Addictive Behaviors xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Nicotine dependence, internalizing symptoms, mood variability and daily tobacco use among young adult smokers

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HIGHLIGHTS

- Daily patterns of cigarette use and mood in young adult smokers were assessed for 3 weeks.
- Daily positive mood predict quantity of cigarettes smoked.
- Moods might be possible targets for intervention in cigarette use.

ARTICLE INFO

Keywords:
Mood variability
Young adult
Daily tobacco use
Nicotine dependence
Internalizing symptoms

ABSTRACT

Introduction: Cigarette use among young adults continues to rise. As young adults transition to college and assume other adult roles and responsibilities, they are at risk for the development of mental health problems and for the progression of substance use problems. Previous studies suggest that individual differences in negative and positive mood contribute to cigarette use in established college-aged smokers, but less is known whether fluctuations in mood influence daily cigarette use, controlling for trait levels of internalizing symptoms and nicotine dependence.

Methods: Data for this study came from a sample of college students (N = 39, 59% female, mean age 20.4 years) who reported regular cigarette use and participated in a 21-day ecological momentary assessment (EMA) study assessing within-individual variation in cigarette use and mood.

Results: A three-level hierarchical linear model accounting for the structure of 1896 occasions of cigarette use nested within days and individuals indicated that within-individual variability in positive mood was associated with cigarette use at each occasion, after taking into account baseline levels of nicotine dependence and internalizing problems.

Conclusions: Daily shifts in positive moods are importantly associated with consuming cigarettes throughout the day.

1. Introduction

As cigarette smoking continues to be the most common form of tobacco use among young adults and a preventable cause of lung cancer (DHHS, 2014), understanding the factors that give rise to the progression of tobacco cigarette use during young adulthood is a public health priority. The majority of adult smokers begin using cigarettes during adolescence and young adulthood, making these developmental periods quite important in understanding the factors that influence individuals to use cigarettes.

To understand how individuals progress to heavy cigarette use and develop nicotine dependence, it is important to identify the experiences associated with continued use. Individuals differ in how sensitive they are to the effects of nicotine (Pomerleau, Collins, Shiffman, & Pomerleau, 1993). For example, individuals that experience positive sensations upon trying their very first cigarette continue to use regularly (Hirschman, Leventhal, & Glynn, 1984; Zabor et al., 2012) due primarily to the pharmacological effects of nicotine (Subramaniyan & Dani, 2015). Individuals that experience pleasant sensations when smoking their first cigarette develop symptoms of nicotine dependence at a faster rate than those for whom that first cigarette was not pleasant (DiFranza et al., 2004; Pomerleau, Pomerleau, & Namenek, 1998).

While initial experiences in cigarette use are important and can

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http://dx.doi.org/10.1016/j.addbeh.2017.09.004
Received 28 February 2017; Received in revised form 7 September 2017; Accepted 13 September 2017

serve as a proxy for the rewarding effects of nicotine from the moments of initial experimentation, the development of nicotine addiction potentially involves trait-level psychological characteristics as well as momentary experiences during each occasion of using cigarettes. Previous research suggests that cigarette use is determined by multiple factors including various forms of internalizing symptoms. Increases in internalizing (such as symptoms of depression, and anxiety) have been reported in young adulthood, particularly while individuals are transitioning from high school to college and take up other adult roles (Guassi Moreira & Telzer, 2015; Samek, Goodman, Erath, McGue, & Iacono, 2016; Taylor, Doane, & Eisenberg, 2014). Internalizing symptoms have been shown to play an important role in cigarette use among college-aged students (Ameringer & Leventhal, 2010; Kenney & Holahan, 2008). A number of prior studies support the association between internalizing symptoms with cigarette use (Cranford, Eisenberg, & Serras, 2009; Dierker, Avenevoli, Merikangas, Flaherty, & Stolar, 2001; Korhonen et al., 2012) and baseline levels of internalizing symptoms increase the likelihood that adults will continue smoking (Forman-Hoffman et al., 2017; Hagman, Delnevo, Hrywna, & Williams, 2008).

Previous research has indicated that mood is made up of both positive and negative aspects. Enhancing positive mood or reducing negative mood is a common reason to use cigarettes (Baker, Brandon, & Chassin, 2004). In fact, individuals who hold expectancies that using cigarettes will reduce negative mood show faster increases in cigarette use and faster development of nicotine dependence symptoms (Heinz, Kassel, Berbaum, & Mermelstein, 2010). There is further evidence that smokers use cigarettes to dampen the effects of negative mood (Berg et al., 2011; Brown, Carpenter, & Sutfin, 2011; Morrell, Song, & Halpern-Felsher, 2011) and that negative and positive mood are associated with nicotine dependence (McChargue, Cohen, & Cook, 2004; Parrott & Murphy, 2012).

