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## Smoking and the Five-Factor Model of Personality

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### Abstract

**Aims**—Investigating the association between personality traits and smoking status using a comprehensive model of personality, the Five-Factor Model (FFM).

**Design**—Cross-sectional survey.

**Setting**—Baltimore, MD, USA.

**Participants**—Adult-elderly Americans ( $n = 1638$ ).

**Measurements**—A self-administered survey on cigarette smoking and the Revised NEO Personality Inventory.

**Findings**—Current-smokers scored higher than never-smokers on Neuroticism and lower on Agreeableness and Conscientiousness; former-smokers scored intermediate on these higher-order dimensions. Neuroticism was related to smoking particularly among individuals with low Conscientiousness, as indicated by an interaction effect between the two factors. There were no differences on Extraversion and Openness to Experience. At the lower-order facet level, smokers were characterized by inability to resist cravings (high Impulsiveness), search for stimulation (high Excitement-seeking), lack of perseverance (low Self-Discipline), and lack of careful consideration of the consequences of their actions (low Deliberation).

**Conclusions**—At the higher-order factor level, this study replicates and extends previous studies using a comprehensive model of personality (FFM). The greater specificity provided by the facet-level analysis appears to explain some of the conflicting results in the literature, and the use of an older sample provides insight especially into the former smokers group. Personality research may lead to a deeper understanding of cigarette smoking and can potentially contribute to policies and programs of smoking prevention and cessation.

### Keywords

Smoking; health risk behavior; personality traits; Five-Factor Model; neuroticism; impulsivity; conscientiousness; interaction effect

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The World Health Organization (WHO, 2002) identifies tobacco smoking as a major preventable risk factor for disease, disability, and death. Programs of smoking prevention and cessation are based on an understanding of the psychological, social, biological, and pharmacological processes involved in smoking initiation and maintenance (Leventhal & Cleary 1980). Smoking cessation programs are increasingly concerned with matching interventions to individuals' needs and their stage of change (Velicer *et al.* 1993, Prochaska *et al.* 2001). From this perspective, it is important to identify individual difference variables particularly personality traits that increase the risk for cigarette smoking. Understanding the

influence of personality on behavior may improve interventions through public policies and personalized treatment.

Personality traits are enduring dispositions (McCrae & Costa 2003) and major determinants of behavior (Paunonen 2003). In the last few decades, a growing consensus has supported the Five-Factor Model (FFM, see Digman 1990, Goldberg 1990, John 1990, McCrae & John 1992, McCrae 2001a, but see Block 1995) as a comprehensive yet manageable taxonomy of traits. Those traits have been shown to be heritable (e.g. Jang *et al.* 1998) and generalizable across-cultures (McCrae & Costa 1997, Paunonen *et al.* 2000, McCrae 2001b, see also Triandis & Suh 2002). The FFM is a hierarchical model that organizes personality traits into five broad or higher-order factors of Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Each factor is defined by six more specific, lower-order traits, known as facets (see Table 1 for a listing of the 30 facet scales). In this study, the five broad factors as well as the specific facets, were used as a framework to investigate the relationship between smoking and personality.

A large number of studies have examined the relationships between personality traits and cigarette smoking variables. Although the personality differences between smokers and non-smokers are usually small, they are important considering the large number of people who smoke (World Health Organization 2002). Even a small contribution of personality research may enhance knowledge of smoking behavior and have a clinical impact through the improvement of smoking prevention and cessation programs.

In 1970, Smith reviewed the empirical literature, and despite conflicting data, concluded that smokers were more extraverted, externally oriented, impulsive, and showed more anti-social tendencies/disagreeableness and poorer mental health than non-smokers. Most of the later studies have been conducted on broad traits conceptually related to the stimulating and mood-regulating effects of cigarette smoking. Eysenck (1980) argued that individuals high in Extraversion would smoke in search of stimulation, whereas individuals high in Neuroticism would smoke to reduce tension and anxiety (see also Tate, Pomerleau & Pomerleau 1994). Results across studies are mixed (e.g., McCrae, Costa & Bosse 1978, Eysenck 1980, Breslau, Kilbey & Andreski 1993, Arai *et al.* 1997, Kassel, Stroud & Paronis 2003), but when differences were found, smokers tended to score higher on Neuroticism and Extraversion compared to those who never smoked. Fewer studies have examined the association of smoking status with other major dimensions of personality. Some studies have found smokers to score higher than non-smokers on Eysenck's Psychoticism (e.g., Spielberger & Jacobs 1982, Arai *et al.* 1997, but see Parkes 1984, Breslau, Kilbey & Andreski 1994), a construct inversely related to Agreeableness and Conscientiousness (McCrae & Costa 1985, Goldberg & Rosolack 1994). Smoking is regarded as somewhat antisocial (Eysenck 1980), and, consistent with this view, Smith (1967) found that smokers were rated by their peers as being low on Agreeableness. Vollrath, Knoch and Cassano (1999) found smoking to be inversely related to self-reported Agreeableness. There is evidence that low Conscientiousness is related to health risk behaviors (Booth-Kewley & Vickers 1994, Vollrath *et al.* 1999, Trobst *et al.* 2000, Vollrath & Torgersen 2002). A remarkable 24-year follow-up study (Kubicka *et al.* 2001) showed that low Conscientiousness in children, but not Neuroticism or Extraversion, was a predictor of smoking in adulthood. Gilbert (1995) summarized studies subsequent to the review of Smith (1970). Despite some inconsistency he concluded that smokers differed most reliably on Psychoticism (especially impulsivity, antisocial behavior, sensation seeking, and aggression) and Neuroticism. He argued that recent studies found only a weak relationship between smoking and Extraversion, and the role of Openness has not been adequately assessed.

