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Tobacco Craving in Smokers With and Without Schizophrenia

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Abstract

We examined tobacco craving and dependence in current smokers (18–65 years) with schizophrenia (N=100) and those without a psychiatric disorder (normal controls, N=100). During the 2–3 hour visit participants completed demographic and smoking related questionnaires and provided a breath CO sample. The Tobacco Craving Questionnaire-Short Form (TCQ-SF) was administered. Immediately after smoking one cigarette, no difference in TCQ-SF total score was

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Disclosures/Conflicts of Interest:

Suzanne Lo has nothing to disclose

Stephen J. Heishman has nothing to disclose

Heather Gallagher Raley has nothing to disclose

Katherine Wright has nothing to disclose

Heidi J. Wehring has nothing to disclose

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Stephanie Feldman has nothing to disclose

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Robert P. McMahon has nothing to disclose

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Contributors:

Suzanne Lo coordinated normal control recruitment and study procedures at NIDA Bayview, and prepared the manuscript

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Heather Raley coordinated schizophrenia recruitment and study procedures at the MPRC and assisted in manuscript preparation

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Heidi J. Wehring assisted in the study data analysis plan, presentation of the data, and manuscript preparation

Eric T. Moolchan assisted in the development of the protocol, assessments and procedures, and assisted in manuscript preparation

Stephanie Feldman supervised research activities and regulatory compliance at the MPRC and assisted in manuscript preparation

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Charles M. Richardson assisted in the protocol development and the recruitment and clinical care of schizophrenia subjects at MPRC. He assisted in manuscript preparation.

Deanna L. Kelly designed and wrote the study protocol and assisted in writing the manuscript. She supervised the study procedures, regulatory compliance, and data dissemination plan.

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noted (46.7 ± 19.5 schizophrenia, 42.8 ± 18.2 controls, $p=0.15$); however, after 15 min TCQ-SF total score was significantly higher in people with schizophrenia (50.0 ± 19.6) than in controls (38.6 ± 19.4) ($p = 0.0014$). TCQ-SF factors of emotionality ($p=0.0015$), compulsivity ($p=0.0003$) and purposefulness ($p=0.0174$) were significantly greater in the schizophrenia group than the control group. FTND scores (5.5 ± 2.0 vs 5.3 ± 2.0 , $p=0.62$) number of cigarettes smoked daily (17.9 ± 11.6 vs. 17.0 ± 7.9), expired breath CO (28.0 ± 14.5 ppm vs. 22.0 ± 8.0 ppm) and age at smoking initiation (16.2 ± 5.4 vs. 15.6 ± 5.5 years, $p=0.44$) did not differ in the schizophrenia and control groups respectively. In conclusion, tobacco craving as measured by the TCQ-SF was significantly greater in people with schizophrenia than controls 15 min post-smoking, despite similar scores in dependence and similar smoking histories and current smoking patterns.

Keywords

schizophrenia; nicotine; smoking; craving; dependency

1.1 Introduction

Tobacco dependence is high in people with schizophrenia and about three times more prevalent than the general population (Grant et al., 2004, Costello et al, 1999, CTC, 2003, de Leon and Diaz, 2005; Lasser et al., 2000). People with schizophrenia are at higher risk for smoking-related deaths, such as cardiovascular diseases and possibly cancer (Hurt et al., 1996). We have found that among people with schizophrenia 35 to 54 years of age, cardiovascular-related mortality risk is 12-fold higher in smokers compared to nonsmokers (Kelly et al., 2009). Despite this morbidity and mortality risk, current treatments for tobacco dependence in this population have shown only modest success and have not been widely offered in general practice (CTC, 2003, Himelhoch and Daumit 2003)

Many factors influence smoking in people with schizophrenia, including genetic (Kendler et al., 1993), physiological (Martin and Freedman 2007) and environmental factors (Prochaska et al 2007, Galazyn et al 2009, Roick et al 2007, Gurpegui et al 2007, Haustein et al 2002). People with schizophrenia may smoke for a variety of reasons including the desire for beneficial effects on cognition or negative symptoms (Griffith et al., 1998; Goff et al. 1992) and to counteract antipsychotic side effects (Winterer 2010). People with schizophrenia may also perceive the health risks of cigarette smoking to be less than the normal population (Kelly et al 2010).