In addition, mood is thought to fluctuate during the course of a day (Stone, Smyth, Pickering, & Schwartz, 1996). Greater variability in mood has been observed among individuals with internalizing disorders such as major depression (Peeters, Berkhof, Delespaul, Rottenberg, & Nicolson, 2006), but is also important for bipolar disorder (Van Rheenen & Rossell, 2013; Wright & Simms, 2016) and other forms of psychopathology (Houben, Van Den Noortgate, & Kuppens, 2015). Some have argued that greater fluctuations in mood are an important clinical feature of various disorders that may reflect a lack of emotional control (Houben et al., 2016).

Daily fluctuations in mood are further associated with different levels of cigarette use, nicotine cravings, and nicotine withdrawal (Weinstein & Mermelstein, 2013). Compared to non-smokers, infrequent smokers exhibit greater variability in positive mood (Pugach, Hedeker, Richmond, Sokolovsky, & Mermelstein, 2014) and variability in negative mood is associated with increased cigarette use (Weinstein, Mermelstein, Shiffman, & Flay, 2008). Further, emerging evidence suggests that as individuals become addicted to cigarettes during late adolescence and young adulthood fluctuations in both positive and negative mood are a result of within-person changes in nicotine withdrawal symptoms (Piasecki, Hedeker, Dierker, & Mermelstein, 2016).

Accurate assessments of phenomena likely to fluctuate on a daily basis should be measured using real time assessment methods. Ecological momentary assessments (EMA) of health behaviors have been shown to provide greater validity than more standard self-report methodologies and have been appearing in clinical settings for some time now (Shiffman, 2014). Studies using the EMA methodology have found that individuals who are depressed experience greater variability in the daily experience of negative emotions (Silk et al., 2011) and that some individuals smoke to reduce negative affect (Shiffman, Kirchner, Ferguson, & Scharf, 2009). Whether variability in negative and positive moods simultaneously contributes to how much young adults smoke has been less explored.

1.1. The present study

Real time assessments of smoking behavior among young adult smokers over the course of several weeks might provide a better understanding of the association between symptoms of psychological distress, mood fluctuations, and number of cigarettes smoked. Given that mood fluctuates on a daily basis (Stone et al., 1996) and that mood includes both negative and positive components (Watson, 1988), the aim of the present study was to examine how negative and positive aspects of mood are associated with the number of cigarettes smoked per occasion among young adult smokers controlling for the influence of internalizing symptoms as well as other important factors.

2. Methods

2.1. Sample and procedure

Participants were recruited from a larger study of college students who were 18 years of age or older at a Mid-Atlantic university; the Spit for Science study (Dick et al., 2014). The Spit for Science, a multi-cohort design study, has been recruiting incoming freshmen each year since 2011 and assesses a number of psychiatric, personality and environmental measures, including substance use. Participants who had taken part in the Spit for Science as freshman or sophomores who reported having smoked in the previous month were contacted and invited to learn more about the present study. Thus, we recruited from a pool of participants in the maintenance stage of smoking (Flay, 1993). To be eligible, participants had to own a smart phone, be current smokers (had smoked in the previous month), and not be using nicotine replacement therapy. Out of the 239 eligible participants from the Spit for Science study, 52 (21.8% response rate) expressed interest in learning more about the present momentary study. Of those who were interested, 39 (75%) enrolled. Informed consent was obtained from each participant prior to beginning the study. Incentives for participating were graduated based on the level of participation and provided at the completion of the study.

2.2. Data collection

Study data were collected and managed using REDCap electronic data capture tools (Harris et al., 2009). At random times during the morning (between 8:00 and 9:30 AM), afternoon (between 11:00 AM and 3:00 PM), and evening (between 7:00 and 9:00 PM) of the 21 day study, participants were sent a text message to their smart phone with a url link to a brief (12 questions) online survey. The surveys had a set of core questions that were common across each of the daily messages; two of the surveys (morning and evening) contained additional questions that were specific to that time of day.

Although participants were compensated at the completion of the three-week study, their compensation depended on completing 90% or more of the prompts. Participants' compensation was graduated depending on the week of the study. In the first week participants who completed 90% or more of the prompts were eligible to receive $10.00, $15.00 for completing 90% or more of the prompts sent during the second week and $20.00 for their completion of 90% + of prompts sent in the third week. In total, a participant who completed > 90% of the prompts during the entire study was eligible to receive $45.00. Research assistants involved in the study monitored participants' compliance throughout the study. The url invitations expired after 2 h of being sent so that participants could not complete a prompt sent in the morning, for instance, at another time of the day.

2.3. Measures

The present study included a number of theoretically important time-invariant and time-variant measures.