

Personality Measures as Predictors of Smoking Initiation and Cessation in the UNC Alumni Heart Study

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MMPI data collected from a sample of college men and women during 1964–1967 were used to predict smoking initiation and cessation over a 20-year follow-up period. People who subsequently began smoking were more rebellious, impulsive, sensation seeking, and hostile; were less likely to present a positive self-image; and were socially extraverted while in college. People who continued to smoke 20 years later were more hostile and sensation seeking. The personality variables that predicted smoking initiation and cessation were the same for men and women. Discussion centers on the potential role of hostility as a predictor of smoking cessation.

Key words: personality, smoking initiation and cessation, hostility

Understanding the processes of smoking initiation and cessation continues to pose challenges to health practitioners and researchers alike. To date, programs designed to help smokers quit have achieved only limited success (e.g., Leventhal & Cleary, 1980). For example, most interventions have a success rate of 10% to 25% 6 months to a year after initial client contact (e.g., Lando & McGovern, 1985; Ockene, Hymowitz, Sexton, & Broste, 1982), and even the best programs do not have an abstinence rate of more than 50% after 2 years (Leventhal & Baker, 1986).

A detailed analysis of the smoking process is necessary to understand why intervention programs have fared so poorly. Few would disagree that smoking behavior is a complex and multifaceted phenomenon. To help simplify and understand the processes involved, the U.S. Department of Health, Education, and Welfare (1979) divided smoking behavior into three main stages: initiation, maintenance, and cessation. Factors that may play a causal role at one stage may not be influential at another. For example, family and peer influences typically have a greater impact on initiation than on persistence of smoking (Leventhal & Cleary, 1980).

Personality factors are likely to have an important role in determining who begins, continues, and successfully stops smoking. Many individuals stop without any external support (e.g., Schachter, 1982), although others fail to abstain from smoking despite their best intentions and efforts, even with clinical interventions. The inability of some people to quit smoking is vividly illustrated by patients who, despite their physician's urgings, continue to smoke after suffering

a myocardial infarction (Burling, Singleton, Bigelow, Baile, & Gottlieb, 1984). Individuals who begin and maintain their smoking habit tend to be extraverted, anticonformist, and rebellious (e.g., Barefoot, Smith, Dahlstrom, & Williams, 1989; Cherry & Kiernan, 1976; Eysenck, 1980; Grunberg, Winders, & Wewers, 1991; Jessor & Jessor, 1977; Smith, 1970; Spielberg, 1986). Therefore, personality differences could potentially be important in the etiology, persistence, and termination of smoking behavior (e.g., Ashton & Stepney, 1982; Barefoot et al., 1989; Eysenck, 1980).

Studies investigating the predictive ability of personality variables have been hindered by two methodological problems. First, with few exceptions (e.g., Barefoot et al., 1989; Cherry & Kiernan, 1976; Seltzer & Oechsli, 1985), researchers have used cross-sectional rather than prospective designs. Consequently, it remains uncertain whether personality differences are the precursors or the products of smoking behavior. Second, studies have often confounded processes of initiation with processes of cessation. Processes of initiation require a comparison between nonsmokers (i.e., people who never smoked) with ex-smokers and current smokers; issues of cessation require a comparison between ex-smokers and smokers (Barefoot et al., 1989; Spielberger & Jacobs, 1982). The few prospective studies that examined the role of individual differences as predictors of initiation and cessation have not explicitly used this comparison strategy (Cherry & Kiernan, 1976; Seltzer & Oechsli, 1985). Instead, nonsmokers, ex-smokers, and current smokers have been compared as separate groups rather than contrasting nonsmokers with ex-smokers plus current smokers (i.e., initiation) or ex-smokers with current smokers (i.e., cessation; Cherry & Kiernan, 1976).

