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Big five personality factors and cigarette smoking: A 10-year study among US adults

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Abstract

The present study examined the relation between the big five personality traits and any lifetime cigarette use, progression to daily smoking, and smoking persistence among adults in the United States (US) over a ten-year period. Data were drawn from the Midlife Development in the US (MIDUS) I and II (N=2,101). Logistic regression was used to examine the relationship between continuously measured personality factors and any lifetime cigarette use, smoking progression, and smoking persistence at baseline (1995–1996) and at follow-up (2004–2006). The results revealed that higher levels of openness to experience and neuroticism were each significantly associated with increased risk of any lifetime cigarette use. Neuroticism also was associated with increased risk of progression from ever smoking to daily smoking and persistent daily smoking over a ten-year period. In contrast, conscientiousness was associated with decreased risk of lifetime cigarette use, progression to daily smoking, and smoking persistence. Most, but not all, associations between smoking and personality persisted after adjusting for demographic characteristics, depression, anxiety disorders, and substance use problems. The findings suggest

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CONFLICT OF INTEREST

None.

CONTRIBUTORS

MZ and RDG conceived of the study and wrote the original version of the manuscript. MZ performed statistical analyses. AB and FT provided critical scientific feedback and contributed to interpreting results. All authors have approved the final version of the manuscript.

that openness to experience and neuroticism may be involved in any lifetime cigarette use and smoking progression, and that conscientiousness appears to protect against smoking progression and persistence. These data add to a growing literature suggesting that certain personality factors —most consistently neuroticism—are important to assess and perhaps target during intervention programs for smoking behavior.

Keywords

epidemiology; personality traits; smoking; tobacco; mood disorders

1. Introduction

There are over 1 billion cigarette smokers in the world (World Health Organization, 2008) and approximately 45.3 million of these smokers reside in the United States (US) (Centers for Disease Control and Prevention, 2011). Estimates suggest 21.5% of men and 17.3% of women in the US are current smokers and 78% of these people are daily smokers (Centers for Disease Control and Prevention, 2012). In the 20th century alone, an estimated 100 million people have died from smoking-related illnesses world-wide, and the number could increase unless urgent action is taken to develop effective smoking-based intervention programs (World Health Organization, 2008). To enhance smoking-based prevention and treatment success, programs are increasingly designed to match interventions to individual and social risk factors for smoking (e.g., motivation to change, psychiatric history) (Velicer et al., 1993, Ziedonis et al., 2008).

Personality factors, reflecting individual differences in enduring psychologiclal traits (Clark, 2005, Costa and McCrae, 1992), have been the subject of sustained attention in terms of their role in smoking behavior (Booth-Kewley and Vickers, 1994, Eysenck, 1983, Gilbert, 1995, Leventhal and Cleary, 1980, Munafo et al., 2007, Smith, 1970). Indeed, specific personality traits, such as neuroticism, are often associated with cigarette smoking (Goodwin and Hamilton, 2002, Kubicka et al., 2001, Welch and Poulton, 2009). Although past work explored many definitions and models of personality, the Five-Factor Model (FFM) has been a highly influential and increasingly well-accepted model of personality dimensions (Goldberg, 1990, John, 1990, McCrae and Costa, 1997). The FFM posits that personality traits are comprised of five higher-order factors, including neuroticism (tendency to experience negative emotions), extraversion (sociability and assertiveness), openness to experience (creativity, adventurousness, and receptivity to new ideas), agreeableness (degree to which behavior is generally considered compliant and cooperative), and conscientiousness (self-discipline and organization) (McCrae and Costa, 1997, McCrae and Terracciano, 2005). These five higher-order traits are heritable, highly stable over time, and are evident across diverse social contexts (McCrae and Costa, 1997).

