



Short communication

## Compulsive behavior in tobacco users

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### Abstract

Addictions have been associated with compulsive behaviors, which serve to reduce emotional distress. Tobacco use has been associated with increased adverse moods such as anxiety. Nicotine has established anxiolytic effects through modulation of central neurotransmitters, including monoamines. Both obsessive–compulsive behaviors and tobacco use have both been associated with dysfunction in orbitofrontal–subcortical circuits. This study demonstrated greater intensity of compulsive behaviors (as measured by the Yale–Brown Obsessive Compulsive Scale [Y-BOCS]) in tobacco users compared to nonusers, which was not due to demographic influences or use of other psychoactive drugs. Both the frequency of tobacco use and level of overall emotional distress correlated positively with the severity of compulsive symptoms. The results are consistent with tobacco use as a form of self-medicating compulsive symptoms, likely through monoamine modulation of orbitofrontal–subcortical circuits. © 2004 Elsevier Ltd. All rights reserved.

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### 1. Introduction

Compulsive behaviors serve to reduce aversive emotional states. Tobacco smokers report higher levels of anxiety than nonsmokers (Williams, Hudson, & Redd, 1982). The relief of adverse moods, rather than increasing positive mood, appears to be the predominant motive for tobacco use (Parrott, 1995). Aversive emotional states occur with tobacco cessation (Ward, Swan, & Jack, 2001), and nicotine use is associated with obsessive–compulsive disorder (OCD) (Grabe et al., 2001).

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Nicotine has established anxiolytic effects (e.g., Pomerleau, Turk, & Fertig, 1984). It modulates multiple neurotransmitter systems relevant to anxiety (Sullivan & Covey, 2002) and is a potent inhibitor of monoamine oxidase (MAO) (Berlin & Anthenelli, 2001). Further, low platelet MAO<sub>B</sub> activity predicts the intensity of tobacco withdrawal. Orbitofrontal circuit dysfunction is evident in both OCD and tobacco use. Nicotine activates orbitofrontal–striatal and limbic circuits (Stein et al., 1998), and cigarette-related cues cause activation of orbitofrontal cortex (Brody et al., 2002). Tobacco users show greater impairment on neuropsychological measures sensitive to orbitofrontal function, and tobacco use is correlated with the degree of impairment (Spinella, 2003, 2002). OCD is associated with increased activation of orbitofrontal–striatal circuits (e.g., Kwon et al., 2003).

Based on these behavioral and neurobiological commonalities between tobacco use and OCD, this study was undertaken to examine OCD symptoms in tobacco users.

## 2. Methods

### 2.1. Participants

Participants were a convenience sample ( $N=173$ ; 110 female, 61 male) of healthy individuals recruited from the local community. The study was approved by an institutional review board and conformed to ethical guidelines of the Declaration of Helsinki and the American Psychological Association. There was no financial compensation for participating. Participants were aged 16 to 67 years ( $M=28.5$ ,  $S.D.=12.2$ ) and completed between 10 and 19 years of education ( $M=14.2$ ,  $S.D.=1.8$ ). A total of 79 identified themselves as current smokers, and 94 identified themselves as nonsmokers.

### 2.2. Measures

#### 2.2.1. Yale–Brown Obsessive Compulsive Scale

The Yale–Brown Obsessive Compulsive Scale (Y-BOCS) is a valid and reliable Likert-format scale for rating OCD symptoms (Goodman et al., 1989). Separate scores were obtained for obsessions (Y-BOCS-O), compulsions (Y-BOCS-C), and the total score (Y-BOCS-T).

#### 2.2.2. Drug use frequency questionnaire

The drug use frequency questionnaire (DUF) is a questionnaire with established reliability and validity that inquires about the frequency of current psychoactive drug use: tobacco, caffeine, alcohol, cannabis, opioids, major stimulants (e.g., cocaine, methamphetamine), methylenedioxymethamphetamine (MDMA), and hallucinogens (O'Farrell, Fals-Stewart, & Murphy, 2003).

#### 2.2.3. Profile of mood states

A short form of the profile of mood states (POMS) with good psychometric properties was utilized (Grove & Prapavessis, 1992). Items are rated on a Likert scale and a total mood

disturbance (TMD) was calculated as the sum of negative affect scales minus positive affect (Vigor).

### 3. Results

Tobacco users reported greater severity of compulsive symptoms [ $F(1,171)=7.174$ ,  $P=.008$ ], which was moderate in size (Cohen's  $d=.4$ ). No difference was found in obsessions [ $F(1,171)=.365$ ,  $P=.547$ ]. Differences in compulsive symptoms persisted after adjusting for both demographics and frequency of use of other psychoactive drugs [ $F(11,168)=9.071$ ,  $P=.003$ ]. A small positive relationship existed between tobacco use and compulsive symptoms, which persisted after controlling for demographics and other DUFs [ $r(157)=.17$ ,  $P=.028$  (two-tailed significance)]. POMS-TMD correlated with the severity of compulsive behaviors in tobacco users, even after adjusting for demographic influences [ $r(73)=.46$ ,  $P<.001$ ].

### 4. Discussion

Tobacco users reported a greater degree of compulsive behaviors than nonusers in this study. This difference was not due to demographic influences (age, sex, or education), and it did not relate to the use of other psychoactive drugs (i.e., caffeine, alcohol, cannabis, opioids, major stimulants, MDMA, or hallucinogens). Further, the degree of compulsive behaviors correlated with the frequency of tobacco use, again independent of demographic influences and other psychoactive drug use frequency.

However, tobacco users did not report a greater degree of obsessive thoughts than nonusers, but there was a positive relationship between the severity of compulsions and overall emotional distress (Y-BOCS-C and POMS-TMD). This could indicate that, while tobacco users do not have a greater severity of obsessive thinking, they have a greater reaction to anxiety and engage in more compensatory compulsive behaviors.

These findings are behavioral evidence corroborating the functional neuroimaging, neurochemical, and neuropsychological studies that demonstrate common involvement of orbito-frontal circuits and monoamine systems in tobacco and OCD. Tobacco modification of monoamine systems likely attenuates the severity of OCD symptoms, even when subclinical in severity. Tobacco use may constitute a means of self-medicating aversive emotional states and minimizing compulsive behaviors.

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