Little published work, however, has focused on determining whether differences in tobacco craving exist between people with schizophrenia and to normal controls. Tidey et al (2008) reported that schizophrenia smokers were more sensitive than control smokers to the effects of acute abstinence on carbon monoxide boost. Weinberger et al (2007) found that after overnight withdrawal, schizophrenia smokers smoked more cigarettes during the smoking reinstatement period than controls, despite similar daily smoking rates. Others have reported (McKee et al 2009) that mecamylamine, a noncompetitive nicotinic acetylcholine receptor (nAChR) antagonist, increased tobacco craving in smokers with schizophrenia compared to normal controls. This may be due, in part, to the underlying pathophysiology of schizophrenia and the possibility of reduced nAChR levels in the brains of people with this disorder (Fonder et al 2005). Thus, we hypothesize that non-cue related cigarette craving is higher in people with schizophrenia compared to normal controls 15 minutes post cigarette.

2.1 Materials and Methods

2.1.1 Participants

This study included volunteers 18–65 years old, smoking at least 5 cigarettes per day, a breath carbon monoxide (CO) ≥ 8 parts per million (ppm), and not actively trying to reduce or quit tobacco use at the time of the study. Two groups were recruited, those with a DSM-IV-TR diagnosis of schizophrenia or schizoaffective disorder (referred throughout as “schizophrenia”) and volunteers with no major DSM-IV-TR Axis I disorder (“normal controls”). The Structured Clinical Interview for Diagnoses (SCID) was used to confirm or rule out diagnoses for patients and control participants. Schizophrenia volunteers were recruited from the Maryland Psychiatric Research Center inpatient and outpatient programs and normal controls were recruited by the National Institute on Drug Abuse Intramural Research Program via print, radio, and television advertisements. This study was approved by the University of Maryland, National Institute on Drug Abuse, and the Department of Health and Mental Hygiene Institutional Review Boards.

2.1.2 Procedure

The study consisted of one 2–3 hour session, where each subject participated in a semi-structured interview and answered clinical and demographic information. Following consent, study screening procedures took place including a breath CO measurement and SCID. At the conclusion of the screening, subjects smoked one preferred-brand cigarette to standardize the time of last tobacco exposure. After the cigarette, study assessments began, and CO measurement was obtained approximately 10–15 minutes after the cigarette. For the CO measurement, subjects exhaled fully, inhaled deeply, and held their breath for 20 seconds before exhaling into a portable breath CO monitor (Vitalograph, Lenexa, KS).

2.1.3 Measures

The Tobacco Craving Questionnaire-Short Form (TCQ-SF) (Heishman et al., 2008) was used to assess tobacco craving in four dimensions: Emotionality (anticipation of relief from withdrawal symptoms or negative mood), Expectancy (anticipation of positive outcomes from smoking), Compulsivity (lack of control over tobacco use), and Purposefulness (intention and planning to smoke for positive outcomes). The TCQ-SF was administered twice: immediately and approximately 15 minutes after the smoked cigarette. The Fagerström Test for Nicotine Dependence (FTND) (Heather et al., 1991, Steinberg et al., 2005) was used to assess dependence in outpatients only.

2.1.4 Statistical Analysis

Comparisons between controls and schizophrenia in tobacco craving (TCQ-SF) were conducted using student’s t-test. Additionally, analysis of covariance (ANCOVA), adjusting for age, sex, race and nicotine dependence, was performed to test whether this adjustment modified the magnitude of differences between normal smokers and smokers with schizophrenia. High and low nicotine dependence was characterized as: High ≥ 6 on the FTND and low to moderate ≤ 5 on the FTND. All statistical analyses were conducted using SAS[®] version 9. All tests were two-sided with $\alpha=0.05$. A power analysis indicated that a sample size of 75 was sufficient to detect a medium effect size at power = 0.08, thus avoiding a type 1 error.