There are several possible explanations for the discrepancies in the literature. The studies conducted span large time periods and involve different countries. Cultural factors and public

policy influence greatly the prevalence of smoking in the population and in turn the characteristics of smokers (Hughes *et al.* 1997). Knowledge of the adverse health consequences of smoking and stringent social policy has produced dramatic effects on some groups but not on others (Pomerleau 1997), and US smokers today are likely to be different from the US smokers of a few decades ago, or current smokers in non-Western countries. The inconsistency in the literature may derive also from comparisons of studies that have used different instruments, different methods of classification of smoking status, or different populations sampled. Another possible reason for inconsistency across studies is the broad and heterogeneous nature of the dimensions studied. For example, the FFM characterizes Extraversion as being hierarchically related to six lower-order facets such as Warmth, Gregariousness, Assertiveness, Activity, Excitement Seeking, and Positive Emotions. Among these, only Excitement Seeking is conceptually related to Eysenck's hypothesis and neurochemical evidence that smoking produces central nervous system stimulation (see also Benowitz 1988, Carton, Jouvent & Widlocher 1994, Stein *et al.* 1998). Although the six facets tend to covary, each has unique variance and predictive value (Paunonen & Ashton 2001), and they are not equally represented in all global measures of Extraversion. More consistent results might be obtained if the specific facets were assessed.

Analysis at the level of facets permits the examination of multi-faceted constructs, which could be relevant to understanding smoking behavior. For example, Whiteside and Lynam (2001) point out that four facets from three factors or domains of the Revised NEO Personality Inventory (NEO-PI-R, Costa & McCrae 1992) define the multi-faceted construct of impulsivity: Impulsiveness, one of the six facets of Neuroticism, refers to the inability to resist cravings and urges; Excitement Seeking, a facet of Extraversion, refers to the tendency to seek excitement and stimulation; low Self-Discipline, a facet of Conscientiousness, refers to the inability to begin and complete a task in the face of boredom and other distractions; and low Deliberation, another facet of Conscientiousness, refers to the tendency to act without considering the consequences (Costa & McCrae 1992). These facets likely play a role in smoking initiation, maintenance, or cessation, and only analyses at the facet level offer the opportunity to assess their importance.

Even at the global factor level, new analyses might be revealing. Parkes (1984) performed discriminant analyses on Eysenck's dimensions and found interactions between Neuroticism and Psychoticism and between Neuroticism and Extraversion to contribute significantly to the differentiation between smokers and non-smokers. Vollrath and Torgersen (2002) used a typological approach and found that individuals both high in Neuroticism and low in Conscientiousness were disproportionately likely to be smokers. The analysis of interaction effects and the use of a typological approach have the advantage of considering multiple dimensions simultaneously. Examining complex interactions is interesting because the effect of a single personality factor can be intensified, weakened or cancelled by the individual's standing on other factors. In this study we examined the interactive effects between the factors of the FFM, to investigate whether combinations of traits have unique effects. The ten possible pairs from the five factors are also known as personality styles: Neuroticism x Extraversion, style of Well-Being; Neuroticism x Openness, style of Defense; Neuroticism x Agreeableness, style of Anger Control; Neuroticism x Conscientiousness, style of Impulse Control; Extraversion x Openness, style of Interest; Extraversion x Agreeableness, style of Interaction; Extraversion x Conscientiousness, style of Activity; Openness x Agreeableness, style of Attitude; Openness x Conscientiousness, style of Learning; Agreeableness x Conscientiousness, style of Character (Costa & McCrae 2000).

Another notable feature of this study is the demographics of the sample studied: middle-aged and elderly adults. As a group, these men and women are at low risk of smoking initiation, but at higher (immediate) risk of the adverse effects of smoking on health. Older populations

include a large proportion of former smokers, a group that cannot be well addressed with a younger sample. Finally, older populations are of interest because they have been less frequently studied.

