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Predictors of DSM and Fagerström-Defined Nicotine Dependence in African American and Puerto Rican Young Adults

Judith S. Brook^a, Jonathan Koppel^a, and Kerstin Pahl^a

a Department of Psychiatry, New York University School of Medicine, 215 Lexington Avenue, 15th Floor, New York, NY 10016

Abstract

This study examined the psychosocial predictors of nicotine dependence, as defined by a variant of the criteria employed in the *DSM-IV*—specifically that of the University of Michigan Composite International Diagnostic Interview (UM-CIDI)—and the Fagerström Test for Nicotine Dependence (FTND). The study was conducted with a community sample of African American and Puerto Rican young adults ($N = 475$; mean age = 26). Data was collected at four time points, between the years 1990–2003. Predictor variables included physiologically-based psychosocial (i.e., depressive symptoms and family problems with smoking) as well as social-behavioral psychosocial (i.e., rebelliousness and partner's problems with smoking) predictors of nicotine dependence. Using multiple regression analyses, UM-CIDI-defined dependence was predicted by each of the four psychosocial variables, while FTND-defined dependence was predicted only by the social-behavioral variables. These findings bear out the disparate dimensions of nicotine dependence each measure taps. Research and clinical implications of the findings are discussed.

Keywords

Nicotine dependence; DSM; FTND; Tobacco; Diagnosis

Introduction

Nicotine dependence is often measured by employing either the Fagerström Tolerance Questionnaire (FTQ; Fagerström, 1978), the closely related Fagerström Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerström, 1991) and/or instruments based on the criteria for nicotine dependence delineated in one of the various editions of the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, such as the *DSM-IV* (American Psychiatric Association, 1994). One measure of nicotine dependence based on the *DSM-IV* is the criteria found in the University of Michigan Composite International Diagnostic Interview (UM-CIDI; Wittchen & Kessler, 1994). Recent comparisons between variants on the two measures, using adolescent samples (Cohen, Myers, & Kelly, 2002; Strong, Brown, Ramsay, & Myers, 2003), adults in the general population (Breslau & Johnson, 2000; Hughes, Oliveto, & Riggs, 2004), and clinical samples (Moolchan et al, 2002) have demonstrated little agreement among these measures.

The weak agreement between the two measures is due to their tapping into different aspects of nicotine dependence. The Fagerström criteria for nicotine dependence are more limited and

appear to focus directly on the behavioral components and indirectly on some physiological components (e.g., length of time between awakening and first cigarette of the day) of tolerance and withdrawal, both hallmarks of physical addiction. In contrast, the DSM criteria for nicotine dependence are broader and assess the physiological symptoms of nicotine dependence (i.e., tolerance and withdrawal), as well as the larger behavioral pattern typical of compulsive substance use (e.g., continued use despite physical and/or psychological problems) and psychological dimensions of addiction (i.e., impaired control over tobacco use; Hughes, 2003). Thus, the FTND appears to focus on the relatively narrow symptoms of craving and addiction, while the DSM criteria probe a more general syndrome associated with substance dependence.

The varying sensitivity of the DSM and Fagerström-derived measures to different aspects of nicotine dependence is reflected in the psychosocial indices related to the two measures. Investigators have found relationships between DSM-defined nicotine dependence and a range of psychosocial variables, including major depression and depressive symptoms (Breslau & Johnson, 2000; Grant, Hasin, Chou, Stinson, & Dawson, 2004; John, Meyer, Rumpf, & Hapke, 2004), overall psychiatric symptomatology (Moolchan et al., 2002), quality of life (Hourani, Yuan, Bray, & Vincus, 1999; Schmitz et al., 2003), and self-rated general health (John, Meyer, Rumpf, Schumann, Dilling, & Hapke, 2005).

Fagerström-defined nicotine dependence appears to be related to a narrower range of psychosocial measures. For instance, Moolchan et al. (2002) found that FTND scores were predicted by longer smoking history and greater tobacco liking, but not with psychiatric symptomatology. FTND scores are closely related to biological indices of tobacco smoking (Payne, Smith, McCracken, McSherry, & Antony, 1994), but not to psychological symptoms of tobacco dependence (Dijkstra & Tromp, 2002; Etter, Vu Duc, & Perneger, 1999).