In a recent study, Barefoot et al. (1989) used the appropriate initiation and cessation group comparisons to study the relationship between several Minnesota Multiphasic Personality Inventory (MMPI) scales and smoking behavior in a sample of 239 male medical students during a 25-year follow-up. The MMPI scales of interest, chosen because of their previous associations with smoking behavior, were the *Pd* (Psychopathic Deviate) scale, which measures impulsive, rebellious, and anticonformist attitudes; the *Si* (Social Introversion) scale, which assesses preference for social activities and desire to interact with people; the *Ma* (Hypomania) scale, which captures sensation seeking, impulsivity, and sociability; the *L* (Lie)

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scale, which assesses a person's willingness to express personal faults; the *Ho* (Hostility) scale, which reflects a negative orientation toward people; and Schubert's (1965) Smoking scale, which was empirically derived to differentiate smokers from nonsmokers. Items on the Schubert scale appear to reflect arousal seeking, masculinity, hostility, and willingness to admit faults.

The results of the Barefoot et al. (1989) study were consistent with previous cross-sectional findings relating these MMPI scales to smoking status (e.g., Dvorak, 1967; Evans, Borgatta, & Bohrnstedt, 1967; Robbins, Tanck, & Meyersberg, 1971; Schubert, 1959, 1965). Physicians who never smoked, compared with those who did (i.e., ex-smokers and current smokers), had higher scores on the *L* (Lie) scale and lower scores on the *Pd* and Schubert scales. Therefore, physicians who had begun smoking portrayed a negative self-image, were more rebellious, and were higher in sensation seeking and masculinity while in medical school. Physicians who had successfully quit had lower *Ma* and *Pd* scores than those who continued to smoke. Thus, cessation was characterized by people who were less impulsive and less rebellious. This study provided evidence demonstrating that initiation and cessation involve different personality variables.

The Barefoot et al. (1989) study, while disentangling several of the earlier methodological problems, itself has limitations. First, the sample is unrepresentative of the population (e.g., well-educated, male physicians). The generalizability and confidence of the results would be strengthened by using a larger, more representative sample of men and women. Furthermore, because only a male sample was used, it was impossible to investigate the interaction between gender with the MMPI constructs as predictors of smoking behavior. There exists substantial evidence to suggest that gender should differentially predict smoking behavior (Grunberg et al., 1991; McGinnis, 1987, for reviews). Consequently, the main goal of the present study was to partially replicate and extend Barefoot et al.'s (1989) findings by using a larger and more representative sample of men and women. Specifically, this study examined how well the MMPI personality measures of *L*, *Si*, *Pd*, *Ma*, Schubert, and *Ho* predicted smoking initiation and cessation in a large sample of men and women.

Method

Subjects

Participants were 4,038 men and 889 women who were enrolled in the University of North Carolina Alumni Heart Study (UNCAHS) during 1987 through 1991. To be eligible in the UNCAHS, a person must have completed the MMPI while in college during 1964–1967, primarily at the time of registration (Siegler, Peterson, Barefoot, Harvin, et al., 1992).

Procedure

Data concerning smoking status was obtained from people who agreed to join the UNCAHS as of March 1, 1991. These data were collected from 4,927 subjects through mail questionnaires during April 1987 through March 1991.¹ At that time, subjects were asked if they had smoked more than 100 cigarettes in their life. If they answered no, they were considered a nonsmoker. If they answered yes, subjects indicated whether they were currently smoking. Individuals who said yes were classified as current smokers; individuals who said no were classified as ex-smokers. Both current and ex-smokers further reported the total number of years they had smoked, subtracting out any years during which they had quit; indicated the number of cigarettes they smoked

or did smoke a day before cessation; and reported the age at which they had begun and had quit smoking (if appropriate). Subjects did not complete the MMPI during these follow-up contacts.

Of the 4,927 subjects who were part of the UNCAHS as of March 1991, 144 persons (115 men and 29 women) were excluded from the present analyses because they had an invalid MMPI profile (MMPI-*L* score > 70; MMPI-*F* score > 80) or had 10% or more items missing from the *Ho* scale. In addition, 113 men and 24 women had missing data concerning their smoking status or did not report the age at which they had started to smoke. This left a total sample of 3,810 men and 836 women. Among women, 128, 290, and 418 were current, ex-smokers, and nonsmokers, respectively. Among men, 670, 1,442, and 1,698 were current, ex-smokers, and nonsmokers, respectively.