To summarize, this study examined personality differences between never, former, and current smokers on the five broad factors and 30 specific facets of the FFM. The analyses at the factor level have the potential to replicate and extend previous studies. The analyses at the level of facets can provide a more detailed profile of the smoker groups and potentially resolve inconsistencies in the literature. Finally, interactions between factors were examined to evaluate the effects of combinations of personality traits.

## Method

### Sample

Participants ( $N = 1638$ ; age range from 20 to 96,  $M = 60.3$ ,  $SD = 18$ ) completed questionnaires as part of the Baltimore Longitudinal Study on Aging (BLSA, Shock *et al.* 1984). The BLSA is not a probability sample; participation is on a voluntary basis. However, prior studies did show that findings from this sample were consistent with the findings from representative samples (Costa *et al.* 1986). Most of BLSA participants are highly educated, have high socioeconomic status, and are relatively healthy. For the analyses of this study, participants were divided into three groups, according to smoking status. “Never-smokers” ( $n = 828$ , 50.5%) never smoked, or smoked fewer than 100 cigarettes over their entire lifetime. “Former-smokers” ( $n = 694$ , 42.4%) were those who have quit smoking. On average, former-smokers started smoking at age 19 ( $SD = 5.3$ , range = 7 to 56), smoked for 19 years ( $SD = 13.5$ , range = 0 to 62 years) and quit 24 years ago ( $SD = 14.9$ , range = 1 to 70 years). “Current-smokers” ( $n = 116$ , 7.1%) were those who reported smoking at the time of the most recent visit. On average, current-smokers started smoking at age 20 ( $SD = 6.5$ , range = 8 to 44), and have smoked for 29 years ( $SD = 17.6$ , range = 0 to 72 years).

Smoking and personality assessments were both collected during each two-day visit to the Gerontology Research Center, Baltimore, MD, USA. The most recent visit was considered in the cases of multiple assessments. Most participants completed smoking and personality questionnaires on the same day or within 48 hours. About 2.4% of cases had no personality or smoking data collected during the most recent visit. In those cases the data from the next most recent visit were used (there was on average a two year interval between visits). The data available were collected from 1989 through 2002. The median date of visit was August 1996 for the never-smokers, March 1997 for the former-smokers, and October 1993 for the current smokers. Those dates reflect the decline in the number of US smokers in the 1990s.

There were gender differences in the three groups ( $\chi^2(2) = 31$ ,  $p < .001$ ). More women were never-smokers (22.5% men vs. 28.1% women), whereas more men were former-smokers (24.9% men vs. 17.5% women). Gender differences among the current-smokers were small (3.6% men vs. 3.5% women). The groups differed in age ( $F(2, 1634) = 36.7$ ,  $p < .001$ ). The former-smokers ( $M = 64.2$ ,  $SD = 15.8$ ) were older than the never-smokers ( $M = 58.3$ ,  $SD = 19$ ), who were older than the current-smokers ( $M = 51.5$ ,  $SD = 17.7$ ). There were also significant differences in years of education ( $F(2, 1582) = 6.9$ ,  $p = .001$ ). Current-smokers ( $M = 15.4$ ,  $SD = 2.7$ ) were significantly less educated than former-smokers ( $M = 16.2$ ,  $SD = 2.7$ ) and never-smokers ( $M = 16.4$ ,  $SD = 2.4$ ). The low percentage of current-smokers, the high percentage of former-smokers, and the pattern observed for gender, age, and education are reasonably in line with the United States population of older individuals with high education (Center for Disease Control 2002). According to the National Health Interview Survey, United States, 2000 (Center for Disease Control 2002), the prevalence of smoking was 9.7% among the population older than 65 years. The prevalence was also lower among individuals with high education (13.2%

among those with an undergraduate degree and 8.4% among those with a graduate degree) and who are above the poverty level.

### Personality Assessment

The NEO-PI-R (Costa & McCrae 1992) is a self-report questionnaire consisting of 240 items answered on a five-point Likert scale ranging from *strongly disagree* to *strongly agree*. The NEO-PI-R assesses 30 facets, six for each dimension of the FFM. Normative data are used to standardize raw scores into *T*-scores ( $M = 50$ ,  $SD = 10$ ). NEO-PI-R scales have shown longitudinal stability, cross-observer agreement, and convergent and discriminant validity in a large body of studies (Costa & McCrae 1992).