It is important, from both a research and clinical perspective, to develop a further understanding of the respective correlates of nicotine dependence as assessed by each measure. Researchers would be well-served, when employing disparate metrics of nicotine dependence, to be aware of what a given classification of nicotine dependence is likely to reflect about an individual. Likewise, clinicians may find, in treating nicotine dependent patients, that the appropriate course of treatment varies according to the particular measure by which an individual was diagnosed.

The current study extends research on the respective predictors of FTND- and DSM-defined nicotine dependence. We examined associations between FTND-defined nicotine dependence, as well as a DSM-based measure of nicotine dependence, and four psychosocial measures: 1) symptoms of depression, 2) family problems with smoking, 3) rebelliousness, and, 4) partner's problems with smoking. The measures of family and partner problems with smoking were intended to assess whether the individual in question had ever been addicted to cigarettes, had difficulty quitting smoking, or smoked in excess.

There are sound conceptual reasons for relating these specific psychosocial variables to both measures of nicotine dependence. As noted, depression is typically related to DSM-defined nicotine dependence. There have been mixed results regarding the relation between depression and Fagerström-defined nicotine dependence. Some researchers have found evidence for such an association (Carton, Jouvent, & Widlocher, 1994; Hu, Davies, & Kandel, 2006; Lerman et al., 1996), while others report findings to the contrary (Breslau & Johnson, 2000; Psujek, Martz, Curtin, Michael, & Aeschleman, 2004). Though the precise mechanism linking nicotine dependence to depression is unclear, the two are likely connected in part through physiological factors, such as a shared genetic risk common to the two syndromes (Johnson, Rhee, Chase, Breslau, 2004).

Smoking may, additionally, represent a form of self-medication. That is, the depressed individual may use nicotine to increase arousal or minimize affect (Lerman et al., 1996). This would link nicotine dependence to depression, first, by establishing a disproportionately high base rate of smoking among the depressed. Those who initiate smoking as a means of self-medication might also be at a particularly high risk for developing nicotine dependence.

A history of familial smoking is also related to smoking patterns, in adult as well as adolescent samples (Boyle, Sanford, Szatmari, Merikangas, & Offord, 2001; Vink, Willemsen, & Boomsa, 2003). Two studies of adults have discerned a specific relation between nicotine dependence and a history of parental smoking (Hu et al., 2006; Kardia, Pomerleau, Rozek, & Marks, 2003), though one study failed to find any relationship between nicotine dependence and family smoking (Rohde, Kahler, Lewinsohn, & Brown, 2004). Similar to the association between depression and nicotine dependence, the relationship between family problems with smoking and nicotine dependence in the individual may stem in part from genetic influences on nicotine dependence (Groman & Fagerström, 2003; Maes et al., 2004; Vink, Willemsen, & Boomsma, 2005).

Both rebelliousness and partner smoking behavior have been found to be related to patterns of smoking in adults as well as adolescents (Agrawal et al., 2006; Botorff et al., 2005; Clark & Etille, 2006). To date, the relationship between rebelliousness and smoking patterns has only been studied in adolescent samples. Furthermore, there does not appear to be prior research expressly relating rebelliousness to nicotine dependence.

Rebelliousness and the smoking behavior of one's partner can affect smoking patterns and nicotine dependence either through selective mating and/or the influence of one partner on the other (see Vanyukov, Neale, Moss, & Tarter, 1996, for a review of the mechanisms in the correlation between partner substance abuse and individuals' own smoking behavior). Thus, the partner's problems with smoking contribute to the behavioral and social influences on the individual's patterns of smoking and addiction to nicotine. The range of dimensions represented by the predictor variables we chose for this study renders them potentially useful in demonstrating different dimensions of the Fagerström- and DSM-based measures of nicotine dependence.