Personality-oriented smoking research has documented numerous clinically important, albeit not fully consistent findings (Kassel et al., 2003). Although numerous methodological factors (e.g., sampling tactics, measurement approaches, time periods of assessment, models of personality being employed) are apt to play a major role in these discrepant results, there

are nevertheless some points of notable convergence. For example, daily smokers compared to former and never smokers tend to be higher in neuroticism (Gilbert, 1995, Kahler et al., 2009, Terracciano and Costa, 2004, Vollrath and Torgersen, 2002). Higher levels of neuroticism are reliably associated with mood management reasons for smoking (Gonzalez et al., 2008) as well as poorer cessation outcomes (Piasecki et al., 1997). Other work has found relatively consistent empirical evidence that smoking initiation in adulthood is predicted by lower levels of conscientiousness (Kubicka et al., 2001); a pattern of findings that is consistent with the broader health behavior literature (Booth-Kewley and Vickers, 1994). Results across a diverse array of studies also suggest that lower levels of agreeableness are often associated with smoking (Malouff et al., 2006). In addition, some studies have found that cigarette smokers also have higher levels of extraversion (Harakeh et al., 2006, Malouff et al., 2006, Munafo and Black, 2007) and openness to experience (Leung et al., 2013) than non-smokers, but the findings are largely inconsistent.

Although promising, past personality-smoking research has not comprehensively examined the FFM in regard to lifetime cigarette use, smoking progression, and smoking persistence in one model over extended periods among adults in the community. In addition, depression and anxiety disorders overlap with some personality factors, such as neuroticism (Brown and Barlow, 2009), that have shown arguably the most consistent relations to smoking. Depression and anxiety disorders are also frequently co-occurring with smoking and nicotine dependence (Ziedonis et al., 2008). Yet, previous studies have not examined the impact of the FFM on smoking while taking into account the potential confounding effects of depression/anxiety disorders. Likewise, substance use problems are often related to smoking (Eckhardt et al., 1994) and specific personality factors (Kotov et al., 2010) yet past work has infrequently adjusted for these potential confounds.

Overall, by gaining a better understanding of how personality influences smoking behavior, it may be possible to improve our ability to implement more effective interventions for smoking prevention and cessation. As such, the purpose of the current study was threefold. First, we examined the relation between FFM personality factors and any lifetime cigarette use over a ten-year period in adulthood. Second, we examined the association between FFM personality factors and progression from any cigarette use to daily smoking. Third, we investigated the relationship between FFM personality factors and persistence of daily smoking over a ten-year period among adults in the US. For all analyses, we adjusted for demographic characteristics, depression, anxiety disorders, and substance use problems.

2. Methods

Data were drawn from the two waves of the Midlife Development in the United States (MIDUS), a national survey of Americans in adulthood that investigated behavioral, psychological, and social factors related to physical and mental health (Brim et al., 2010). The MacArthur Midlife Research Network collected Wave I data from 1995 to 1996 and Wave II data from 2004 to 2006. Wave I consisted of a nationally representative multistage probability sample (main sample) of community-dwelling English speakers in the continental United States (n = 3,032). Participants who completed the telephone interview (response rate = 70%) were mailed a self-administered questionnaire. The response rate

from the mailed questionnaire was 86.6%, yielding a response rate of 61% (.70 * .87 = .61) for Wave I. Of the 3,032 participants from Wave I, 2,101 completed the Wave II telephone surveys (response rate of 69.5%) which was collected by the Institute on Aging at the University of Wisconsin–Madison and supported by the National Institute on Aging (2004 – 2006). Wave II participants completed a 30-min telephone interview and a self-administered questionnaire was mailed to them. For this study, we analyzed only data from those who participated in the Wave I main sample who completed both the phone and mail-in surveys, participated in the Wave II survey, and had complete information for Wave II outcome variables (N = 2,101).

