk, bullying and current smoking habits.

Depression is one of the most consistent risk factors implicated in smoking behavior. In longitudinal investigations and cross-sectional studies, both depressive symptoms (Nezami et al., 2005; Arnold et al., 2014), as well as a diagnosis of major depression (Munafo et al., 2008; Chaiton et al., 2009), have been shown to be associated with smoking among adolescents. Previous studies have also reported the role of depression (either through causal or shared effects) in elevating the probability of smoking (i.e. increasing the likelihood of initiating and/or influencing the number of cigarettes) (Pomerleau, 1995). Additionally, in 2008, Dierker et al. (2015) reported that depression is an earmark for nicotine dependence symptoms. Furthermore, in 2013, Nunes et al. (2013) demonstrated that nicotine dependence and depression had

overlapping neurobiological underpinnings, and it was possible that the emergence of one type of symptoms involved a functional recalibration of the central nervous system (CNS), which triggered the emergence of the other symptoms. Building on the association between depression and smoking, other studies have hypothesized that depressed persons may use substances (e.g., alcohol and cigarette) to cope with the depression mood (Holahan et al., 2003; Kapson and Haaga, 2010). For example, a depressed adolescent may smoke heavily to cope with unpleasant feelings. The relationship between depression and smoking is complex. Moreover, we found that gender may play a role in this relationship, and this relationship seemed to be stronger in female adolescents than males (Needham, 2007; Wu et al., 2008). Although boys were generally thought to more likely be current smokers than girls (Arday et al., 1994), Acierno's research in the United States found that depression was a risk factor for smoking among female but not males (Acierno et al., 2000). Similarly, another study of U.S. adolescents in 2010 also suggested that depression had a strong association with substance use only in females (Luk et al., 2010).

Bullying (i.e., bullying others, being bullied, and both bullying others and being bullied) includes verbal or written name-calling, teasing, threats, and social exclusion, as well as hitting, kicking, or other violent bodily contact (Espelage et al., 2001). Researchers have reported that involvement in bullying is a common problem among adolescents (Nansel et al., 2001). Many studies found that bullying is associated with smoking among adolescents (Weiss et al., 2005; Timmermans et al., 2008). In Italy, a report using data from the 2006 Health Behavior in School-aged Children survey (HBSC) showed that victims, and particularly bullies and bully victims (those involved in both bullying others and being bullied), were at increased risk of smoking compared to their completely uninvolved peers (Vieno et al., 2011). A previous cross-sectional study using data from the 2003 Ontario Student Drug Use Survey (OSDUS) maintained that smoking may be an indicator for identifying bullies. The researchers suggested that a possible explanation for the positive association between bullying and smoking may be related to bully's desire to gain social status and to be perceived as cool and attractive (Morris et al., 2006). However, a study from the United States reported that bully victims had higher rates of smoking than other students (Schwartz, 2000), and similar studies reported that bully victims may be particularly at risk for smoking because of their peer rejection and negative moods. Further, they may use smoking to cope with victimization and depression (Kaukiainen et al., 2002; Unger et al., 2003). These variations in the reported associations between bullying behavior and smoking might be caused by differences in the measurement methods, statistical analyses, and cultural contexts. There have been no consistent results indicating the role of gender in the relationship between bullying and smoking. A study that used data from the 2003 OSDUS found that gender had a modifying effect on the relationship between bullying and smoking (Morris et al., 2006), but the 2001/2002 HBSC study did not observe any significant effect of gender on the association between bullying and smoking (Currie et al., 2004).

As previously mentioned, adolescents with high risk of depression and those who are involved in school bullying are particularly vulnerable to smoking (Kaukiainen et al., 2002; Weiss et al., 2005). Notably, prior studies have demonstrated a strong association between bullying and depression risk (Fitzpatrick et al., 2010; Kaltiala-Heino and Frojd, 2011). Therefore, controlling for bullying is essential to determine the unique impact of depression risk on smoking and vice versa. Most previous studies exploring the influence of depression risk on smoking failed to consider the effects of bullying (Weiss et al., 2005; Wu et al., 2008), and researches studying the association between bullying and smoking also did not consider the effect of depression risk

(Morris et al., 2006; Timmermans et al., 2008; Vieno et al., 2011).

There is limited research examining how being at high risk of depression and involvement in school bullying correlate with smoking in adolescents, and few studies have assessed the effect of gender on these conditions. Therefore, our study aimed to investigate the prevalence of being at high risk for depression, bullying behaviors, and current smoking among Chinese adolescents in order to explore the associations between these behaviors and how they are influenced by gender.

2. Methods

2.1. Study design and participants

A school-based, cross-sectional study with a multistage, stratified cluster, random sampling method was used to obtain a representative sample of Chinese adolescents. In stage 1, we selected three large provinces (Guangdong, Fujian, and Chongqing) to represent the different regional features of southern China. Then we divided each province into three economic stratifications by per capita GDP (high-level, mid-level, and low-level) and then selected two representative cities (or primary sampling units) from each stratification by simple randomization. In total, eighteen representative cities were sampled. In stage 2, schools (or secondary sampling units) in each representative city were divided into three categories based on the education quality: key junior/senior high schools, regular junior/senior high schools, and vocational high schools. Two key junior high schools, two key senior high schools, two regular junior high schools, two regular senior high schools, and two vocational high schools were randomly selected from each representative city. In stage 3, two classes (or the minimum sampling units) were randomly selected from each grade within the selected schools. All available students in the selected classes were invited to participate in our study. A total of 37,702 students were invited to participate in the study, and 35,893 student questionnaires were completed and qualified for our survey. The response rate was 95.2%.

2.2. Data collection

To protect the privacy of the students, anonymity of the self-reported questionnaires was guaranteed, and the questionnaires were administered by research assistants in the classrooms without the presence of teachers (to avoid any potential information bias). All data were collected from 2011 to 2012.

2.3. Ethical statement

The study was approved by the Sun Yat-Sen University, School of Public Health Institutional Review Board. All the participants were fully informed of the purpose of the survey, and they were invited to voluntarily participate. Written consent letters were obtained from each participating student or from one of the student's parents.

2.4. Measures

2.4.1. Dependent variable
2.4.1.1. Current cigarette smoking. The question 'During the past 30 days, on how many days did you smoke cigarettes?' was used to determine current smoking status. Students who selected answers indicating 1 or more days were classified as current smokers. (Acierno et al., 2000; Kandra et al., 2013a, b; Kann et al., 2014).