Table 1 contains the smoking history for ex-smokers, for current smokers, and for men and women who had ever smoked. Overall, current smokers had started smoking later and smoked more cigarettes for more years than did ex-smokers. Male current smokers started smoking later, smoked for more years, and smoked more cigarettes per day than did ex-smokers ($ps < .01$). Female current smokers smoked for more years than did female ex-smokers. Among current smokers, men smoked more cigarettes than did women. Among ex-smokers, women had started smoking later and smoked fewer cigarettes for fewer years than did men. Women who had ever smoked started smoking later and smoked fewer cigarettes than did men who had ever smoked. No other significant differences emerged.²

Results

Overview

Personality comparisons were made among (a) those who had never smoked with those who had smoked, (b) those who had begun smoking 1 year after taking the MMPI during college with people who were nonsmokers, and (c) those who had quit smoking versus those who continued to smoke. All analyses using the *L*, *Pd*, *Ma*, and *Si* scales were based on their standardized scores. Degrees of freedom varied because of missing data.

Contrasts Between People Who Had Ever Smoked and People Who Had Never Smoked

Comparisons were made on the six personality measures between people who had ever smoked versus those who had never smoked. This was assessed by contrasting ex-smokers and current smokers with people who reported to have never smoked in a two-factor Smoking Status (ex-smoker plus smoker vs. person who had never smoked) \times Gender multivariate analysis of variance (MANOVA). There were significant main effects for smoking status, multiple $F(6, 4531) = 42.5, p < .0001$, and gender, multiple $F(6, 4531) = 96.8, p < .0001$, and no interactions. Table 2 contains these mean differences. Women as compared with men had lower *Ma*, *Pd*, Schubert, and *Ho*

¹ Tracking enrolled participants, recruiting new subjects, and receipt of mailed questionnaires are ongoing processes. As of October 31, 1992, 5,733 persons had been located and enrolled in the UNCAHS. The 4,927 subjects in this study, whose data were available, represent 86% of that total. More detailed information concerning enrollment procedures can be found in Siegler, Peterson, Barefoot, Harvin, et al. (1992).

² Correlations were computed among the six personality measures with quantity and length of time spent smoking. In general, the correlations did not exceed $|\pm .12|$ and were inconsistent with the exception of *Pd*. Higher *Pd* scores correlated with years spent smoking for ex-smokers and current smokers. Detailed results can be obtained from Isaac M. Lipkus on request.

Table 1
Smoking History for Current Smokers, Ex-Smokers, and Men and Women Who Had Ever Smoked

Item	Current smoker						Ex-smoker						Smoking status					
	Men			Women			Men			Women			Collapsed across gender			Gender		
	M	SD		M	SD		M	SD		M	SD		M	SD		M	SD	
Age started smoking	18.1 _a	3.4	17.9 _a	3.2	17.5 _a	3.0	18.1 _b	2.3	18.1 _a	3.3	17.6 _b	2.9	17.6 _a	3.1	18.1 _b	2.6		
Average cigarettes smoked per day	25.4 _a	14.2	20.7 _b	1.2	21.1 _a	13.8	18.0 _b	0.76	24.6 _a	14.3	20.6 _b	13.7	22.5 _a	14.1	18.8 _b	13.3		
Years spent smoking	20.2 _a	5.5	19.6 _a	6.5	10.9 _a	6.6	10.3 _b	6.3	20.0 _a	5.7	10.8 _b	6.5	13.8 _a	7.6	13.1 _a	7.6		

Note. Items with different lettered subscripts refer to within-group contrasts that are significant at $p < .05$ or smaller.

