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Effects of pubertal timing on alcohol and tobacco use in the early adulthood: A longitudinal cohort study in Taiwan

Meng-Che Tsai [a], Yi-Ping Hsieh [b], Carol Strong [c], Chung-Ying Lin [c,*]

[a] Department of Pediatrics, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
[b] Center of Teacher Education & Institute of Education, College of Social Science, National Cheng Kung University, Tainan, Taiwan
[c] Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan

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ABSTRACT

We aimed to examine the effects of pubertal timing on adolescents' alcohol and tobacco use from late adolescence to young adulthood. In addition, we separately explored associative factors of the use of these substances stratified by pubertal timings. A longitudinal cohort of 7th- and 9th-grade students was recruited in Taiwan. Pubertal timing was classified according to the Pubertal Developmental Scale. Effects of pubertal timing on self-reported drinking and smoking at age 20 were evaluated using generalized estimating equation analysis. Furthermore, we assessed the predictive roles of parental monitoring, parent–child relationships, peer influence, and school adhesion among participants, stratified by pubertal timing using multiple logistic regression analysis. A survey of 2290 participants was analyzed, with 51.2% being female. The smoking rate is 19.2% (adjusted odds ratio [OR] 1.43, 95% confidence interval [CI] 1.03–2.00) and the alcohol drinking rate is 41.6% (adjusted OR 1.34, 95% CI 1.07–1.69) for early maturing adolescents as compared to 12.3% and 41.6% respectively for on-time peers. A satisfactory parent–child relationship is a protective factor and strict parental monitoring is a risk factor for future tobacco and alcohol use in logistic regression analyses. Early maturation confers risk for cigarette smoking and alcohol consumption in young adulthood. Health professionals and parents should be advised of the potential associative factors with future substance use among adolescents with different maturation tempo. Emphasis could be placed on promoting positive parenting strategies and intra-familial interactions.

1. Introduction

The onset and tempo of pubertal progression has been extensively implicated in determining health behavior outcomes, such as a link between early maturation and problem behaviors (e.g., alcohol misuse and cigarette smoking) (Marceau, Ram, Houts, Grimm, & Susman, 2011; Waylen & Wolke, 2004). The *maturation-deviance hypothesis* proposes that adolescents who are deviated from developmental norms experience marked stress, and this results in behavior problems (Tschann et al., 1994; Williams & Dunlop, 1999). The *developmental readiness hypothesis* alternatively supposes that early maturation confers risks for behavioral problems because of inadequate skills for coping with challenges inherent in physical and

* Corresponding author at: Department of Public Health, College of Medicine, National Cheng Kung University, 1, University Road, Tainan 70101, Taiwan. Tel.: +886 6 2353535x5869; fax: +886 6 2359033.
E-mail address: cylin36933@gmail.com (C.-Y. Lin).

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psychosocial transformations (Ge, Conger, & Elder, 2001; Mendle, Turkheimer, & Emery, 2007). Also, worthy of note is that individual biological predispositions and hormonal profiles may interact with social and environmental factors, leading to different behavioral outcomes (de Water, Braams, Crone, & Peper, 2013). Because adolescence is an essential developmental phase within a life course perspective, it is important to investigate the temporal effect of pubertal progression on developmental trajectories.