There have been at least two other studies employing a similar format as the current study (Breslau & Johnson, 2000; Moolchan et al., 2002). In both studies, the FTND and the DSM-based measure of nicotine dependence were compared with regard to which psychosocial indices served as predictors or consequences of nicotine dependence. Breslau & Johnson (2000) found that FTND-defined dependence predicted cessation more strongly than did DSM-defined dependence, but that DSM-defined dependence predicted major depression and FTND-defined dependence did not. Moolchan et al. (2002) found that the FTND diagnosis was predicted by greater tobacco liking, while the DSM diagnosis was predicted by greater psychiatric symptomatology. The current study builds on this prior work, by extending the comparison to variables not included in these previous studies, as well as by providing further evidence on the relationship between depression and FTND-defined dependence.

The current study was conducted with a community sample of urban African American (AA) and Puerto Rican (PA) young adults. In light of the limited research on nicotine dependence among African Americans and Puerto Ricans, the current study additionally serves to test whether the existing and posited relationships between nicotine dependence and our psychosocial variables also hold among these understudied groups.

We hypothesized that FTND-defined nicotine dependence, with its focus on physiological dimensions, would be predicted only by depression and family problems with smoking, variables which are likely to have a physiologically- and/or genetically-based link with nicotine

dependence. We hypothesized that FTND-defined dependence would not be predicted by the broader behavioral and social influences on nicotine dependence, rebelliousness and partner's problems with smoking. We hypothesized that DSM-defined dependence would be predicted by each of the psychosocial measures because it is conceptualized to assess a broader range of behavioral patterns associated with compulsive substance use. Given the contradictory findings of other researchers, of particular interest, is whether our study yields a significant relationship between symptoms of depression and FTND-defined dependence.

Method

Sample

The present study followed a subset of the original participants from a four-wave longitudinal study of AA and PR adolescents/young adults. The Time 1 (T1) sample (N = 1330) was collected in 1990, Time 2 (T2, N = 1190) in 1995, Time 3 (T3, N = 662) in 2000–2001, and Time 4 (T4, N = 475) in 2001–2003 for a study investigating tobacco use among African American and Puerto Rican young adults. The Institutional Review Boards at Mount Sinai School of Medicine and at New York University School of Medicine approved the study's procedures for all data collections.

Participants at T1 came from Grades 7–10 in 11 schools in a school district of East Harlem area of New York City. The school district was specifically selected in order to obtain a large sample of African American (N = 694) and Puerto Rican (N = 636) youths living in an urban area. The T2 response rate was 89.3% of those who participated at T1. Because of budget limitations, the T3 data collection did not target the entire T2 sample, but over-sampled those respondents who reported using marijuana or other illicit drugs and/or having a child at T2. The main reason for this strategy was to sample a sufficient number of illicit drug users and still stay within budgetary limitations¹. At T4, a stratified random sample of T3 participants (N=650) were invited to participate in the study. Sampling was proportionate to sex and ethnicity. Of those approached, only five individuals refused to participate.

The present study included data for 475 participants seen at T4. Of these participants, 51% (n=243) were African American, 49% (n=232) were Puerto Rican, and 51% (n=241) were female. Their mean ages were 14 (SD = 1.3) at T1, 19 (SD = 1.5) at T2, 24 (SD = 1.3) at T3, and 26 (SD = 1.4) at T4. At T1, 77% (367) of participants reported living with their mother/mother figure while 38% (n=122) reported living with their father/father figure. Sixteen percent of the respondents reported that their parents had not completed high school. Twenty-five percent reported that either their mother or their father had completed a college education. Attrition analyses revealed that individuals who participated at both T1 and T4 smoked more frequently at T1 than those who participated at T1 but not at T4. No significant differences were found in age or parental education between participants who participated at both T1 and T4 and those who only participated at T1. In addition, the female/male ratio at T1 was significantly higher than that at T4.

Measures

One of the nicotine dependence measures employed in this study was the FTND. The FTND consists of 6 items assessing indicators of nicotine addiction on a continuous scale (e.g., smoking when sick, difficulty refraining from smoking in forbidden places, and smoking shortly after waking up in the morning). The FTND has been used with young adults and adolescents and has demonstrated acceptable psychometric properties (Clark, Wood, Martin, Cornelius, Lynch, & Shiffman, 2005; Haddock, Lando, Klesges, Talcott, & Renaud, 1999;

¹The original longitudinal study aimed at studying the predictors and consequences of illicit drug use over time.