Table 2
Means and Odds Ratios Comparing People Who Never Smoke Versus People Who Have Smoked

Personality measure	Smoking status						Gender collapsed across smoking status							
	Never smoked			Ever smoked			Men			Women			p <	
	M	SD		M	SD		M	SD		M	SD			
Social Introversion (Si)	51.7	10.3	49.7	9.7	50.0	9.7	1.69	1.62	1.50*	53.4	10.7	53.4	10.7	.0001
Lie (L)	46.9	5.9	45.8	5.5	46.2	5.7	1.28	1.44*	1.44*	46.9	5.7	46.9	5.7	.01
Hypomania (Ma)	57.6	10.1	60.3	10.2	59.4	10.2	1.52	1.72*	1.72*	59.4	10.2	57.7	10.3	.0001
Psychopathic Deviate (Pd)	56.8	9.6	60.1	10.3	59.0	10.1	1.72	1.93*	1.93*	59.0	10.1	56.6	10.0	.0001
Schubert Smoking scale	18.6	5.0	21.3	5.1	20.6	5.1	2.59	2.95*	2.95*	20.6	5.1	17.4	4.9	.0001
Hostility (Ho)	17.1	7.7	18.3	7.7	18.3	7.7	1.20	1.36*	1.36*	18.3	7.7	15.1	7.6	.0001

Note. The status of Ever smoked includes ex-smokers and current smokers and is based on subjects' 1987-1991 reports. The odds ratio represents the odds of ever having smoked. For Never smoked category, $n = 2,116$; for Ever smoked category, $n = 2,530$; for men, $n = 3,810$; for women, $n = 836$.

* $p < .0001$.

scores as well as higher *Si* and *L* scores. Thus, women were less rebellious, less impulsive, less sensation seeking, and less hostile as well as more introverted and more likely to present a favorable self-image. In relation to people who had never smoked, past and current smokers had higher *Ma*, *Pd*, *Ho*, and Schubert scores and lower *Si* and *L* scores. In summary, people who had ever smoked versus those who had never smoked were more impulsive, rebellious, hostile, socially extroverted, sensation seeking, and more willing to express personal faults.

Table 2 also contains the odds ratios for having ever smoked, estimated from beta coefficients of logistic regression models predicting smoking status from each scale. These odds ratios represent changes in odds of ever having been a smoker associated with a 2-standard-deviation difference on each scale. Overall, higher *Pd*, *Ma*, Schubert, and *Ho* scores as well as decreasing *Si* and *L* scores were associated with a significant increased probability of ever smoking.

Prospective Analysis of Smoking Initiation

The data collected in this study provided the unique opportunity to assess how well the various individual-difference measures predicted smoking initiation. On the basis of subjects' reported smoking history during college, it was possible to identify individuals who were nonsmokers or who reported that they had started smoking at least 1 year after taking the MMPI during the years 1964–1967.³ We assessed smoking initiation, therefore, by comparing people who reported at follow-up to have started smoking 1 year or more after taking the MMPI during 1964–1967 with people who had never started smoking.

Individual differences were assessed in a two-factor Smoking Status (smoker vs. nonsmoker) \times Gender MANOVA. There were significant main effects for smoking status, multiple $F(6, 2532) = 3.72, p < .01$, and gender, multiple $F(6, 2532) = 36.0, p < .0001$, and no interactions. Table 3 contains the mean differences among these groups. Women compared with men had lower *Ma*, *Pd*, Schubert, and *Ho* scores as well as higher *Si* and *L* scores. Compared with nonsmokers, people who would begin smoking had higher *Ma*, *Pd*, *Ho*, and Schubert scores as well as lower *Si* and *L* scores. In summary, people who would begin smoking were more impulsive, rebellious, hostile, socially extraverted, sensation seeking, and willing to express personal faults. Moreover, the lack of interaction between gender and smoking status suggests that these personality variables had the same influence on smoking initiation for men and women.

Table 3 also contains the odds ratios for smoking initiation, obtained through logistic regression, which represent changes in odds of ever having started smoking associated with a 2-standard-deviation difference on each scale. Overall, higher *Pd*, *Ma*, Schubert, and *Ho* scores as well as decreasing *Si* and *L* scores were associated with a significant increased probability of initiating smoking.