### Statistical Analyses

All analyses were performed using SPSS 11.0.1. The assumption of homogeneity of variance for the ANOVA was tested using the Levene statistic. No large violations were found and robust statistics produced consistent results. In the major analysis reported in Table 1, Bonferroni correction was performed to evaluate the statistical significance of mean differences among the three groups. Because 35 comparisons were performed, the .05 and .01 significance levels were divided by 35 ( $.05/35 = .0014$ ;  $.01/35 = .00029$ ). The effect sizes were estimated with  $\eta^2$ . According to Cohen (1998),  $\eta^2$  values of .0099, .0588, and .1379 correspond to small, medium, and large effect sizes, respectively.

### Results

Means (SD) for personality traits for the never, former, and current-smoker groups are reported in Table 1. Analysis of variance (see *F* values in Table 1) indicates that there were significant differences among groups on Neuroticism, Agreeableness, and Conscientiousness, but no significant differences on Extraversion or Openness factors. Post-hoc tests indicate that current-smokers compared to non-smokers scored significantly higher on Neuroticism and significantly lower on Agreeableness and Conscientiousness, with the difference in Conscientiousness larger than 0.5 *SD*,  $d = .6$ . Former-smokers showed intermediate scores on the above factors, with significant differences from the other groups on Neuroticism and Conscientiousness. Former-smokers also scored significantly lower than never-smokers in Agreeableness. Additional analyses indicated that individuals who smoked fewer than 100 cigarettes in their lifetime scored intermediate between never and former smokers on Neuroticism, Agreeableness and Conscientiousness, but they were not significantly different from never smokers.

Analyses at the facet level indicate that with the exception of Self-Consciousness, all facets of Neuroticism showed significant differences among smoking status groups. Current-smokers scored higher than the other groups on all facets of Neuroticism, with the largest differences in Impulsiveness. Among the facets of Extraversion, there were significant differences only on Excitement Seeking, with current-smokers scoring higher than never-smokers. There were significant differences on Openness to Values, with current-smokers scoring the highest. There were also significant differences on Straightforwardness, Altruism, and Compliance, with current-smokers scoring lower than never-smokers. There were significant differences among groups on all facets of Conscientiousness, with smokers scoring clearly lower than non-smokers. The  $\eta^2$  values are between small and medium effect size (Cohen 1988), which are consistent with previous studies.

ANCOVAs were performed to control for the effect of age and education because smokers were younger and less educated than non-smokers, and there are known maturational changes (McCrae *et al.* 1999) and effects of education (Costa & McCrae 1992) on personality traits.

After controlling for age and education, the differences among groups remained unchanged. There were differences in gender composition in the three groups and there are known sex differences in personality traits (Costa, Terracciano & McCrae 2001). The present analysis used *T*-scores standardized within gender, thus adjusting for gender effects.

In addition to the above statistical controls, a “design control” was performed, selecting never and former smokers who were sex- and age-matched to the current smokers. To select never and former smokers from the large samples, a random procedure was used when multiple cases matched the characteristic of the current smokers. The resulting samples of never ( $n = 116$ , age  $M = 51.5$ , range 21 to 89) and former smokers ( $n = 116$ , age  $M = 51.7$ , range 21 to 89) matched almost perfectly the sample of current smokers ( $n = 116$ , age  $M = 51.5$ , range 21 to 89). ANOVAs indicated that differences among the sex- and age-matched groups were reasonably consistent with the results obtained with the full sample. In particular, there were significant differences on Neuroticism ( $p = .001$ ), Agreeableness ( $p = .001$ ), and Conscientiousness ( $p < .001$ ), but not on Extraversion and Openness ( $p > .05$ ). The only notable difference was the non-significant differences on Excitement Seeking in the sex-and-age-matched sample.

Vollrath and Torgersen (2002) used a typological approach to examine configurations of personality traits in regard to health risk behaviors. They found that individuals both high in Neuroticism and low in Conscientiousness were disproportionately likely to be smokers. To replicate and extend their study, a stepwise hierarchical discriminant analysis was performed to identify factors and interactions between factors that provide the best discrimination among groups. A two stage hierarchical analysis was adopted, entering first the five factors and then the ten two-way interactions. The interaction terms were represented by the cross-products of the factors (e.g., Neuroticism  $\times$  Extraversion). As advocated by Cohen (1978), in the hierarchical approach the two-way interactions are corrected for the effects of the main factors; in other words, they explain variance beyond that explained by the main factors. Three of the five factors, Conscientiousness ( $\Lambda = .970$ ,  $F(2, 1635) = 25.62$ ,  $p < .001$ ), Agreeableness ( $\Lambda = .958$ ,  $F(4, 3268) = 17.67$ ,  $p < .001$ ), and Neuroticism ( $\Lambda = .950$ ,  $F(6, 3266) = 14.02$ ,  $p < .001$ ) were found to contribute significantly to the discriminant function. Of all possible interaction terms, only Neuroticism  $\times$  Conscientiousness contributed significantly to the discriminant function ( $\Lambda = .946$ ,  $F(8, 3264) = 11.59$ ,  $p < .001$ ,  $\eta^2 = 1 - \Lambda = .054$ ). Further analyses showed that the discriminant analysis results were robust across different multivariate methods (e.g., multinomial logistic regression, GLM on dichotomized factors). The interactive effect of Neuroticism and Conscientiousness is illustrated in Figure 1, in which the proportions of never, former, and current smokers are stratified by the Style of Impulse Control (combination of scores on Neuroticism and Conscientiousness; Costa, McCrae & PAR Staff 2000). The group low in Conscientiousness and high in Neuroticism (under-controlled style) was about two times more likely to be current smokers than the group low in Conscientiousness and low on Neuroticism (relaxed), and was three times more likely to be current smokers than groups high on Conscientiousness and high (over-controlled) or low (directed) on Neuroticism. This suggests that Neuroticism was related to smoking mostly among individuals low on Conscientiousness.