Robinson, Berlin, & Moolchan, 2004). A score of 5, out of a possible score of 10, is generally taken as indicative of substantial dependence. (Heatherton et al., 1991; Hudmon, Kilfoy, & Prokhorov, 2006). Thus, in the current study, we created a dichotomous score on the FTND (1=dependent; 0=not dependent), employing 5 as a cut-off score.

The other measure of nicotine dependence was based on the DSM, and was assessed using a modified version of the University of Michigan Composite International Diagnostic Interview (UM-CIDI) (Wittchen & Kessler, 1994). The UM-CIDI is a close variant on the Composite International Diagnostic Interview (CIDI), which has demonstrated good validity and reliability (Wittchen, 1994).

The analyses on the dependence measures were performed on the entire sample, rather than only on those participants who reported smoking.

Psychosocial variables in young adulthood (T4) included the participant's symptoms of depression, whether a family member had ever had problems with smoking, the partner's problems with smoking, and the participant's rebelliousness. Symptoms of depression consisted of an 8-item scale. A sample item is, "You sometimes feel hopeless about the future," with the participant indicating (1 = Completely False; 4 = Completely True) how accurately that statement reflects his/her mood state (Cronbach's $\alpha = .83$). The rebelliousness scale consisted of 3 items, such as "You sometimes enjoy doing things you shouldn't, just for the fun of it," with the participant rating the accuracy of the statement on the same 1–4 scale (Cronbach's $\alpha = .68$).

Family problems with smoking included 3 items — mother's problems with smoking, father's problems with smoking, and siblings' problems with smoking. Each item inquired whether the participant's biological relatives (mother, father, siblings) had ever had a problem with cigarettes (true or false). For the siblings' problems with smoking item, participants were instructed to answer in reference to half-siblings as well as full siblings. The partner's problems with smoking scale consisted of the same single item, this time in reference to the participant's partner or spouse.

Participants' gender and ethnicity were represented by dummy codes in the analyses (1=female, 0=male; 1=African American; 0=Puerto Rican). Parental education, assessed at T1, was represented by either the mother's or the father's level of education, whichever was higher (1 = less than high school; 6 = completed college).

Results

Table 1 shows the distribution of those classified as nicotine dependent/not dependent by the FTND and UM-CIDI. Both measures of nicotine dependence classified 9.1% ($n = 43$) of the sample as nicotine dependent and 67.0% ($n = 318$) of the sample as not dependent. The UM-CIDI classified a greater number of individuals as dependent than did the FTND. Specifically, 23.0% of the sample ($n=109$) were classified as dependent by the UM-CIDI and not dependent by the FTND. Only 5 (1.1%) individuals were classified as dependent by the FTND but not by the UM-CIDI. Because the UM-CIDI covers a longer time period (12 months) than the FTND (current status), we repeated the tabulation including only those respondents who reported any smoking in the past 30 days. This reduced the sample to $n = 187$. The number of participants classified as dependent by the FTND did not change. For the UM-CIDI, the number of participants who were previously classified as dependent was only reduced by 17 (to $n=92$). Thus, the ratio of those classified as dependent only by the UM-CIDI and those who were classified as dependent by both measures did not change dramatically (from 2.53 to 2.15). Logistic regressions, controlling for age, gender, education, and ethnicity were then conducted to examine the relationships of our four predictor variables (i.e., depressive symptoms,

rebelliousness, family problems with smoking, partner's problems with smoking) with each measure of nicotine dependence. All predictors were standardized before being entered into the analyses, so that the relative importance of the predictors could be compared. Analyses revealed that all four variables predicted nicotine dependence, as defined by the UM-CIDI, at a statistically significant level. In contrast, when predicting nicotine dependence as defined by the FTND, only depressive symptoms and family problems with smoking emerged as statistically significant predictors. Adjusted odds ratios for both the UM-CIDI and FTND are presented in Table 2.