Prospective Analysis of Smoking Cessation

Determinants of smoking cessation were assessed by contrasting ex-smokers with current smokers in a two-factor Smoking Status (former vs. current) \times Gender MANOVA. The results revealed significant main effects for smoking status, multiple $F(6, 2471) = 4.07, p < .001$, and gender, multiple $F(6, 2471) = 41.3, p < .0001$, and no interactions. Table 4 contains the means for these groups. Women,

compared with men, had higher *Si* and lower *Pd*, Schubert, and *Ho* scores. Compared with ex-smokers, current smokers had higher Schubert and *Ho* scores only. In summary, people who had quit versus those who continued to smoke were less hostile and sensation seeking. Moreover, the lack of interaction between gender and smoking status suggests that these personality variables had the same influence on smoking cessation for men and women.

Table 4 also contains the odds ratios for remaining a smoker, obtained through logistic regression analyses. These odds ratios represent changes in odds of remaining a smoker associated with a 2-standard-deviation difference on each scale. Overall, higher Schubert and *Ho* scores were associated with a significant increased probability of remaining a smoker.

Discussion

Analyses were conducted to determine which subscales from the MMPI best predicted smoking initiation and cessation. The results, obtained using prospective data and making the appropriate group contrasts to examine processes of initiation and cessation, are consistent with previous findings linking personality and smoking behavior. Specifically, indicators of impulsiveness, rebelliousness, sensation seeking, gregariousness, self-presentational concerns, and hostility measured during college best predicted people who were likely to begin smoking (high *Pd*, *Ma*, *L*, Schubert, and *Ho* scores and low *Si* scores). Successful smoking cessation was best predicted by low *Ho* and Schubert scores. People who continued to smoke were more hostile and engaged more often in sensation-seeking behaviors. Moreover, the personality variables that predicted initiation and cessation did not vary by gender. The present study also reaffirms the basic Barefoot et al. (1989) findings, with a few exceptions. The major differences are that in the Barefoot et al. (1989) study, *Ho* did not predict smoking initiation or cessation, whereas *Ma* and *Pd* did predict smoking cessation. It is unclear why these findings differed between the two studies, although differences in sample characteristics (e.g., age or status) may provide plausible explanations.

The present results also contribute to the literature linking personality to smoking behavior more generally. The link between *Si* and smoking behavior reaffirms what has been found cross-sectionally, especially by Eysenck and colleagues, that extraversion is an important variable in initiating smoking (Ashton & Stepney, 1982; Eysenck, 1980; Smith, 1970). However, the present study also differs from the work of Eysenck and colleagues, who typically investigate the relationship between smoking and neuroticism, extroversion, and psychoticism, in that a broader range of personality variables were explored through the use of the MMPI.

³ A concern was whether subjects would be biased (i.e., inaccurate) in their recall of their smoking behavior during college. Fortunately, self-reports of smoking behavior were obtained from a large subsample of subjects ($n = 968$) at the time of college registration. Therefore, it was possible to verify the degree of agreement between what subjects had said on the follow-up questionnaire with what they had said when they were in college. There was clear disagreement in only 2.8% of the sample. Potential disagreement (e.g., saying in 1987 that they had been nonsmokers when in college but reporting during registration that they occasionally smoked) was present in an additional 16.9% of the sample. Although this analysis did not encompass the entire sample, it provided encouraging evidence that suggested that subjects' recall of their smoking behavior was, in general, quite accurate.

