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The Relationship of DSM-IV Personality Disorders to Nicotine Dependence-Results from a National Survey*

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Abstract

This study examined the prevalence of nicotine dependence (ND) and its associations with DSM-IV personality disorders (PDs) among current smokers (n=7,078), controlling for sociodemographic characteristics and comorbid Axis I and II disorders. Data were derived from a nationally representative sample of the U.S. population. Although all PDs were significantly associated with ND when sociodemographic factors were controlled, only schizotypal, borderline, narcissistic and obsessive-compulsive PDs were associated with ND after adding controls for Axis I and other Axis II disorders. These associations remained significant after controlling for degree of smoking exposure. The results suggest that both shared and PD-specific pathogenetic factors underlie these PD-ND associations. Implications are also discussed in terms of the relationship between personality features of schizotypal, borderline, narcissistic and obsessive-compulsive PDs and the self-medication hypothesis and the role of neurotransmission.

Keywords

personality disorders; nicotine dependence; epidemiology; neurobiology; smoking exposure; self-medication hypothesis

1. Introduction

Although cigarette smoking and nicotine dependence (ND) necessarily overlap, not every smoker suffers from ND. Recently, there has been increased interest in the relationship between ND and smoking behaviors and the role of other Axis I disorders, including mood, anxiety and substance use disorders, in this relationship (Dierker and Donny, 2008; Dierker et al., 2007; Dickerson et al., 2009). However, little is known about how personality disorders (PDs) affect the conditional risks of ND among smokers.

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This gap in our knowledge reflects the scarcity of epidemiological studies that have assessed DSM-IV (American Psychiatric Association, 1994) PDs in the general population. To date, only three studies have examined the relationship between ND and PDs (Zimmerman and Coryell, 1989; Trull et al., 2004; Grant et al., 2004a), and only the study by Grant et al. utilized a nationally representative, general population sample, reporting highly significant associations between PDs and ND. None of these studies controlled for the potentially confounding effect of psychiatric comorbidity, which is crucial as other psychiatric disorders are highly comorbid with ND, PDs, and one another (Grant et al., 2004a, 2004b, 2005b, 2005c). Moreover, none examined associations with ND in relation to smoking status or exposure, thus obfuscating whether PDs are linked to ND simply by increasing the likelihood of smoking or if they are associated with an additional susceptibility to nicotine dependence. Addressing this distinction would increase understanding of the pathomechanisms of ND and PDs and help identify populations at risk of developing ND.

Accordingly, this study presents the first nationally representative data on the prevalence and associations of DSM-IV PDs and ND among current smokers, controlling for sociodemographic measures, Axis I and II comorbidity and smoking exposure. Data were drawn from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), which assessed all 10 DSM-IV PDs in a sufficiently large sample ($n=34,563$ including 7,078 current smokers) to test these associations with multiple covariates.

2. Methods

2.1 Sample

The 2004–2005 Wave 2 NESARC (Grant et al., 2003c) was conducted as a follow-up to the 2001–2002 Wave 1 NESARC (Grant et al., 2004b, 2001), which surveyed a representative sample of the U.S. adults, oversampling Blacks, Hispanics and young adults aged 18–24 years. The target population was the civilian population, 18 years and older, residing in households and selected group quarters. The Wave 2 NESARC attempted face-to-face interviews with all Wave 1 participants, achieving a response rate of 86.7% ($n=34,653$ completed interviews). The cumulative response rate at Wave 2 was 70.2%. Wave 2 data were weighted to reflect design characteristics, adjustments for nonresponse, and attrition between Wave 1 and Wave 2 (Grant et al., 2008). The research protocol, including informed consent procedures, received full ethical review and approval from the U.S. Census Bureau and the U.S. Office of Management and Budget.

2.1 Measures

All Wave 2 diagnoses were assessed using the Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV Wave 2 version. (AUDADIS-IV-2, Grant et al., 2003a). Past year DSM-IV ND required at least three of seven dependence criteria to be met in the year preceding the Wave 2 interview. Test-retest reliability and validity of ND were good to excellent (Grant et al., 2003b, 2004a). Smoking exposure variables included past year monthly smoking frequency, usual number of cigarettes per smoking day and total smoking duration in months.