2.1. Measures

2.1.1. Personality traits—Assessment of personality traits in the Midlife Development Inventory Personality Scales (MIDI) was based on the 'big five' factor model (John, 1990). Its development was based on the results of a pilot study conducted in 1994 with a probability sample of 1,000 men and women, aged 30–70 (574 valid cases were usable for item analysis) (Lachman and Weaver, 1997). Items with the highest item to total correlations and factor loadings were selected for the MIDI (Gonzalez et al., 2008, Kassel et al., 2003, Malouff et al., 2006, Vollrath and Torgersen, 2002). Forward regressions were also run to determine the smallest number of items needed to account for over 90% of the total scale variance. Many of the negatively worded items (unemotional, unreliable, unsophisticated, unsympathetic, shy, unsociable) were dropped due to low variance. New items were added to increase reliabilities on some scales. Scales included agreeableness (helpful, warm, caring, softhearted, sympathetic) ($\alpha = 0.80$), 5-item scale; openness to experience (creative, imaginative, intelligent, curious, sophisticated, adventurous) ($\alpha = 0.77$), 7-item scale; conscientiousness (organized, responsible, hardworking, (not) careless) ($\alpha = 0.58$), 4-item scale; extraversion (outgoing, friendly, lively, active, talkative) ($\alpha = 0.78$), 5-item scale; neuroticism (moody, worrying, nervous, (not) calm) ($\alpha = 0.74$) 4-item scale. Responses were on a Likert-scale from 1–4, asking participants to describe how much of the time the particular word described them. The scale ranged from 'all the time', 'most of the time' and 'sometimes' to 'a little'. For each trait, the score for each case was computed by finding the mean of the relevant personality items for cases that had valid values for at least half of the items for that trait. The alphas are based on the MIDUS sample at Wave I (n = 3,032).

2.1.2. Cigarette smoking—At Waves I and II, all participants were asked whether they had ever smoked a cigarette. Those who responded in the affirmative were considered to have lifetime cigarette use and were compared to individuals who reported no lifetime cigarette use in current analyses. Those with cigarette use at Wave I were also asked, "Do you smoke regularly now—that is at least a few cigarettes a day?" at Waves I and II. Those who responded in the affirmative only at Wave II were considered to have progressed to daily smoking. In the current analyses, respondents who progressed to daily smoking were compared to respondents who reported lifetime cigarette use (but never daily use) at Waves I and II. Respondents who reported smoking regularly only at Wave I were excluded from the analyses. Participants who endorsed smoking regularly at both waves were considered to be current daily smokers. For the current analyses, those who responded that they were

currently daily smokers at Waves I and II were considered persistent daily smokers and were compared to those who reported to be daily smokers at Wave I and had quit at Wave II.

2.1.3. Depression, anxiety, and alcohol/substance use problems—The MIDUS psychiatric diagnoses were based on the Composite International Diagnostic Interview Short Form (CIDI-SF) scales, a series of diagnostic-specific scales that were developed from item level analyses of the Composite International Diagnostic Interview (CIDI) questions in the National Comorbidity Survey (Kessler et al., 1998). The CIDI-SF scales were designed to reproduce the full CIDI as exactly as possible, with only a small subset of the original questions. CIDI-SF diagnoses at 12 months included in the MIDUS were major depression, panic attacks, and generalized anxiety disorder. Validity data have been presented suggesting that there is a strong relationship between diagnoses based on the CIDI-SF and the full CIDI (Hedden et al., 2012, Kessler et al., 1998). These measures were used in Wave I and Wave II for past-12 month disorders. The presence of depression was coded as 1 (vs. 0 for no depression). Anxiety disorders were coded as the presence of GAD and/or panic attacks (1 = GAD and/or panic attack presence; 0 = GAD and PA absence). At Wave I, participants were also asked whether they had experienced or been treated for any alcohol or drug problems within the past 12 months. The presence of an alcohol and/or drug use problem was coded as 1 (vs. 0 for no alcohol or drug use problem) for the current analyses.

2.2. Statistical Analyses

Logistic regression analyses were used to examine the relations between each personality trait and the likelihood of each smoking outcome. Odds ratios (with 95% Confidence Intervals) were calculated. Analyses were then adjusted for demographics (i.e., age, gender, education, and race) and then subsequently for Wave I (past 12-month) depression, anxiety disorders (generalized anxiety disorder and panic) and alcohol/substance use problems.

3. Results

3.1. Personality factors and lifetime cigarette use

Neuroticism and openness to experience were associated with significantly increased risk of any lifetime cigarette use (with each additional point there was an increase in risk of smoking; [See Table 1]). These associations remained significant after adjusting for covariates.

Conscientiousness was associated with significantly decreased risk of any lifetime cigarette use. This association was maintained after adjusting for potential confounds.