Table 3
Means and Odds Ratios Comparing People Who Began Smoking Versus Nonsmokers

Personality measure	Smoking status			p <	Odds ratio	95% CI			Gender collapsed across smoking status				p <
	Began smoking		Nonsmoker			Lower CI	Upper CI	Men		Women			
	M	SD	M					SD	M	SD	M	SD	
Social Introversion (Si)	50.4	10.0	51.7	10.2	.02	1.29*	1.05	1.57	50.9	9.9	54.0	11.0	.0001
Lie (L)	45.9	5.7	46.8	5.9	.01	1.39*	1.13	1.71	46.6	5.9	47.3	5.6	.02
Hypomania (Ma)	59.5	9.7	57.6	10.1	.001	1.44**	1.18	1.76	58.3	9.9	56.5	10.4	.001
Psychopathic Deviate (Pd)	58.6	9.0	56.0	9.6	.001	1.44**	1.19	1.73	57.6	9.5	55.6	9.4	.0001
Schubert Smoking scale	20.1	5.0	18.6	5.0	.0001	1.82**	1.49	2.22	19.5	4.9	16.1	4.7	.0001
Hostility (Ho)	18.1	7.6	17.1	7.7	.01	1.30*	1.08	1.56	18.0	7.6	14.2	7.5	.0001

Note. Individuals who constituted the Began smoking group (n = 481) consisted of people, based on the follow-up questionnaire, who started smoking at least 1 year after taking the Minnesota Multiphasic Personality Inventory (MMPI) during 1964-1967. The Nonsmoking group (n = 2,060) consisted of people who were not smoking at least 1 year after taking the MMPI during 1964-1967 and considered themselves to be nonsmokers at time of follow-up. The odds ratio represents the odds of someone starting to smoke. For men, n = 2,067; for women, n = 474. *p < .01. **p < .001.

Table 4
Means and Odds Ratios Comparing Current Smokers With Ex-Smokers

Personality measure	Smoking status			p <	Odds ratio	95% CI			Gender collapsed across smoking status				p <
	Current smoker		Ex-smoker			Lower CI	Upper CI	Men		Women			
	M	SD	M					SD	M	SD	M	SD	
Social Introversion (Si)	49.7	9.8	49.7	9.7	ns	1.00†	0.86	1.17	49.1	9.4	52.8	10.5	.0001
Lie (L)	46.1	5.6	45.7	5.4	ns	1.16†	0.98	1.37	45.8	5.4	46.1	5.8	ns
Hypomania (Ma)	60.7	10.0	60.1	10.3	ns	1.12†	0.94	1.32	60.5	10.3	59.4	9.9	ns
Psychopathic Deviate (Pd)	60.6	10.5	59.8	10.2	ns	1.16†	0.98	1.36	60.5	10.2	57.9	10.4	.0001
Schubert Smoking scale	21.6	5.2	21.1	5.1	.04	1.20*	1.01	1.42	21.7	5.1	18.8	4.8	.0001
Hostility (Ho)	18.9	7.6	18.0	7.7	.01	1.27**	1.07	1.51	18.7	7.7	16.2	7.7	.0001

Note. The odds ratio represents the odds of remaining a smoker. For current smokers, n = 798; for ex-smokers, n = 1,732; for men, n = 2,112; for women, n = 418. †Not significant. *p < .05. **p < .01.

Whereas the strength of the present study is its large prospective sample spanning many years, there are several methodological issues that merit attention. A limitation is the lack of independent verification of smoking status, especially during college. It is possible, because of the time elapsed, that recall of smoking behavior during college may be biased. An attempt to check the accuracy of the report on a subsample of subjects was encouraging (see footnote 3).

In this study, it is also assumed that personality is at least moderately stable from young to middle adulthood. Indeed, there is evidence supporting this assumption. In an analysis of the MMPI content scales, using a subsample of the UNCAHS, Siegler et al. (1990) found that approximately half of the variance in basic dimensions of personality over 20 years was stable from college to middle adulthood. Furthermore, hostility was found to have a stability coefficient of .46 (Siegler et al., 1990), closely replicating another study, which encompassed a 32-year follow-up period (Hearn, Davidson, & Murray, 1990). Finally, the ability of the present clinical and content scales to predict smoking behavior in accordance with previous findings suggests that these scales are tapping the constructs of interest with at least moderate validity and stability.