## Discussion

There has been great progress in trait psychology in the past 20 years, with a general consensus on the FFM as a reasonably comprehensive taxonomy of personality traits. A major contribution of the present study is its use of the FFM to investigate the association between cigarette smoking and personality traits. Analyses at the facet level extend knowledge, allow direct tests of hypotheses, and provide insight into the dynamics of cigarette smoking.

Current-smokers were found to score significantly higher than never-smokers on Neuroticism and significantly lower on Agreeableness and Conscientiousness. Former-smokers showed intermediate scores on these factors, with significant differences from the others groups in Neuroticism and Conscientiousness, suggesting that Neuroticism and Conscientiousness may play a role in both smoking initiation and maintenance/cessation. No differences on overall Extraversion or Openness were observed among groups. These effects remained after controlling for age, education, and sex with a statistical and a design control. At the facet level, all facets of Neuroticism except Self-Consciousness showed significant differences among groups, with the largest differences in Impulsiveness. The smokers' higher scores on Neuroticism facets are consistent with the susceptibility toward psychopathology found in nicotine-dependent smokers (e.g., Breslau *et al.* 1993). The high score on Neuroticism is also consistent with the view that some individuals use cigarette smoking as self-medication (Khantzian 1997). There is striking evidence (Fowler *et al.* 1996) that smoking inhibits monoamine oxidase, which breaks down neurotransmitters such as serotonin and dopamine that are implicated in mood regulation. The Fowler *et al.* study highlights the importance of investigating biological and genetic factors underlying or moderating the association of personality traits and smoking. Possible genetic moderators, especially genes involved with serotonin and dopamine systems, are plausible candidates.

High scores on Neuroticism could be a cause as well as an effect of smoking. Indeed, longitudinal data suggest that high Neuroticism is a risk factor for smoking initiation (Cherry & Kiernan 1976). Other evidence indicates that nicotine depletion (i.e., time between cigarettes) produces high negative affective states (Costa & McCrae 1981, Parrott 1998, Picciotto, Brunzell & Caldarone 2002) and over long periods of time, cigarette smoking may increase the risk of anxiety and depressive disorders (Choi *et al.* 1997, Wu & Anthony 1999, Johnson *et al.* 2000). Consistent with previous studies (Parrott 1998), former-smokers scored lower on Neuroticism compared to current-smokers. It is possible that even before quitting, former-smokers had a lower Neuroticism score compared to individuals who continued to smoke, which may have facilitated quitting: The stress of nicotine withdrawal may be more tolerable to better adjusted people (Hall *et al.* 1993, Covey, Glassman & Stetner 1997, Madden *et al.* 1997). Alternatively, quitting smoking may reduce stress and lower Neuroticism, as some evidence suggests (Parrott 1995, 1998), providing an additional incentive for quitting smoking.

Among the facets of Extraversion, only Excitement-Seeking differed among groups, with current smokers scoring higher than non-smokers. The role of Excitement-Seeking is particularly relevant in light of the stimulating effect of nicotine. However, global Extraversion was unrelated to smoking status, because there were no differences among groups on the other facets. Prior findings suggesting that Extraversion is related to smoking were often obtained using measure of Extraversion that included impulsivity as facet (Eysenck & Eysenck 1964). Different questionnaires assess Extraversion through different facets and this might explain the literature's inconsistent results regarding the broad Extraversion factor. Another intriguing, although speculative, possibility is that extraverts are more likely to be smokers within populations with a high prevalence of smokers, where smoking is less socially disapproved (Eysenck 1983). Indeed, the association of smoking with Extraversion was found in the US population before 1970–1980 (Smith 1970), but not in the last two decades, whereas the association is still found in countries with a high prevalence of smokers, such as Japan (Arai *et al.* 1997). An inverse pattern could be argued for Neuroticism.