3.2. Personality factors and progression to daily smoking

Neuroticism was the only personality dimension that was associated with significantly increased likelihood of progression from ever smoking [at Wave I] to daily smoking [at Wave II] (OR=1.3 [1.1, 1.5; see Table 2]). This association persisted in all cases except after adjusting for demographics, depression, or anxiety disorders.

Conscientiousness was associated with significantly decreased risk of progression to daily smoking, except after adjusting for demographics, depression, or alcohol/drug use problems.

3.3. Personality factors and persistence (vs. remission) of daily smoking

Compared with daily smokers at Wave I, who had quit by Wave II, neuroticism was the only personality dimension associated with increased likelihood of persistent smoking (see Table 3); this association persisted in all cases except after adjusting for demographics or anxiety.

Conscientiousness was associated with significantly decreased risk of persistent smoking. This association remained significant except after adjusting for demographics.

4. Discussion

The purpose of this study was to examine the relationship between FFM personality factors and any lifetime cigarette use, progression to daily smoking, and smoking persistence over a ten-year period in adulthood. Results indicated that higher levels of neuroticism and openness to experience were each associated with an increased lifetime smoking history after adjusting for covariates. These data are consistent with previous research that suggest greater curiosity and neuroticism may each individually be related to smoking (Smith, 1970). We also found that conscientiousness appeared to protect against both the onset and persistence of cigarette smoking.

It is likely that neuroticism may be related to emotion-regulation via smoking behavior insofar as individuals who smoke do so in an effort to cope with negative affect or distress (Kassel et al., 2003). Moreover, withdrawal symptoms, which trigger psychological distress, have been shown to be potent stimuli for smoking relapse (Brown et al., 2005). There was consistent empirical evidence that neuroticism, but no other personality dimension, was associated with increased risk of progression from ever smoking to daily smoking and persistent daily smoking over a ten-year period. The observed effect sizes were clinically significant and consistent with effects observed in past smoking research (Gilbert, 1995, Joseph et al., 2003, Kahler et al., 2009, Terracciano and Costa, 2004). These data clearly document that the tendency to experience negative affect plays a formative role in smoking progression and persistence over a relatively long period of time. Although the mechanisms remain unclear, such empirical findings are broadly consistent with theoretical models of mood-smoking comorbidity (Levanthal and Zvolensky, in press, Zvolensky and Bernstein, 2005) as well as emotion-regulation perspective of drug use more generally (Baker et al., 2004) that predict neuroticism should be related to reflexive smoking behavior aimed at achieving addictive-oriented or affect management functions. These data invite theory-driven mechanistic focused work in the future oriented on the linkages between neuroticism, smoking, and anxiety/depression disorders. For example, it may be useful to evaluate a mediational model linking neuroticism to the various smoking outcomes by way of increases in emotional disorders. Overall, these present results may serve to conceptually inform the need to target this high-risk subset of smokers. Namely, smokers higher in neuroticism may benefit from targeted treatments that manage negative mood during efforts to quit or reduce smoking, as has been done with similar negative affect amplifying factors such as anxiety sensitivity (Zvolensky et al., 2014, Zvolensky et al., 2008)

Those with higher levels of openness to experience may have an increased tendency to accept the health risk of experimenting with cigarettes, but may not need to continue to smoke to regulate their emotions and may be better equipped to handle distress associated with withdrawal. Thus, the motivation to use tobacco may be more exploratory in nature rather than a drive to cope with negative affect or stress, and, accordingly, the progression to persistent smoking may be attenuated.

The apparent protective impact of higher levels of conscientiousness on smoking initiation and persistence is largely consistent with the findings of previous studies in which low levels of conscientiousness are predictive of smoking behavior (Kubicka et al., 2001, Malouff et al., 2006). Research has shown that individuals with higher levels of conscientiousness are less likely to take health risks, particularly when it may impact others as well (e.g., secondhand smoke) (Hampson et al., 2000). In fact, conscientiousness appears to be positively related to the engagement of beneficial health-related behaviors and longevity (Bogg and Roberts, 2004). Consequently, interventions that can reinforce facets of conscientiousness—such as self-discipline, impulse control, and delayed-gratification—may be useful in reducing tobacco use.