Although they were statistically significant, another issue is whether the present effect sizes have practical importance. Unfortunately, there are no standardized methods to estimate what is an important or large effect size. The significance of an effect size needs to be considered in the light of the study design and the outcome(s) of interest. With respect to longitudinal studies, even small differences can have a very large cumulative impact over a period of time (Abelson, 1985; Siegler, Peterson, Barefoot, & Williams, 1992). Indeed, the ability of any single variable to predict a phenomenon over a large time span, as in this study, is important.

Of the six personality variables studied, hostility emerged as a significant disposition that distinguished ex-smokers from current smokers. This finding not only provides additional evidence linking hostility to smoking behavior (e.g., Koskenvuo et al., 1988; Musante, Treiber, Davis, Strong, & Levy, 1992; Scherwitz & Rugulies, 1992) but also extends the work of Siegler, Peterson, Barefoot, and Williams (1992), who found that hostility prospectively predicted prevalence of current smoking in the UNCAHS. Because smoking has been linked to coronary disease and hostility may be an important variable in initiating and maintaining this habit, an important task of future research will be to further clarify the relationship between hostility and smoking. Indeed, this task would add significantly to the growing literature linking hostility with coronary disease (e.g., Barefoot, Dahlstrom, & Williams, 1983; Shekelle, Gale, Ostfeld, & Paul, 1983) and with maladaptive health habits (Scherwitz & Rugulies, 1992).