DSM-IV PDs were assessed at Wave 1 (avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic and antisocial) and Wave 2 (borderline, narcissistic and schizotypal) and have been described in detail elsewhere (Grant et al., 2004c; 2008). Each PD required a lifetime assessment of long-term patterns of functioning, excluding symptoms limited to times when depressed, manic, anxious, drinking heavily, using medicine or drugs, experiencing withdrawal symptoms or physically ill. To receive a DSM-IV PD diagnosis, respondents needed to endorse the requisite number of symptom items, and at least one positive symptom must have been

associated with social/occupational dysfunction. Test-retest reliability and validity of PD diagnoses were fair to good (Grant et al., 2005a; Ruan et al., 2008).

Lifetime mood and anxiety disorders, alcohol and drug use disorders, and attention deficit/hyperactivity disorder (ADHD) were controlled in multivariate analyses. Mood disorders included major depressive disorder, bipolar I and II disorders, and dysthymia; anxiety disorders included social and specific phobias and post-traumatic stress, generalized anxiety and panic (with or without agoraphobia) disorders. These disorders have been described in detail elsewhere and were associated with good to excellent test-retest reliability and validity (Grant et al., 2003b, 2004c, 2005a, 2005d, 2006; Stinson et al., 2007).

2.3 Analysis

Weighted cross-tabulations measured the prevalence of current ND across subgroups defined by sociodemographics, PDs and other psychiatric disorders, and these associations were reflected in univariate odds ratios (OR). Four sequential multiple logistic regression models estimated the association of each PD with ND. The first controlled for sociodemographic characteristics; the second added controls for lifetime Axis I disorders; the third added controls for other Axis II PDs; and the fourth added smoking exposure controls to those models in which the OR for PD remained significant in the third model. To avoid potential overfitting and multicollinearity, control psychiatric disorders except for ADHD were aggregated into any lifetime mood or anxiety disorder, any lifetime alcohol or drug use disorder and any other PD. (Goodness of fit statistics of the models are shown in Supplementary Table 1. and 2.)¹

All analyses were restricted to current smokers (individuals who had smoked at least 100 cigarettes during their lifetimes and who had smoked during the year preceding the Wave 2 NESARC). All analyses were conducted using SUDAAN (Research Triangle Institute, 2006) software to account for the design effects of complex surveys.

3. Results

Table 1 shows the univariate associations of ND with all sociodemographic characteristics and Axis I and Axis II disorders among current smokers. Men had significantly lower odds of ND than women (OR = 0.81) and Blacks and Hispanics had lower odds compared with Whites (ORs = 0.76, 0.61). The odds of ND were greater among 45-to-64 year olds (OR = 1.28) but lower among those 65 years and older (OR = 0.78) relative to those aged 20-to-29 years. Individuals who were widowed/divorced/separated had greater odds of ND than those who were married or cohabitating (OR = 1.16). In addition, the odds of ND were significantly increased among individuals with all types of PD (ORs = 1.68 to 4.41) and among those with Wave 2 lifetime diagnoses for all Axis I disorders (ORs = 1.42 to 2.88).

As shown in Table 2, associations between each PD and ND remained statistically significant after controlling for sociodemographic characteristics. Once Axis I comorbidity was controlled, antisocial and avoidant PDs were no longer associated with ND. After further controlling for other PDs, associations of ND with schizoid, paranoid, dependent and histrionic PDs were no longer significant. Four PDs remained significantly associated with ND after controlling for all covariates including smoking exposure: schizotypal, borderline, narcissistic and obsessive-compulsive PDs (ORs = 1.60 to 1.87). These continued to drive significant associations at the cluster level as well (ORs = 1.30 to 1.67).