The clinical implications of the current report are twofold. First, it may be advisable to screen smokers for higher levels of neuroticism in the context of smoking cessation. These individuals appear to be at a higher risk for smoking cessation problems and in need of more intensive, or even tailored, treatment approaches relative to smokers lower in neuroticism. Second, it is possible that smoking cessation programs may be enhanced by developing specialized treatment approaches for smokers with higher levels of neuroticism. For example, transdiagnostic prevention programs or treatments for anxious/depressed smokers that include psychoeducation and cognitive-behavioral strategies for negative mood propensity may serve to address the 'neuroticism component' and thereby facilitate lower odds of smoking initiation and/or greater success in quitting compared to the standard relapse/prevention model of smoking cessation.

There are a variety of limitations that should be noted. First, while these results are generalizable to the adult US population, it is not clear whether they are applicable internationally. Second, the conscientiousness measure used has a low coefficient alpha ($\alpha <$. 60). Third, participants were examined at two separate time points; accordingly, changes that may have occurred between these time periods are unknown. Fourth, approximately one-third of participants from Wave I did not complete Wave II of the survey, potentially leading to a bias (e.g., mortality). Fifth, the study was based on participant self-report, and therefore, method variance could influence the reported findings. Sixth, there was no measurement of nicotine dependence. Thus, future studies would benefit from modeling personality relations to nicotine dependence and other indices of smoking severity. Seventh, it is also important to note that many of the effect sizes in this study were small. Thus, the clinical significance of this work should be judged in the context of its limitations and the naturalistic design employed. Finally, it is noteworthy that we did not have data on participants who dropped out of the investigation. Therefore, there is necessarily some caution that must be applied to the comparability of 'drop outs' versus 'completers.' Although this limitation is not inherent to the current report, it is possible that those participants who

dropped out from the investigation were somehow different from those that completed it (e.g., more severe in psychopathology).

There are several directions for future investigations as studies examining the cross-national consistency of the current findings are important. Future investigations could usefully build upon the current study by attempting to explicate mediating and moderating processes involved in linkages between FFM personality factors and smoking behavior. Multimethod approaches would be a useful methodological next-step in exploring personality-smoking patterning over time.

Overall, the findings of the present investigation suggest that openness to experience is related to lifetime cigarette use and that neuroticism plays an important role in many aspects of smoking progression and persistence over time. In addition, the results suggest that conscientiousness may be protective against lifetime cigarette use, progression to daily smoking, and smoking persistence. However, there was little prospective evidence that other personality dimensions were related to the smoking outcomes examined.

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HIGHLIGHTS

- Traits from the Five-Factor Model of personality appear to influence the onset, progression and persistence of cigarette smoking across a ten-year period among adults in the United States.
- Higher levels of openness to experience and neuroticism are each significantly associated with increased risk of any lifetime cigarette use.
- Neuroticism is also associated with increased risk of progression from ever smoking to daily smoking and increased likelihood of persistent daily smoking over a ten year period.
- Conscientiousness appears to protect against progression and persistence of cigarette smoking.
- Many, but not all, of the observed associations remained significant after adjusting for demographic characteristics, depression, anxiety disorders, and alcohol/substance use problems.

Table 1

Big-Five personality factors and lifetime cigarette use

W1	Never smoked a cigarette N=(640) M (SD)	Lifetime cigarette user N=(1176) M (SD)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)	AOR[c] (95% CI)	AOR[d] (95% CI)
Agreeableness	3.49 (0.49)	3.49 (0.47)	1.0 (0.8, 1.2)	n/a	n/a	n/a	n/a
Extraversion	3.21 (0.56)	3.21 (0.57)	1.0 (0.8, 1.2)	n/a	n/a	n/a	n/a
Neuroticism	2.24 (0.66)	2.33 (0.70)	**1.2 (1.1, 1.4)**	**1.3 (1.1, 1.6)**	**1.1 (1.0, 1.3)**	**1.2 (1.0, 1.4)**	**1.2 (1.0, 1.4)**
Conscientiousness	3.45 (0.45)	3.40 (0.45)	*0.7 (0.6, 0.9)*	*0.8 (0.6, 0.98)*	*0.7 (0.6, 0.9)*	*0.7 (0.6, 0.9)*	*0.7 (0.6, 0.9)*
Openness	2.98 (0.54)	3.03 (0.52)	**1.2 (1.0, 1.5)**	**1.3 (1.1, 1.6)**	**1.2 (1.01, 1.5)**	**1.2 (1.01, 1.5)**	**1.2 (1.0, 1.5)**