Discussion

The present study is the first to examine the relationship between psychosocial factors and nicotine dependence, as defined by the UM-CIDI and the FTND, in an urban sample of AA and PR young adults. The findings of the present study support our hypotheses. FTND-defined nicotine dependence was associated with physiologically-based predictors of nicotine dependence, symptoms of depression and family problems with smoking. FTND-defined nicotine dependence was not significantly associated with broader behavioral and social predictors of nicotine dependence, rebelliousness and partner's problems with smoking. In contrast, as hypothesized, UM-CIDI-defined dependence was related to all four psychosocial variables.

The difference in the predictors of nicotine dependence as assessed by the UM-CIDI and the FTND is presumably a function of the varying dimensions of nicotine dependence each measure taps. In this study, there was little agreement between smokers classified as nicotine dependent according to either the FTND or the UM-CIDI. The UM-CIDI diagnosed many more smokers as dependent than did the FTND, even when the time frames of the two measures were rendered comparable. The lack of agreement between the two measures, as well as the greater number of individuals classified as dependent by the UM-CIDI, is consistent with prior research. (e.g., Moolchan et al., 2002). As reported, the greater number of smokers diagnosed as nicotine-dependent according to the UM-CIDI is due, in the current study, only in small part to the different time frames of the two measures.

The relationship we found between the FTND and depressive symptoms is in accord with the findings of those investigators who have reported associations between FTND-defined dependence and depression (Carton, Jouvent, & Widlocher, 1994; Hu, Davies, & Kandel, 2006; Lerman et al., 1996). However, our findings differ from those several researchers who did not find this association (Breslau & Johnson, 2000; Psujek, Martz, Curtin, Michael, & Aeschleman, 2004). The difference between our results and those of Breslau & Johnson (2000) and Psujek et al. (2004) may be due the difference in the samples employed.

It is not surprising that there is an association between symptoms of depression and nicotine dependence. First, several investigators have reported a significant association between daily or current cigarette smoking – a necessary component of current nicotine dependence – and major depression (Breslau, Novak, & Kessler, 2004; Lasser, Boyd, Woolhandler, Himmelstein, McCormick, & Bor, 2000), and depressive symptoms (Kenney, Holahan, North, & Holahan, 2006; Ridner, Staten, & Danner, 2005). Second, assuming nicotine dependence and depression share a genetic liability, we should expect an association between the two to hold across narrower as well as broader measures of nicotine dependence.

There are a number of mechanisms which may link the psychosocial measures addressed in the current study to nicotine dependence. We will address, in turn, first the physiologically-based and then the social-behavioral predictors of nicotine dependence. With respect to depression, we have cited the likelihood of a shared genetic risk between depression and

nicotine dependence. Though no such common genotype has been found, there is evidence that shared familial factors, either environmental or genetic, account for much of the comorbidity between major depression and smoking patterns, including nicotine dependence (Johnson et al., 2004). The high comorbidity between depression and nicotine dependence can also be taken as circumstantial evidence that the two conditions hold genetic factors in common (Yoshimasu & Kiyohara, 2003). This consideration is buttressed as well by evidence of a shared genetic vulnerability between major depression and regular smoking (Kendler, Neale, Maclean, Heath, Eaves, & Kessler, 1993).

Similarly, with respect to having family members who experience difficulty quitting or problems with smoking, the genetic component of nicotine dependence is likely to be an underlying risk factor for family smoking problems as well. It may also be that the smoking behavior of family members serves as a model of smoking behavior for the individual (e.g., Bandura, 1986).

Rebelliousness may be related to nicotine dependence because many adolescents start smoking in order to cultivate a rebellious image (Jarvis, 2004). In addition, rebellious adolescents are likely to have more friends who smoke, which, due to peer influences, increases their own liability to smoke (see Hoffman, Sussman, Unger, & Valente, 2006, for a review of peer influences on cigarette smoking). Although these dynamics may play a greater role in adolescence, their effect on smoking patterns may hold into adulthood.

The relationship between partner's problems with smoking and nicotine dependence can, as previously described, arise either through assortative mating, by which individuals with similar smoking patterns seek each other out as mates, or the influence of one partner's behavior on the other partner. The bulk of the present research suggests that assortative mating, rather than social influence, is primarily responsible for the correlation between the individual's smoking habits and those of his or her partner (Agrawal et al., 2006; Clark & Etile, 2006).