3.1 Results

3.1.1 Population

Two hundred smokers were enrolled into this study (N=100 schizophrenia and N=100 normal controls). The demographic and clinical characteristics are listed in Table 1. The schizophrenia group was significantly older and had higher percentages of Whites enrolled. The schizophrenia and control groups had similar smoking characteristics.

3.1.2 TCQ-SF

Adjusting for baseline TCQ-SF, age, gender, race, and FTND score, ANCOVA showed that immediately following a cigarette there was no difference in total TCQ-SF score at baseline; however, after 15 minutes TCQ-SF scores were significantly higher in people with schizophrenia than in controls (see Table 2.). TCQ-SF factors of emotionality, compulsivity and purposefulness were also significantly higher than controls 15 minutes after the last cigarette. There was no effect of age, race, sex, or level of dependence (FTND) on the TCQ-SF, except that Whites had higher scores on emotionality than nonwhites across groups (mean \pm s.e.=1.62 \pm 0.67, df=186, $t=-2.41$, $p=0.017$).

4.1 Discussion

Craving is recognized as a prominent feature of nicotine dependence (American Psychiatric Association, 1994; USDHHS, 1988; World Health Organization, 1992). After adjusting for age, gender, race, and FTND score, we found no difference in TCQ-SF scores between controls and people with schizophrenia immediately following a cigarette. However, after 15 min, TCQ-SF scores were significantly higher across a broad domain (purposefulness, emotionality, compulsivity and a trend for expectancy) in people with schizophrenia than in controls. This indicates that in schizophrenia smokers, 15 minutes after smoking increases tobacco craving, which might contribute to the higher smoking prevalence in this population and suggests that strategies targeted at diminishing acute post cigarette craving reactions or supporting resistance to acute craving may aid in smoking cessation strategies in people with schizophrenia (Tidey et al 2005, Williams et al 2008).

Unlike previous studies (Grant et al., 2004; CTC, 2003), in our study, nicotine dependence and mean number of cigarettes smoked per day were very similar between controls and smokers with schizophrenia. We also observed no difference in FTND scores between normal controls and patients in this study. One notable difference between this and previous studies is that we recruited a large sample of controls and schizophrenics with very similar current tobacco use and smoking histories.

Our study has a few limitations. We lack data on specific psychiatric symptoms, such as the severity of positive and negative symptoms or cognitive functioning in the schizophrenia group. Compared to controls, schizophrenia smokers were older and included a higher percentage of Whites. Age, race, gender, and level of nicotine dependence did not affect craving, except that Whites had higher emotionality scores than nonwhites in both groups. The high percentage of normal controls reporting themselves as never married may limit the generalizability to the general population of smokers. Lastly, this study reports the first use of the TCQ-SF in people with schizophrenia; it has been validated in the normal population. A strength of this study is that 200 people were characterized as to diagnosis (schizophrenia versus no major Axis I disorder) making this one of the larger comparative studies to examine schizophrenia compared to normal controls. It is also strengthened by the fact that control subjects and those with schizophrenia were similar in smoking histories, breath CO and the number of cigarettes smoked daily.

In summary, 15 minutes after smoking a cigarette, tobacco craving was significantly higher in people with schizophrenia compared to normal controls and this was distinguishable using the Tobacco Craving Questionnaire-Short Form. This higher craving was present despite similar levels of nicotine dependence. Thus, it may be that smokers with schizophrenia crave cigarettes for a broader range of reasons than the normal population. Future studies can determine what factors encourage and inhibit smoking initiation, use, and dependence in people with schizophrenia and to what degree symptom levels, medications and environmental factors affect their tobacco craving. This information will provide insight to guide future development of effective prevention and treatment strategies to address this comorbidity.