Considering the social pressure against starting and continuing smoking, the smokers' lower scores on Agreeableness facets are not surprising. Some studies suggest that rebelliousness, a trait closely related to low Agreeableness, contributes to the etiology of cigarette smoking (Stewart & Livson 1966). Individuals with low scores on Agreeableness are antagonistic, hostile, and intolerant; they have lower needs for social approval and thus are more likely to

start and continue smoking in spite of the deleterious effect of smoking upon other people (e.g., environmental tobacco smoke or secondhand smoking, negative role models). Among the facets of Conscientiousness, smokers were particularly lower in Self-Discipline and Deliberation, which are related to the impulsivity construct. Lack of persistence, restraint, and dutifulness are likely to play a critical role in the individual's susceptibility to smoking initiation. The same personality characteristics are also likely to undermine efforts in smoking cessation programs. Low Conscientiousness has been associated with other health risk behaviors (see Trobst *et al.* 2000), and the present study supports the view that Conscientiousness is the strongest personality predictor of health risk behaviors (Booth-Kewley & Vickers 1994). It is worth noting that the personality dimension of Conscientiousness, which showed the largest association to smoking behavior in this study, has rarely been considered in previous studies. This finding supports the need for the use of a comprehensive model of personality to avoid the risk of neglecting important correlates of health risk behavior.

Combinations of personality traits (styles or types) have been related to smoking. Vollrath and Torgersen (2002) reported that the *Impulsive* and *Insecure* personality types, which are both characterized by low Conscientiousness and high Neuroticism, are more likely to be current-smokers. Analyses on the present sample are highly consistent with their findings and are somewhat consistent with the Parkes' (1984) findings of an interaction between Neuroticism and Psychoticism but not with the finding of interaction between Neuroticism and Extraversion. The Neuroticism  $\times$  Conscientiousness interaction effect illustrates that personality traits can influence behavior in a complex manner. The level of Conscientiousness seems to be a moderator factor in the relationship between Neuroticism and smoking. Neuroticism was related to smoking particularly among individuals with low Conscientiousness, an effect that may have contributed to produce inconsistent results across studies. These data suggest that individuals high on Conscientiousness may not adopt the same maladaptive strategy (i.e., smoking) to deal with high Neuroticism. Of relevance, high Neuroticism and low Conscientiousness defines the Under-controlled style of Impulse Control. Under-controlled individuals are described as being "often at the mercy of their own impulses. They find it difficult and distressing to resist any urge or desire, and they lack self-control to hold their urges in check. As a result, they may act in ways that they know are not in their long-term interests. They may be particularly susceptible to substance abuse and other health risk behaviors" (Costa, McCrae & PAR Staff 2000).

The findings of the present study have implications for understanding smoking and smoking cessation programs. The high impulsivity of smokers, expressed in their inability to resist cravings, search for stimulation, lack of careful consideration of the consequences of their actions, and their limited self-discipline, suggest that relying only on the individual's resources could be a poor strategy for smoking prevention and cessation. Even with full knowledge of the harmful effects of smoking, individuals with this personality profile may be unable to control their smoking. Data from the WHO confirm that societal pressure in the form of high taxation, restriction in advertising, and interdiction of smoking in public places are more cost effective than programs that rely on the efforts of individual smokers. However, evidence that smokers are not a homogeneous group suggests that a diversity of treatment modalities is necessary. For example, smokers high on Neuroticism might benefit from psychotherapy or antidepressant treatment. A combination of public policy and treatment strategies tailored to the needs of individual smokers is required to reduce the prevalence of cigarette smoking. Potentially important in this regard, is the addition of personality trait profiles to expert-systems interventions for smoking cessation as described by Velicer and Prochaska (1999). Their Pathways to Change System is based upon the Transtheoretical model of change and provides assessments and feedback related to the individuals' needs and readiness to change. Efficacy is evidenced by cessation rates of 22-26% in a general population. An important and interesting



aspect of future research is to consider how to integrate individual smoker's personality trait information into population-based intervention programs. Indeed, different treatment options are available, and all seem effective on some individuals but not on others. Personality traits may provide indications of which treatments are more likely to be effective. For example, individuals high on Neuroticism may benefit from psychotherapy or medication or both. Such indications could be based on observational data from former smokers, assessing their personality traits and their successful and unsuccessful ways of quitting. More compelling data would come from assessing personality traits in individuals involved in ongoing cessation treatment programs. In both cases, it would be possible to test whether personality traits affect the success rate of each treatment program.

This study was conducted on an adult-elderly US population, from 1989 to 2002. Although the findings are likely to generalize to the US adult population today, historical and cross-cultural differences may shape the association of smoking status with personality traits. As argued by Hughes et al. (1997), the prevalence of smoking is constantly changing, with different trends in different times and cultures. Continuous monitoring of the variables associated with smoking status is essential to addressing this major public health treat.