Limitations

A limitation of this study is that the associations between the psychosocial variables and nicotine dependence cannot be considered causal in nature, particularly in light of the cross-sectional nature of the study's design. Nonetheless, our findings do suggest that individuals presenting with particular risk factors (depression, rebelliousness, and family and partner problems with smoking) are more likely to be nicotine-dependent.

Conclusions

The findings reported here carry implications for future research as well as clinical practice. Investigators should bear in mind that, in measuring nicotine dependence, smokers diagnosed as dependent will vary according to whether the FTND or a DSM-based measure is used. Given its short length and tight focus, the FTND is an efficient measure of nicotine addiction and craving. Researchers interested in the narrow symptoms of craving and addiction will find the FTND a direct and effective assessment tool.

However, a corollary of the FTND's tight focus is that the measure may fail to classify as nicotine dependent a number of individuals who display a behavioral pattern of compulsive substance use. Researchers interested in the larger behavioral and social patterns and psychological dimensions associated with nicotine dependence are advised to consider using DSM-based measures of nicotine dependence.

In terms of clinical and treatment implications, clinicians should be cognizant that different measures of nicotine dependence lack agreement as to who should be classified as nicotine dependent. In the current study, this lack of agreement was mostly because the UM-CIDI

classified many more individuals as nicotine dependent than did the FTND. Different measures of nicotine dependence will yield varying frequencies of the disorder.

More generally, clinicians may be well-advised to use symptom profiles typical of nicotine dependence to infer that a patient might be suffering from this condition. For instance, there is an increased risk for nicotine dependence, as defined by either the DSM or the FTND, among individuals exhibiting depressive symptoms, a history of family problems with smoking, rebelliousness, and partner problems with smoking. This indicates that patients presenting with a combination of these symptoms are especially likely to be nicotine dependent.

The association between depression and nicotine dependence, assessed by either measure of nicotine dependence, may be of particular interest to practitioners. Given the dynamic, bidirectional relationship between cigarette smoking and depression (Orlando, Ellickson, & Jinnett, 2001; Windle & Windle, 2001), it is likely that treatment of one condition would ameliorate the other. This underscores the utility of a holistic approach to the treatment of nicotine dependence, whereby nicotine dependence is treated not as an isolated syndrome, but as part of a larger pattern of ill health and poor functioning.

Lastly, practitioners should be aware that nicotine dependent clients may manifest varying patterns of dependence and overall functioning, depending on the measure by which they are defined as nicotine dependent. In FTND-defined dependent smokers, nicotine dependence appears to represent a specific behavioral and physiological craving for tobacco. In DSM-defined dependent smokers, conversely, nicotine dependence grows out of a larger behavioral pattern of substance dependence.

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Table 1

Proportion of Respondents Classified as Nicotine Dependent/Not Dependent (n=475)

	Not Dependent (UM-CIDI)	Dependent (UM-CIDI)
Not Dependent (FTND)	n= 318 (67.0%)	n = 109 (23.0%)
Dependent (FTND)	n = 5 (1.1)%	n = 43 (9.1%)

Table 2

Adjusted Odds Ratios (OR) and 95% Confidence Intervals (CI) for UM-CIDI- and FTND-Defined Nicotine Dependence (N= 475)

Psychosocial Measures	UM-CIDI		FTND	
	AOR	CI	AOR	CI
Age	.90	.77–1.05	.94	.74–1.20
Female	.67	.43–1.05	.92	.49–1.74
Education	.92	.79–1.07	.94	.74–1.17
African American	.83	.53–1.30	.79	.41–1.53
Depressive Symptoms	1.41**	1.13–1.77	1.44*	1.07–1.94
Family Problems with Smoking	1.42**	1.14–1.77	1.67**	1.21–2.30
Partner's problems with Smoking	1.47***	1.19–1.82	1.27	.95–1.68
Rebelliousness	1.21**	1.08–1.36	1.10	.93–1.30

*
p < .05;

**
p < .01;

p < .001

Note: Odds ratios are adjusted for other predictors in the regression equation.