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4. Discussion

This study found that one cluster A PD (schizotypal), two cluster B PDs (borderline and narcissistic) and one cluster C PD (obsessive-compulsive) were significantly associated with ND among current cigarette smokers in a representative sample of U.S. adults. These results controlled for Axis I and other Axis II disorders in accordance with the importance of including psychiatric confounders in studies of comorbidity (Hasin et al, 2007; Compton et al., 2007). Further control for smoking exposure measures did not change the significance of these associations. However, comparison with the study of Grant et al. (2004a), which assessed the association of ND and PDs in the total population, implicates smoking status as an important mediator of these associations, especially antisocial, histrionic and paranoid PD. That is, these disorders appear to be more strongly associated with smoking per se than with a susceptibility to ND.

Associations of ND with schizotypal, borderline, narcissistic and obsessive-compulsive PDs were considerably reduced in strength when other psychiatric disorders were controlled, suggesting that common correlates may have spuriously inflated the unadjusted OR. These may include shared predisposing factors between PDs and the comorbid Axis I and II disorders and common psychopathologic dimensions or disability. It further suggests that associations of ND with other PDs in prior studies (Zimmerman and Coryell, 1989; Grant et al., 2004a; Trull et al., 2004) may have been overstated, as other psychiatric disorders were not controlled in those studies. The fact that these four associations remained significant, albeit diminished, after controlling for comorbidity indicates disorder-specific as well as common factors. Given that the adjustment for degree of smoking exposure did not change the significance or the magnitude of these associations, these disorder-specific mechanisms most likely include susceptibility to dependence conferred by maladaptive traits of these PDs or shared pathogenesis based on common neurobiological vulnerabilities.

An example of the latter would be the involvement of the acetylcholinergic transmission, the most direct target of nicotine and an important regulator of cognitive, emotional and physiologic processes. Altered function of this system may result in dysphoria, depression, anxiety, irritability, affect instability, aggression, and hostility (Crowell et al., 2009; Siever and Weinstein, 2009), symptoms frequently present in borderline and narcissistic PDs. Disturbances in cognitive organization seen in schizophrenia spectrum disorders could be linked to the cholinergic system as well, both directly and indirectly through regulating dopamine release (Ochoa and Lasalde-Dominicci, 2007; Siever and Weinstein, 2009), and this might explain the relationship between ND and schizotypal PD. Moreover, cholinergic transmission interacts with the serotonergic system, the primary neurobiological background of the obsessive-compulsive spectrum disorders, including obsessive-compulsive PD (Fineberg et al., 2007).

Prior research has shown strong associations between ND and the personality traits of impulsivity, neuroticism, negative affect (including affect instability), anxiety and anger (Trull et al., 2004; Grekin et al., 2006; Munafò et al., 2007; Munafò and Black, 2007) and hostility and aggression (Elkins et al., 2006). Since hallmark features of borderline PD include impulsivity, affect instability and negative affectivity, and narcissistic PD is associated with high levels of hostility and aggression (Widiger and Mullins-Sweatt, 2009), individuals with these PDs may be especially prone to ND. Another possible explanation for the relationship between ND and narcissistic PD is suggested by the findings of Russ et al. (2008), who showed that the construct of narcissistic PD is heterogeneous, with two malfunctioning subtypes: a grandiose/malignant subtype and a fragile subtype that is characterized by grandiosity coexisting with feelings of inadequacy and vulnerability. One might speculate that the association of ND and narcissistic PD could reflect a propensity to self-medicate to maintain

a sense of omnipotence and to protect a very fragile self esteem among those with the latter type of narcissism, while the grandiose/malignant subtype might contribute to this association through the impaired impulse control. The link between the maladaptive traits of obsessive-compulsive PD and ND is less clear, but it is possible that individuals with maladaptive high levels of conscientiousness (perfectionism, workaholism, inflexibility) might be prone to nicotine use, because of its psychostimulant effect, as it was found in a recent study (O'Connor et al, 2009), but not supported by previous research (Terraciano and Costa Jr., 2004). Future studies are needed to clarify this relationship.