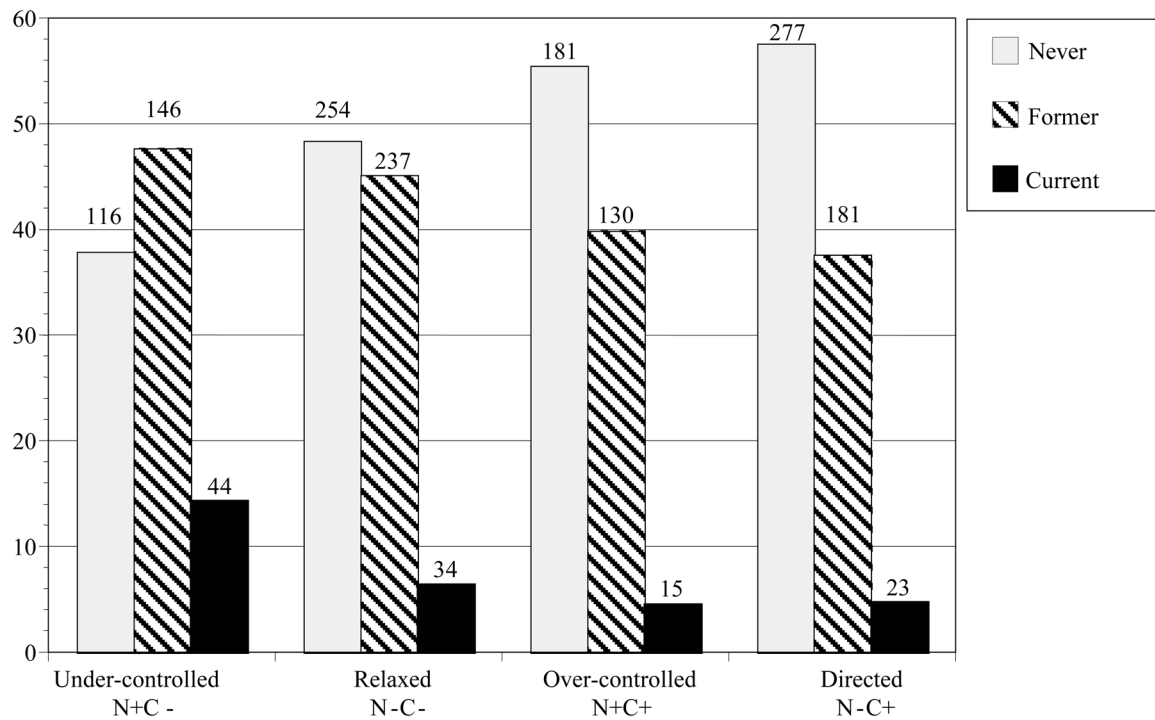
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**Figure 1. Proportion of smokers in impulse control style groups. Neuroticism  $\times$  Conscientiousness interaction**

The four impulse control style groups were determined by scores on Neuroticism (N) and Conscientiousness (C). The sample was split at the mean normative value ( $M = 50$ ), and the sign + and - following N or C indicates scores above and below the mean, respectively. For example, the Under-controlled (N+C-) group has high scores on Neuroticism and low on Conscientiousness.

Table 1

Means (SD) of personality traits for never, former, and current-smokers.