[a] AOR = Age, gender, education, race

[b] AOR = Wave 1 depression

[c] AOR = Wave 1 anxiety disorders (GAD or panic attacks)

[d] AOR = Wave 1 alcohol or drug use problem

Bold = risk factor; associated with higher odds of outcome

Italics = protective factor; associated with lower odds of outcome

Table 2

Personality factors and progression to daily smoking

W1	Lifetime cigarette user (never daily smoker) N = (514) M (SD)	Daily smoker at W2 only N = (525) M (SD)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI) (95%	AOR[c] (95% CI)	AOR[d] (95% CI)
Agreeableness	3.45 (0.51)	3.50 (0.44)	1.3 (0.98, 1.7)	n/a	n/a	n/a	n/a
Extraversion	3.21 (0.57)	3.24 (0.53)	1.1 (0.9, 1.4)	n/a	n/a	n/a	n/a
Neuroticism	2.24 (0.64)	2.36 (0.74)	**1.3 (1.1, 1.5)**	1.1 (0.9, 1.4)	1.1 (0.9, 1.4)	1.1 (0.9, 1.3)	**1.3 (1.1, 1.5)**
Conscientiousness	3.43 (0.45)	3.35 (0.46)	*0.7 (0.5, 0.9)*	0.7 (0.5, 1.0)	0.7 (0.5, 1.0)	*0.7 (0.5, 0.9)*	0.7 (0.5, 1.0)
Openness	3.03 (0.54)	3.04 (0.50)	1.0 (0.8, 1.3)	1.3 (0.96, 1.6)	1.1 (0.8, 1.4)	1.1 (0.8, 1.4)	1.05 (0.8, 1.3)

[a] AOR = Age, gender, education, race

[b] AOR = Wave 1 depression

[c] AOR = Wave 1 anxiety disorders (GAD or panic attacks)

[d] AOR = Wave 1 alcohol or drug use problem

Bold = risk factor; associated with higher odds of outcome

Italics = protective factor; associated with lower odds of outcome

Table 3

Personality factors and persistence of daily smoking

W1	Daily smoker at W1, quit by W2 N=548 M (SD)	Persistent daily smoker at W1 and W2 N=356 M (SD)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)	AOR[c] (95% CI)	AOR[d] (95% CI)
Agreeableness	3.48 (0.49)	3.49 (0.47)	1.0 (0.8, 1.4)	n/a	n/a	n/a	n/a
Extraversion	3.18 (0.60)	3.23 (0.53)	1.1 (0.9, 1.5)	n/a	n/a	n/a	n/a
Neuroticism	2.28 (0.67)	2.41 (0.75)	**1.3 (1.1, 1.6)**	1.0 (0.8, 1.2)	**1.2 (1.0, 1.5)**	1.1 (0.9, 1.4)	**1.3 (1.3, 1.5)**
Conscientiousness	3.4 (0.44)	3.33 (0.46)	*0.7 (0.5, 0.9)*	0.7 (0.5, 1.0)	*0.7 (0.5, 0.9)*	*0.7 (0.5, 0.9)*	*0.7 (0.5, 0.96)*
Openness	3.03 (0.53)	3.02 (0.52)	1.0 (0.8, 1.3)	n/a	n/a	n/a	n/a

[a] AOR = Age, gender, education, race

[b] AOR = Wave 1 depression

[c] AOR = Wave 1 anxiety disorders (GAD or panic attacks)

[d] AOR = Wave 1 alcohol or drug use problem

Bold = risk factor; associated with higher odds of outcome

Italics = protective factor; associated with lower odds of outcome