References

- Abelson, R. P. (1985). A variance explanation paradox: When a little is a lot. *Psychological Bulletin*, *97*, 129–133.
- Ashton, H., & Stepney, R. (1982). *Smoking: Psychology and pharmacology*. London: Tavistock Publications.
- Barefoot, J. C., Dahlstrom, W. G., & Williams, R. B. (1983). Hostility, CHD incidence, and total mortality: A 25-year follow-up study of 255 physicians. *Psychosomatic Medicine*, *51*, 46–57.
- Barefoot, J. C., Smith, R. H., Dahlstrom, W. G., & Williams, R. B. (1989). Personality predictors of smoking behavior in a sample of physicians. *Psychology and Health*, *3*, 37–43.
- Burling, T. A., Singleton, E. G., Bigelow, G. E., Baile, W. F., & Gottlieb, S. H. (1984). Smoking following infarction: A critical review of the literature. *Health Psychology*, *3*, 83–96.
- Cherry, N., & Kiernan, K. E. (1976). Personality scores and smoking behavior: A longitudinal study. *British Journal of Preventive and Social Medicine*, *30*, 123–131.
- Dvorak, E. J. (1967). Educational and personality characteristics of smokers and nonsmokers among university freshman. *Journal of the American College Health Association*, *16*, 80–84.
- Evans, R. R., Borgatta, E. F., & Bohrmstedt, G. W. (1967). Smoking and MMPI scores among entering freshman. *Journal of Social Psychology*, *73*, 137–140.
- Eysenck, H. J. (1980). *The causes and effects of smoking*. London: Temple Smith.
- Grunberg, N. E., Winders, S. E., & Wewers, M. E. (1991). Gender differences in tobacco use. *Health Psychology*, *10*, 143–153.
- Hearn, M. D., Davidson, M. L., & Murray, D. M. (1990, April). *Thirty-two year stability of the MMPI Cook-Medley Hostility scale in university students*. Paper presented at the Eleventh Annual Meeting of the Society of Behavioral Medicine, Chicago.
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychosocial development: A longitudinal study of youth*. San Diego, CA: Academic Press.
- Koskenvuo, M., Kaprio, J., Rose, R. J., Kesaniemi, A., Sarna, S., Hekkila, K., & Langivainio, H. (1988). Hostility as a risk factor for mortality and ischemic heart disease in men. *Psychosomatic Medicine*, *50*, 330–340.
- Lando, H. A., & McGovern, P. G. (1985). Nicotine fading as a nonaversive alternative to broad spectrum tests. *Addictive Behaviors*, *10*, 153–161.
- Leventhal, H., & Baker, T. B. (1986). Strategies for smoking withdrawal. *Wisconsin Medical Journal*, *85*, 11–13.
- Leventhal, H., & Cleary, P. D. (1980). The smoking problem: A review of the research and theory in behavioral risk modification. *Psychological Bulletin*, *88*, 370–405.
- McGinnis, M. J. (1987). Tobacco and health: Trends in smoking and smokeless tobacco consumption in the United States. *Annual Review of Public Health*, *8*, 441–467.
- Musante, L., Treiber, F. A., Davis, H., Strong, W. B., & Levy, M. (1992). Hostility: Relationship to lifestyle behaviors and physical risk factors. *Behavioral Medicine*, *18*, 21–26.
- Ockene, J. K., Hymowitz, N., Sexton, M., & Broste, S. K. (1982). Comparison of patterns of smoking behavior change among smokers in the Multiple Risk Factor Intervention Trial (MRFIT). *Preventive Medicine*, *11*, 621–638.
- Robbins, P. R., Tanck, R. H., & Meyersberg, H. A. (1971). Psychological factors in smoking, drinking, and drug experimentation. *Journal of Clinical Psychology*, *27*, 450–452.
- Schachter, S. (1982). Recidivism and self-care of smoking and obesity. *American Psychologist*, *37*, 436–444.
- Scherwitz, L., & Rugulies, R. (1992). Life-style and hostility. In H. S. Friedman (Ed.), *Hostility, coping, and health* (pp. 77–98). Washington, DC: American Psychological Association.
- Schubert, D. S. P. (1959). Personality implications of cigarette smoking among college students. *Journal of Consulting Psychology*, *23*, 376.
- Schubert, D. S. P. (1965). Arousal seeking as a central factor in tobacco smoking among college students. *International Journal of Social Psychiatry*, *11*, 221–225.
- Seltzer, C., & Oechsli, F. (1985). Psychosocial characteristics of adolescent smokers before they started smoking: Evidence of self-selection. A prospective study. *Journal of Chronic Diseases*, *38*, 17–26.
- Shekelle, R. B., Gale, M., Ostfeld, A. M., & Paul, O. (1983). Hostility, risk of coronary disease and mortality. *Psychosomatic Medicine*, *45*, 219–228.
- Siegler, I. C., Peterson, B. L., Barefoot, J. C., Harvin, S. H., Dahlstrom, W. G., Kaplan, B. H., Costa, P. T., & Williams, R. B. (1992). Using college alumni populations in epidemiology research: The UNC Alumni Heart Study. *Journal of Clinical Epidemiology*, *45*, 1243–1250.

- Siegler, I. C., Peterson, B. L., Barefoot, J. C., & Williams, R. B. (1992). Hostility during late adolescence predicts coronary risk factors at midlife. *American Journal of Epidemiology*, *136*, 146–154.
- Siegler, I. C., Zonderman, A. B., Barefoot, J. C., Williams, R. B., Costa, P. T., & McCrae, R. R. (1990). Predicting personality in adulthood from college MMPI scores: Implications for follow-up studies in psychosomatic medicine. *Psychosomatic Medicine*, *52*, 644–652.
- Smith, G. M. (1970). Personality and smoking: A review of the literature. In W. G. Hunt (Ed.), *Learning mechanisms in smoking* (pp. 42–61). Chicago: Aldine.
- Spielberger, C. D. (1986). Psychological determinants of smoking behavior. In R. D. Tollison (Ed.), *Smoking and society: Towards a more balanced assessment* (pp. 89–134). Lexington, MA: Lexington Books.
- Spielberger, C. D., & Jacobs, G. A. (1982). Personality and smoking behavior. *Journal of Personality Assessment*, *46*, 396–403.
- U.S. Department of Health, Education, and Welfare. (1979). *Smoking and health: A report of the Surgeon General* (DHEW Publication No. PHS 79-50066). Washington, DC: U.S. Government Printing Office.