Despite substantial evidence on the association between early pubertal timing and initiating and accelerating substance use, particularly in early and middle adolescence, the longitudinal impact of pubertal timing remains controversial when addressed at an older age (Downing & Bellis, 2009; Ge et al., 2006; Lanza & Collins, 2002; Modecki, Barber, & Eccles, 2014). In a cross-sectional study of 16- to 20-year-old Swiss adolescents, those with early pubertal timing reported engaging in some health-compromising behaviors, including drunkenness and smoking, at a significantly higher rate (Michaud, Suris, & Deppen, 2006). This stands in contrast to another study reporting no association between age at menarche and substance use among 14–15 year-old Canadian adolescent girls, after adjusting for the effects of school performance and family relationships (Al-Sahab, Ardern, Hamadeh, & Tammim, 2012). Some longitudinal studies have followed their participants across early and/or middle adolescence, and further explored the developmental pathway linking pubertal timing and substance use. For example, Westling, Andrews, Hampson, and Peterson (2008) found that affiliation with deviant peers and parental monitoring would mediate or moderate the impact of pubertal timing. Moreover, sensation seeking and impulsivity, inherent to adolescence, were shown to partially explain the relationship between pubertal timing and substance use, and these factors were also shown to become more salient predictors of smoking and drinking in late adolescence (Castellanos-Ryan, Parent, Vitaro, Tremblay, & Séguin, 2013; Kong et al., 2013). Therefore, it is unclear whether early maturing adolescents could outgrow these adverse impacts as their emotional and cognitive development matures in young adulthood; so we suggested further research to examine the issue across the whole transition time.

The impact of pubertal timing on adolescent health behaviors is likely to differ according to social contexts. Current knowledge of the link between pubertal timing and health behaviors is derived mainly from research conducted in the US and Europe. Very little is known about pubertal course and health-compromising behaviors among East Asian adolescents. In many East Asian countries, where social collectivism and interdependency prevails, adolescents are usually influenced by institutional norms that prohibit deviant behaviors such as drinking and smoking until late adolescence. Epidemiological studies demonstrate a lower prevalence of adolescent alcohol use and cigarette smoking in Taiwan than that found in Western countries, and health-compromising behaviors usually occur from late adolescence to young adulthood (Chen et al., 2008; Wu, Chang, Yen, & Lee, 2007). Despite the enactment of laws regarding child and adolescent protection and welfare, rates of drinking and smoking have been steadily increasing in the past decade (Chang et al., 2011; Chuang & Huang, 2012; Wang et al., 2013). These behaviors are perceived preferentially as socialization norms that eventually confer the status of adulthood. As a secular trend toward the early onset of pubertal timing is a common observation in many countries, the gap between physical maturity and the full social status of adulthood is constantly lengthening (Gluckman & Hanson, 2006). The role of pubertal timing is scarcely mentioned in the analysis of factors associated with adolescent substance use in Taiwan. Knowing the relevant predicting factors is imperative for identifying the vulnerable youth and differentially tailoring any preventive interventions to the social context.

Using longitudinal data from the Taiwan Youth Project (TYP), we investigated the relationship between pubertal timing and adolescent alcohol/tobacco use through late adolescence into young adulthood. We also examined the interaction between pubertal timing and other contextual factors (viz., peer influence, self-esteem, parental monitoring, parent–child relationship, and school adhesion). We hypothesized that early maturation confers risks for alcohol/tobacco use in the young adulthood. In addition, pubertal timing may moderate the predictive effects of personal factors associated with substance use.

2. Methods

2.1. Study population

Data were from a longitudinal panel study by the TYP, which was launched in 2000 and conducted by the Institute of Sociology, Academia Sinica, Taiwan (Yi, Wu, Chang, & Chang, 2009). Two cohorts of 7th- and 9th-grade students were originally recruited in northern Taiwan (Taipei City, Taipei County, and Yilan County) in 2000, and the same cohorts were surveyed in the following eight years up to 2007. The sampling method was a multistage-stratified and class-clustered selection procedure, stratified by school and class. In total, 81 classes in each grade distributed across 40 schools were chosen. This study used questionnaire-based self-reported assessments taken at the 9th grade as its baseline and annually followed. The final wave of survey was taken at age 20 years and comprised a total of 2290 youths, with 1118 (48.8%) males valid for analysis. The Institutional Review Board of the National Cheng Kung University Hospital approved this study.

2.2. Measures

Alcohol and tobacco uses were assessed at the 10th and 11th grades, and at 20 years of age using the self-reported items: "Have you drunk [alcohol] within a month?" and, "Have you smoked [cigarettes] within a week?" Responses were dichotomized into "Yes" and "No".