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Characteristics of adolescent intermittent and daily smokers ☆

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HIGHLIGHTS

- Despite infrequent smoking, most adolescent ITS reported signs of addiction.
- Adolescent ITS report similar difficulty in quitting smoking as daily smokers.
- Given the risks, we must develop a greater understanding of adolescent ITS.

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ABSTRACT

Introduction: Intermittent smoking is common among adolescent smokers, but little is known about adolescent intermittent smokers (ITS). This study describes a cohort of adolescent ITS and compares them to adolescent daily smokers (DS) for the purpose of providing a more detailed characterization of adolescent ITS, specifically patterns of smoking, level of self-reported addiction, and experience with cessation
Methods: Participants were 124 ITS and 55 DS. ITS were defined as smoking at least monthly but <30 days per month; and DS as smoking daily. Participants completed demographic, smoking and addiction surveys including the HONC and mFTQ.
Results: ITS started smoking at an older age, smoked fewer cigarettes per day and scored significantly lower on addiction scales, but had similar difficulty to DS in quitting smoking with similar numbers of reported quit attempts. These differences remained after adjusting for years of smoking. ITS were more likely to smoke in social situations, while DS were more likely to smoke when angry. Both groups were equally likely to report smoking when drinking alcohol.
Conclusions: We documented significant differences in smoking related behaviors between adolescent ITS and DS. Importantly, we also found that, despite low level infrequent smoking, ITS reported difficulty in quitting smoking. Given the risks from light and intermittent smoking, it is essential that we develop a greater understanding of adolescent ITS, including their difficulty in quitting and the contextual factors influencing their smoking, so that we may develop new targeted interventions.

1. Introduction

Cigarette smoking is most frequently initiated during adolescence (Services, U. S. D. o. H. a. H., 2012). The transition from experimentation with cigarettes to daily or "addicted" smoking is variable but often encompasses a period of non-daily (i.e., intermittent) smoking (Kandel & Chen, 2000). The development of addiction in adolescence remains controversial, with some researchers arguing that addictive smoking is differentiated from experimental or intermittent smoking by the presence of *daily smoking* (Colby, Tiffany, Shiffman, & Niaura, 2000). Others argue that adolescents can become addicted to nicotine even before they begin smoking daily (DiFranza et al., 2011; O'Loughlin et al., 2003). Further complicating the understanding of addiction are findings that, at least among adults, many intermittent smokers (ITS) can go days at a time without smoking (Shiffman et al., 2012), and yet experience great difficulty in quitting smoking, with quit rates similar to those of daily smokers (Tindle & Shiffman, 2011). In fact, this pattern of persistent, intermittent smoking challenges some of the established notions of addiction whereby addicted smokers must smoke throughout the day in order to prevent withdrawal (Benowitz, 2010).

Abbreviations: CPD, cigarettes per day; ITS, intermittent smokers; DS, daily smokers; mFTQ, Modified Fagerström Tolerance Questionnaire; HONC, Hooked on Nicotine Checklist.

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There is a growing literature on the prevalence and significance of ITS in young adult and adult smokers. For a review see Husten, (2009). However, despite the known health-risks posed by intermittent smoking (Schane, Ling, & Glantz, 2010), and the fact *most* adolescent smokers are non-daily smokers (Centers for Disease Control, Prevention, 2013), there is scant research on adolescent ITS. Although it is possible that adolescent ITS may be on a developmental trajectory that will eventually lead to daily smoking, we know from the young adult literature that many ITS smokers will continue to smoke intermittently (Levy, Biener, & Rigotti, 2009). Furthermore, even if some of this group will eventually transition to daily smoking, understanding the current smoking patterns and habits of ITS is important because characterizing their level of addiction, ability to quit, and factors influencing their smoking behaviors can prove useful for the development of prevention and treatment programs specifically targeted towards this important group of adolescent smokers. For example, many cessation programs utilize a paradigm of daily smoking when addressing withdrawal symptoms and craving, an approach which may not be relevant to ITS. In addition, nicotine replacement, a common adjunct for cessation treatment is largely dosed for daily smokers and may not be appropriate for intermittent smoking.