This preliminary study found that nicotine dependence is associated among smokers with schizotypal, borderline, narcissistic and obsessive-compulsive PDs. Future work in many directions is indicated, including examining with more informative approaches (e.g. structural-equation modeling, path analysis) the role of PDs in mediating the relationships between Axis I disorders and ND. To date, attempts to examine such a mediating effect have been restricted to the study of personality traits such as extraversion and neuroticism (Elkins et al., 2006; Grekin et al, 2006; Munafò et al., 2007; Munafò and Black, 2007). This study provides strong grounds for extending this research to look at specific DSM-IV PDs and not simply their associated personality traits.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Associations of 12-Month Nicotine Dependence With Sociodemographic Characteristics and Psychiatric Disorders, Among Current Smokers (N=7078)^a

Characteristic/Disorder	Prevalence of characteristic/disorder among respondents with		OR (95% CI)
	No Nicotine Dependence (n=2840) % (SE)	Nicotine Dependence (n=4238) % (SE)	
Sex			
Male	56.16 (1.15)	50.94 (0.98)	0.81 (0.71–0.92)
Female	43.84 (1.15)	49.06 (0.98)	1.00
Age, years			
20–29	23.40 (1.16)	21.52 (0.77)	1.00
30–44	33.28 (1.06)	32.34 (0.90)	1.06 (0.88–1.27)
45–64	32.81 (1.16)	38.59 (0.91)	1.28 (1.07–1.53)
≥65	10.50 (0.58)	7.55 (0.42)	0.78 (0.64–0.96)
Race-ethnicity			
White, non-Hispanic	71.24 (1.56)	76.62 (1.14)	1.00
Black, non-Hispanic	12.29 (0.98)	10.05 (0.79)	0.76 (0.63–0.91)
Native American	2.99 (.040)	3.95 (0.49)	1.23 (0.89–1.70)
Asian or Pacific Islander	2.63 (0.54)	2.27 (0.49)	0.80 (0.49–1.32)
Hispanic	10.86 (1.14)	7.11 (0.68)	0.61 (0.50–0.75)
Marital status			
Married, cohabiting	56.24 (1.14)	53.96 (0.98)	1.00
Widowed, divorced, separated	21.53 (0.81)	23.93 (0.75)	1.16 (1.01–1.33)
Never married	22.23 (1.05)	22.11 (0.83)	1.04 (0.89–1.20)
Education			
Less than high school graduate	17.91 (0.89)	18.20 (0.75)	1.02 (0.87–1.20)
High school graduate	34.53 (1.28)	34.38 (0.89)	1.00 (0.88–1.14)
Some college or higher	47.56 (1.33)	47.42 (1.06)	1.00
Family income			
\$1–19,999	24.64 (0.96)	25.39 (0.92)	1.11 (0.95–1.30)
\$20,000–34,999	21.15 (0.86)	22.42 (0.76)	1.11 (0.98–1.34)
\$35,000–69,999	32.13 (1.05)	31.76 (0.91)	1.07 (0.91–1.26)
\$70,000 or more	22.07 (0.99)	20.43 (0.90)	1.00
Cluster A	9.06 (0.66)	19.04 (0.86)	2.36 (1.97–2.83)
Paranoid	4.80 (0.48)	9.63 (0.63)	2.11 (1.64–2.71)
Schizoid	2.97 (0.36)	6.56 (0.48)	2.29 (1.72–3.06)
Schizotypal	3.46 (0.43)	8.94 (0.54)	2.74 (2.07–3.61)
Cluster B	14.54 (0.93)	28.59 (0.89)	2.35 (1.99–2.79)
Antisocial	6.28 (0.66)	10.15 (0.66)	1.68 (1.27–2.23)
Borderline	5.54 (0.53)	15.92 (0.66)	3.23 (2.60–4.01)
Histrionic	1.92 (0.26)	4.53 (0.42)	2.43 (1.74–3.38)
Narcissistic	5.25 (0.59)	11.43 (0.64)	2.33 (1.84–2.94)

