



Smoking and its risk factors in Chinese elementary and middle school students: A nationally representative sample study



Xinghui Zhang^a, Yajun Li^b, Qin Zhang^c, Furong Lu^d, Yun Wang^{a,*}

^a National Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, Beijing, China

^b Hongkou Teachers Training College of Shanghai, Shanghai, China

^c School of Political Science and Public Administration, University of Electronic Science and Technology of China, China

^d School of Educational Science, Shanxi University, Taiyuan, China

HIGHLIGHTS

- The first nationally representative sample of elementary and middle school students.
- Investigated the prevalence of smoking among different types of students.
- Examined the risk factors from family and school for smoking and smoking frequency.
- These findings could inform smoking prevention and cessation programs

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ABSTRACT

Objective: The purpose of this study was to examine the prevalence of smoking in a nationally representative sample of Chinese elementary and middle school students and to investigate its risk factors from families and schools. **Method:** The data were from the National Children's Study of China (NCSC), in which 24,013 fourth- to ninth-grade students were recruited from 100 counties in 31 provinces in China. Chi-square tests and one-way ANOVAs were used to analyze the relationships between smoking and the risk factors. Logistic regressions were used to calculate odds ratios.

Results: The prevalence of ever smokers and current smokers were 19.0% and 5.4%. Focusing on current smokers, boys, middle school students, rural students, boarding students, non-only children and those owning parents with low educational levels reported smoking significantly more than girls, elementary school students, urban students, non-boarding students, only children and those owning parents with high educational levels. Lower trust and support from teachers and higher parent–child conflict positively predicted both smoking and smoking frequency. Lower trust and support from classmates was associated with higher possibility of smoking. However, higher trust and support from classmates was associated with higher smoking frequency. Teacher smoking and friend smoking were only predictive of smoking, but not of smoking frequency.

Conclusions: Boys, middle school students, rural students, boarding students, non-only children and those owning parents with low educational levels need special attention. The most risk factors for smoking and smoking frequency were lower trust and support from teachers and higher parent–child conflict.

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1. Introduction

Tobacco use is a risk factor for six of the eight leading causes of death in the world (WHO, 2008). Approximately 80% of smokers were living in developing countries (Boutayeb, 2006). As the largest tobacco producing and consuming country (Mackay, Eriksen, & Shafey, 2006), China has the largest smoking problem on earth. Nearly 30% of the

world's smokers lived in China (WHO, 2008). It is worth noting that adolescence is a major risk period for developing tobacco dependence (O'Loughlin, Paradis, Renaud, & Gomez, 1998) and the average age of smoking initiation in China is rapidly decreasing (Yang et al., 1999). A study focusing on 12–17 year old students in Anhui Province found that the percentages of ever smokers and current smokers were 19.7% and 10.6% (Qing et al., 2011). The rates of ever smokers and current smokers of elementary and middle school students in Beijing were 17.02% and 7.05% (Guo, Deng, & Tao, 2009). Zhang et al. (2000) indicated that among 10–19 year old students from Henan, 16.9% of boys and 4.0% of girls had ever tried smoking and that 15.1% of boys and 1.4% of girls were current smokers. In Wuhan, the smoking prevalence in the

* Corresponding author at: National Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, No. 19 Xijiekouwai Street, Haidian District, Beijing 100875, China. Tel./fax: +86 1058807506.

E-mail address: wangyun@bnu.edu.cn (Y. Wang).

30 days prior to data collection was 16% among boys and 4% among girls in grades 7–9 (Unger et al., 2001).

Smoking can greatly influence the physical and psychological development of adolescents. The probability of asthma and cardiovascular diseases is higher in regular adolescent smokers than that in non-smokers (Flouris, Fought, & Klentrou, 2008; Gilliland et al., 2006). Smoking is also related to retardation in physical development (Stice & Martinez, 2005) and adolescents who smoke are more likely to use illicit drugs and alcohol and to be involved in deviant behaviors (Newcomb, Maddahian, & Bentler, 1986). Hence, it is critical to identify the risk factors related to smoking in adolescents.

Some researches found that peer smoking and parent smoking were strongly associated with smoking among 10–18 year old adolescents (Khuder, Price, Jordan, Khuder, & Silvestri, 2008; Rudatsikira, Muula, & Siziya, 2009; Villanti, Boulay, & Juon, 2011). The smoking habit of teachers was also a strong predictor of adolescent smoking (Zhang, Wang, Zhao, & Vartiainen, 2000). Some researchers indicated that the bad relations with mothers and teachers could predict the occurrence of smoking behavior (Zambon, Lemma, Borraccino, Dalmasso, & Cavallo, 2006).