NEO-PI-R scales	Never-smokers (n = 828)	Former-smokers (n = 694)	Current-smokers (n = 116)	F (2, 1635)	$\eta^2$
Neuroticism	46.74 <sup>a</sup> (9.6)	48.51 <sup>b</sup> (9.2)	51.86 <sup>c</sup> (9.9)	17.77 <sup>**</sup>	.021
Extraversion	50.44 (10.3)	50.25 (10)	50.92 (9.4)	.24	.000
Openness	52.05 (11.1)	51.99 (10.6)	53.68 (10.8)	1.26	.002
Agreeableness	51.04 <sup>a</sup> (10.2)	49.42 <sup>b</sup> (9.0)	47.81 <sup>b</sup> (9.6)	8.94 <sup>**</sup>	.011
Conscientiousness	51.80 <sup>a</sup> (10.1)	48.86 <sup>b</sup> (9.7)	45.59 <sup>c</sup> (10.3)	29.42 <sup>**</sup>	.035
N1: Anxiety	47.7 <sup>a</sup> (9.7)	48.55 <sup>a</sup> (9.6)	51.57 <sup>b</sup> (10.2)	8.41 <sup>**</sup>	.010
N2: Angry Hostility	47.4 <sup>a</sup> (9.4)	49.51 <sup>b</sup> (9.0)	51 <sup>b</sup> (9.4)	14.3 <sup>**</sup>	.017
N3: Depression	47.16 <sup>a</sup> (9.4)	48.25 <sup>a</sup> (9.3)	51.76 <sup>b</sup> (10.6)	12.57 <sup>**</sup>	.015
N4: Self-consciousness	48.23 (9.8)	48.49 (9.2)	49.59 (10.2)	1.03	.001
N5: Impulsiveness	47.83 <sup>a</sup> (9.3)	49.56 <sup>b</sup> (9.3)	53.01 <sup>c</sup> (9.9)	18.32 <sup>**</sup>	.022
N6: Vulnerability	46.95 <sup>a</sup> (9.8)	48.99 <sup>b</sup> (9.6)	51.11 <sup>b</sup> (9.3)	14.41 <sup>**</sup>	.017
E1: Warmth	50.31 (10.1)	49.67 (9.8)	49.7 (9.8)	.83	.001
E2: Gregariousness	50.17 (10.6)	50.94 (10)	50.84 (10)	1.11	.001
E3: Assertiveness	52.79 (10)	52.12 (9.4)	50.84 (9.9)	2.46	.003
E4: Activity	51.33 (10.2)	50.42 (10.6)	50.17 (10.9)	1.71 <sup>**</sup>	.002
E5: Excitement-Seeking	47.14 <sup>a</sup> (9.7)	48.03 <sup>b</sup> (9)	50.95 <sup>b</sup> (8.6)	8.87 <sup>**</sup>	.011
E6: Positive Emotions	50.17 (11)	49.62 (10.4)	50.86 (10.7)	.91	.001
O1: Fantasy	50.82 (10.7)	51 (10.5)	53.76 (10.5)	3.94	.005
O2: Aesthetics	53.61 (10.1)	53.22 (10.1)	53.18 (9.3)	.31	.000
O3: Feelings	50.93 (10.2)	50.54 (9.9)	53.04 (9.4)	3.12	.004
O4: Actions	50.73 (11.1)	50.57 (10.2)	49 (10.3)	1.35	.002
O5: Ideas	51.39 (10.4)	51.28 (10.2)	51.28 (10.7)	.03	.000
O6: Values	49.85 <sup>a</sup> (10.8)	50.59 <sup>a</sup> (9.5)	53.57 <sup>b</sup> (10.3)	6.93 <sup>*</sup>	.008
A1: Trust	52.09 (10)	52.01 (9)	49.85 (10.6)	3.72	.005
A2: Straightforwardness	51.28 <sup>a</sup> (9.9)	50.36 <sup>a</sup> (9.5)	47.83 <sup>b</sup> (8.8)	6.98 <sup>*</sup>	.008
A3: Altruism	51 <sup>a</sup> (9.8)	49.05 <sup>b</sup> (9.5)	48.58 <sup>b</sup> (9.7)	9 <sup>**</sup>	.011
A4: Compliance	51.89 <sup>a</sup> (10.8)	50.07 <sup>b</sup> (10)	48.60 <sup>b</sup> (9.8)	8.76 <sup>**</sup>	.011
A5: Modesty	47.53 (10.2)	46.74 (9.5)	46.87 (10.2)	1.25	.002
A6: Tender-mindedness	50.41 (10.2)	49.58 (9.3)	50.32 (10.6)	1.35	.002
C1: Competence	53.32 <sup>a</sup> (10)	50.92 <sup>b</sup> (10.4)	49.63 <sup>b</sup> (10.7)	13.9 <sup>**</sup>	.017
C2: Order	49.21 <sup>a</sup> (10.3)	47.24 <sup>b</sup> (10.1)	46.78 <sup>b</sup> (10.8)	8.12 <sup>*</sup>	.010
C3: Dutifulness	51.85 <sup>a</sup> (9.3)	50.37 <sup>b</sup> (8.8)	46.58 <sup>c</sup> (9.6)	18.78 <sup>**</sup>	.022
C4: Achievement Striving	51.78 <sup>a</sup> (10.7)	49.78 <sup>b</sup> (10.2)	45.15 <sup>c</sup> (10.3)	23.08 <sup>**</sup>	.027
C5: Self-Discipline	49.23 <sup>a</sup> (10.7)	47.02 <sup>b</sup> (10.5)	44.43 <sup>c</sup> (10.3)	15.2 <sup>**</sup>	.018
C6: Deliberation	52.89 <sup>a</sup> (9.6)	50.02 <sup>b</sup> (9.5)	48.08 <sup>b</sup> (10.3)	24.08 <sup>**</sup>	.029

Note. Means with the same superscript are not significantly different,  $p < .05$  after Bonferroni correction.\*  $p < .05$ ,\*\*  $p < .01$ , after Bonferroni correction for 35 comparisons and controlling for sex, age, and education.