Characteristic/Disorder	Prevalence of characteristic/disorder among respondents with		
	No Nicotine Dependence (n=2840) % (SE)	Nicotine Dependence (n=4238) % (SE)	OR (95% CI)
Cluster C	6.68 (0.59)	14.85 (0.71)	2.44 (1.97–3.02)
Avoidant	2.07 (0.42)	4.59 (0.39)	2.27 (1.43–3.61)
Dependent	0.32 (0.12)	1.39 (0.27)	4.41 (1.85–10.54)
Obsessive-compulsive	5.27 (0.48)	12.41 (0.69)	2.55 (2.05–3.17)
Attention deficit/hyperactivity disorder	2.14 (0.36)	5.91 (0.43)	2.88 (1.97–4.20)
Any mood or anxiety disorder lifetime	39.01 (1.17)	58.80 (0.98)	2.23 (1.98–2.51)
Any drug or alcohol use disorder lifetime	53.25 (1.36)	61.71 (1.19)	1.42 (1.25–1.61)

^a Percentages may not add to 100.0 because of rounding.

Table 2

Adjusted Odds Ratios for Associations of DSM-IV Lifetime Personality Disorders and Past-Year Nicotine Dependence among Current Smokers Controlling for Sociodemographic Characteristics, Comorbid Psychiatric Disorders and Smoking Exposure

Personality Disorder	Control for Sociodemographic Characteristics		Control for Sociodemographic Characteristics and Axis I Psychiatric Disorders		Control for Sociodemographic Characteristics, Axis I and II Psychiatric Disorders		Control for Sociodemographic Characteristics, Axis I and II Psychiatric Disorders and Smoking Exposure	
	Odds Ratio (95% CI)		Odds Ratio (95% CI)		Odds Ratio (95% CI)		Odds Ratio (95% CI)	
Cluster A	2.37 (1.97–2.86)		1.71 (1.41–2.07)		1.32 (1.07–1.62)		1.30 (1.06–1.60)	
Paranoid	2.07 (1.61–2.66)		1.48 (1.14–1.91)		1.13 (0.87–1.48)		NA	
Schizoid	2.25 (1.68–3.00)		1.58 (1.17–2.12)		1.25 (0.92–1.69)		NA	
Schizotypal	2.80 (2.12–3.69)		1.97 (1.48–2.61)		1.51 (1.13–2.02)		1.60 (1.18–2.16)	
Cluster B	2.48 (2.09–2.94)		1.87 (1.56–2.24)		1.69 (1.41–2.04)		1.67 (1.37–2.04)	
Antisocial	1.76 (1.32–2.35)		1.28 (0.95–1.73)		1.12 (0.83–1.53)		NA	
Borderline	3.25 (2.60–4.05)		2.31 (1.82–2.93)		1.94 (1.51–2.50)		1.87 (1.43–2.44)	
Histrionic	2.41 (1.72–3.36)		1.64 (1.18–2.28)		1.30 (0.93–1.81)		NA	
Narcissistic	2.54 (2.02–3.20)		2.01 (1.59–2.53)		1.71 (1.35–2.16)		1.80 (1.39–2.32)	
Cluster C	2.38 (1.93–2.95)		1.78 (1.43–2.22)		1.49 (1.20–1.86)		1.47 (1.17–1.85)	
Avoidant	2.21 (1.40–3.50)		1.49 (0.96–2.33)		1.16 (0.74–1.81)		NA	
Dependent	4.22 (1.74–10.20)		2.62 (1.07–6.43)		1.97 (0.81–4.79)		NA	
Obsessive-compulsive	2.49 (2.00–3.11)		1.90 (1.51–2.39)		1.60 (1.28–2.01)		1.63 (1.28–2.06)	

Note: Sociodemographic controls: age, sex, race-ethnicity, marital status

Axis I disorder controls: aggregated any mood and anxiety disorder, aggregated any drug and alcohol use disorders, ADHD

Axis II disorder controls: aggregated any other personality disorder

Smoking exposure controls: past year smoking frequency/month, number of cigarettes/smoking day, total duration of smoking in months

NA: Odds ratio were not statistically significant in the third model