Although there have been some correlational researches regarding smoking, two limitations still exist. First, to date, there is no nationally representative study on the prevalence and correlation of adolescent smoking in China. According to China's Development Index, there are great differences in the level of development among regions (China, 2008) and the efforts of tobacco control also vary between regions (Li, Jiang, & Yang, 2007). Hence, the result of one region may not be generalized to the whole nation. Second, although several variables that influence the likelihood of smoking in the adolescent population have been studied, the effects of these variables on smoking frequency are not well understood. Therefore, the aim of the present study was to investigate the prevalence of smoking and the risk factors for smoking and smoking frequency from families and schools in a nationally representative sample of Chinese elementary and middle school students. These findings can help educational agencies design programs and policies for preventing smoking.

2. Methods

2.1. Participants

The data analyzed in this study were from the National Children's Study of China (NCSC) (Dong & Lin, 2011a). The NCSC, which involved a nationally representative school-based sample in China, was conducted by the National Key Laboratory of Cognitive Neuroscience and Learning in Beijing Normal University. It was designed to examine the psychological development of students and the relationships with family, school, and individual factors. The NCSC used multistage, stratified, and unequal probability methods to draw the sample in each of the 31 provinces in the Chinese mainland. Additional details about sampling can be found in the technical report of the NCSC (Dong & Lin, 2011b). The research program was approved by the Institutional Review Board of the National Key Laboratory of Cognitive Neuroscience and Learning of Beijing Normal University. The data were collected during the spring semester of 2009.

The data in the present study included 24,013 participants in fourth to ninth grade, who were recruited from 100 counties among 31 provinces in China. The mean age was 12.84 years old ($SD = 1.78$). Among these participants, 53.3% were boys and 46.7% were girls. Elementary and middle school students took up 50.1% and 49.9%.

2.2. Measurements

2.2.1. Demographics

Demographic information included gender, grade (elementary school students in grades 4 to 6 and middle school students in grades

7 to 9), location of school (urban or rural), school boarding and if they were the only child. In addition, the higher educational level of parents included 3 groups: low (junior high school and these lower), high (undergraduate course and higher), and medium (all others).

2.2.2. Smoking behaviors

Three questions about the participants' smoking behaviors were asked: "Have you ever tried smoking, including just one puff? (Yes/No)", "In the past 30 days, have you ever smoked? (Yes/No)", and "In the past 30 days, how many days you have smoked? (1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–30 days)".

We classified students who had ever tried smoking, even just only one puff, as "ever smokers" and those who had smoked in the past 30 days as "current smokers", as previous researches described (Warren et al., 2000, 2008). In the present study, the core of analysis and discussion is "current smokers". Besides, the second and third items were aimed to investigate "smoking" and "smoking frequency".

2.2.3. Family and school related factors

2.2.3.1. Smoking environment. Three items were asked about the smoking environment that the participants lived in: "Do your parents smoke? (Yes/No)", "Do your teachers smoke? (Yes/No)", and "Do your friends smoke? (Yes/No)".

2.2.3.2. Social trust and support. The questionnaire was designed by NCSC to examine the social support perceived by participants. It covered three dimensions, including the trust and support from parents (6 items) (e.g. parents trust my ability), teachers (5 items) (e.g. teachers often smile to me) and classmates (7 items) (e.g. classmates consider me smart). The Cronbach's α was 0.86, 0.83 and 0.85, respectively. The higher the scores, the higher levels of trust and support from parents, teachers and classmates.

2.2.3.3. Parent–child relationship. The questionnaire was comprised of six items, including "parent–child satisfaction" and "parent–child conflict". For "satisfaction", the participants were asked "Are you satisfied with the relationship with your parents", "Are you happy when you stay with your parents", and "Are the relationships with your parents good for you". For "conflict", participants were asked "Do you have different opinions from or quarrel with your parents", "Do you argue with your parents or criticize each other", and "Do you debate with your parents". The Cronbach's α was 0.80 and 0.74, respectively. The higher the scores, the higher satisfaction and conflict with parents.

2.3. Statistical analysis

In the NCSC, each case was assigned a weight that stood for the number of individuals in the population that each case represented. These weights were used to produce an unbiased estimate of the prevalence of smoking in Chinese elementary and middle school students. Chi-square tests and one-way ANOVAs were used to detect the associations between smoking and family and school factors. Logistic regressions were used to calculate odds ratios. All statistical analyses were conducted using SPSS 20.0.

3. Results

3.1. The prevalence of smoking

In China, 19.0% of elementary and middle school students had ever tried smoking and 5.4% were current smokers.

The following analyses focus only on current smokers. The rate of smoking was significantly higher among boys (9.2%) than girls (1.1%) ($\chi^2 = 760.41, p < 0.001$). The percentage of smokers in elementary school students was 2.8%, which was significantly lower than that in

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