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Table 1

Demographic and Clinical Characteristics

	Schizophrenia N=100	Normal Controls N=100	Statistics
Age (years)	43.3 ± 11.4	37.1 ± 10.6	t=3.99, df=198, p=0.00009
Sex (male)	71 (71%)	65 (65%)	$\chi^2=0.83$, df=1, p=0.36
Race			$\chi^2= 17.2$, df=2, 0.0002
White	61(61%)	32 (32%)	
African American	37(37%)	66 (66%)	
Other Races	2 (2%)	2 (2%)	
Level of Education (years)	12.0 ± 2.0	11.8 ± 1.8	t=-0.9, df=193, p=0.39
Marital Status			$\chi^2 =3.2$, df=3, p=0.37
Presently married	4 (4%)	9 (9%)	
Widowed	1 (1%)	2 (2%)	
Divorced/separated	17 (18%)	22 (22%)	
Single	73 (77%)	66 (67%)	
Level of family support *	63.1 ± 29.7	65.9 ± 33.4	t=0.63, df=193, p=0.53
Expired CO **	28.0 ± 14.5	22.9 ± 8.0	t=0.27, df=1 p=0.61
Age at beginning of regular smoking (years)	16.2 ± 5.4	15.6 ± 5.5	t=-0.78, df=192, p=0.44
Age at first puff (years)	14.1 ± 4.8	13.3 ± 5.1	t=-1.12, df=192, p=0.27
Age at first whole cigarette (years)	15.1 ± 4.6	15.0 ± 5.0	t=-0.05, df=192, p=0.96
FTND ***	5.5 ± 2.0 (N=72)	5.3 ± 2.0	T=-0.50, df=165, p=0.62
Number of cigarettes smoked daily	17.9 ± 11.6	17.0 ± 7.9	T=-0.67, df=174, p=0.51
Outpatients N=72	21.4 ± 11.8		
Inpatients N=28	9.0 ± 3.8		

* 100 mm VAS (100 fully supportive, 0 no support)

** approximately 10–15 minutes after smoking cigarette

*** Fagerström Test for Nicotine Dependence. Only applicable to outpatients due to the inability of inpatients to smoke first thing in the morning (questions on dependency relating to morning cigarettes).

No differences clinical differences in data between inpatients and outpatients except in number of cigarettes per day, which is noted above (T=7.91, df=96, p<0.001). Inpatients were those in a volunteer program with smoking and ground privileges.

Table 2

Tobacco Craving Questionnaire (TCQ)-Short Form

	Schizophrenia	Controls	Mean Difference (Schizophrenia vs Control)	P-Value
TCQ Score Immediately following a cigarette	46.7 ± 19.5	42.8 ± 18.2	3.7 ± 18.8	p=0.15
TCQ Score After 15 minutes	50.0 ± 19.6	38.6 ± 19.4	7.3 ± 2.3	P=0.0014*
Sub-factors: 15 minutes post cigarette				
Emotionality	11.6 ± 5.6	8.0 ± 5.4	2.3 ± 0.7	P=0.0015*
Expectancy	13.4 ± 6.0	11.5 ± 6.3	1.5 ± 0.8	p=0.056*
Compulsivity	11.5 ± 5.9	7.9 ± 5.2	2.5 ± 0.7	P=0.0003*
Purposefulness	13.5 ± 5.4	11.1 ± 5.4	1.7 ± 0.7	p=0.0174*

* Multivariate ANCOVA adjusting for age, gender, race and FTND group

There was no effect of age, race, sex or level of dependency (FTND) on the TCQ-SF except the following: Whites had higher scores on sub-factor emotionality than nonwhites across groups (difference +/- s.e. = 1.62 +/- 0.67, df=186, t=-2.41, p=0.0171).