The goal of this analysis was to describe a cohort of adolescent intermittent smokers and compare them to adolescent daily smokers for the purpose of providing a more detailed characterization of intermittent smoking in adolescents. Specifically, we sought to describe patterns of smoking, level of self-reported addiction, and experience with cessation. We also sought to identify contextual factors (e.g., smoking when others are smoking or when stressed) differentiating between ITS and DS to examine the relevance of social and environmental triggers which may drive patterns of smoking in adolescents. Because of the belief that early smoking is mediated by social factors (Landrine, Richardson, Klonoff, & Flay, 1994; O'Neill, Glasgow, & McCaul, 1983), we hypothesize that among adolescents, both DS and ITS will list social situations in their top 3 smoking situations. However, it is expected that the patterns of smoking will be different between the two groups. Specifically, we hypothesize that ITS will smoke proportionally more cigarettes on the weekends, compared to the DS, for whom it is likely that the number of cigarettes smoked is relatively consistent throughout the week. Unlike adult ITS, who have been smoking longer, we also hypothesize that adolescent ITS will report less difficulty with and fewer attempts at cessation than DS.

2. Methods

2.1. Subjects

Two hundred two adolescent smokers aged 13–17 from the San Francisco bay area that smoked at least 1 cigarette per month were recruited as part of an ongoing longitudinal study of adolescent smoking. Adolescents responding to online, school, and clinic-based advertising were screened by telephone. Potential participants needed to be able to attend a 9-hour assessment visit and to be free of chronic diseases. In addition, parental consent was required for participation. Exclusion criteria included using any type of nicotine replacement therapy in the past week and being, or attempting to become, pregnant. Those who met eligibility requirements were invited to complete the study visit. Twenty-three (11.4%) participants did not report smoking in the prior month and were excluded from analysis. The final sample consisted of 129 ITS and 50 DS.

2.2. Informed consent

The research design and procedures were reviewed and approved by the University of California Institutional Review Board. Informed, written assent from the adolescent subject and consent from one parent were obtained for each subject before data collection.

2.3. Definitions

Participants were characterized as ITS if they reported smoking at least monthly, but fewer than 30 days per month. Participants who reported smoking on 30 days per month were classified as daily smokers (DS). Although there is no precise definition of non-daily or intermittent smoking, the most consistent definition seems to be smoking on fewer than 30 of the previous 30 days (DiFranza et al., 2007; Husten, 2009; Lindstrom & Isacsson, 2002). We therefore chose to adopt the above criteria to define our groups so as to parallel those found in other studies.

2.4. Procedures

A full description of the procedures is presented elsewhere (Rubinstein et al., 2013). In short, as part of a larger study of nicotine addiction in adolescents, participants completed detailed surveys that included questions about demographics and smoking behaviors including quit attempts. Participants were asked to report their frequency and quantity of cigarette smoking, and when they first tried smoking. Daily mean cigarettes smoked per day (CPD) were calculated using the mean number of cigarette participants reported smoking on each day of the week during a typical week. Frequency of smoking was determined by asking participants on how many days they smoke out of 30.

Participants were asked to review a list of 20 situations and then indicate the three top situations in which they smoke (e.g., social situations, drinking alcohol or when angry) (Shiffman et al., 2012). Two scales are commonly used to assess nicotine dependence in adolescents. The most commonly used scale is the Modified Fagerström Tolerance Questionnaire (mFTQ) which is derived from the adult Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), and has been validated in adolescents (Prokhorov et al., 2000). The Hooked on Nicotine Questionnaire (HONC) has been conceptualized as a measure of the loss of autonomy over tobacco use (J. R. DiFranza et al., 2002), even early in adolescents' smoking careers. Addiction was thus measured using the mFTQ and the HONC, both of which were scored continuously.

We also utilized the Items to Measure Readiness, Motivation, and Confidence in Ability to Change Smoking Behavior scale (Crittenden, Manfredi, Lacey, Warnecke, & Parsons, 1994). The two questions, "At present, how much do you want to cut down the number of cigarettes you smoke?" and "How much do you want to quit smoking?" were scored on a Likert scale of 1 = "not at all" to 4 = "very." The two questions, "If you wanted to cut down now, how sure are you that you would be able to do it?" and "If you decided to quit smoking completely, how sure are you that you would be able to do it?" were scored on a Likert scale of 1 = "not at all" to 4 = "very much."

2.5. Data analyses

ITS and DS were compared using univariate linear regression (for quantitative outcomes) or logistic regression (for binary outcomes). To account for possible differences in addiction scores between ITS and DS which may be related to race, sex, CPD or the duration of their smoking careers, regression analyses were adjusted for each of these variables. Because the number of cigarettes per day reported by participants was not normally distributed, it was square root transformed. To examine patterns of smoking throughout the week in both groups, we used generalized estimating equations (GEE) to conduct a repeated measures analysis taking into account within-subject correlations. The top three situations identified by the participants as most often